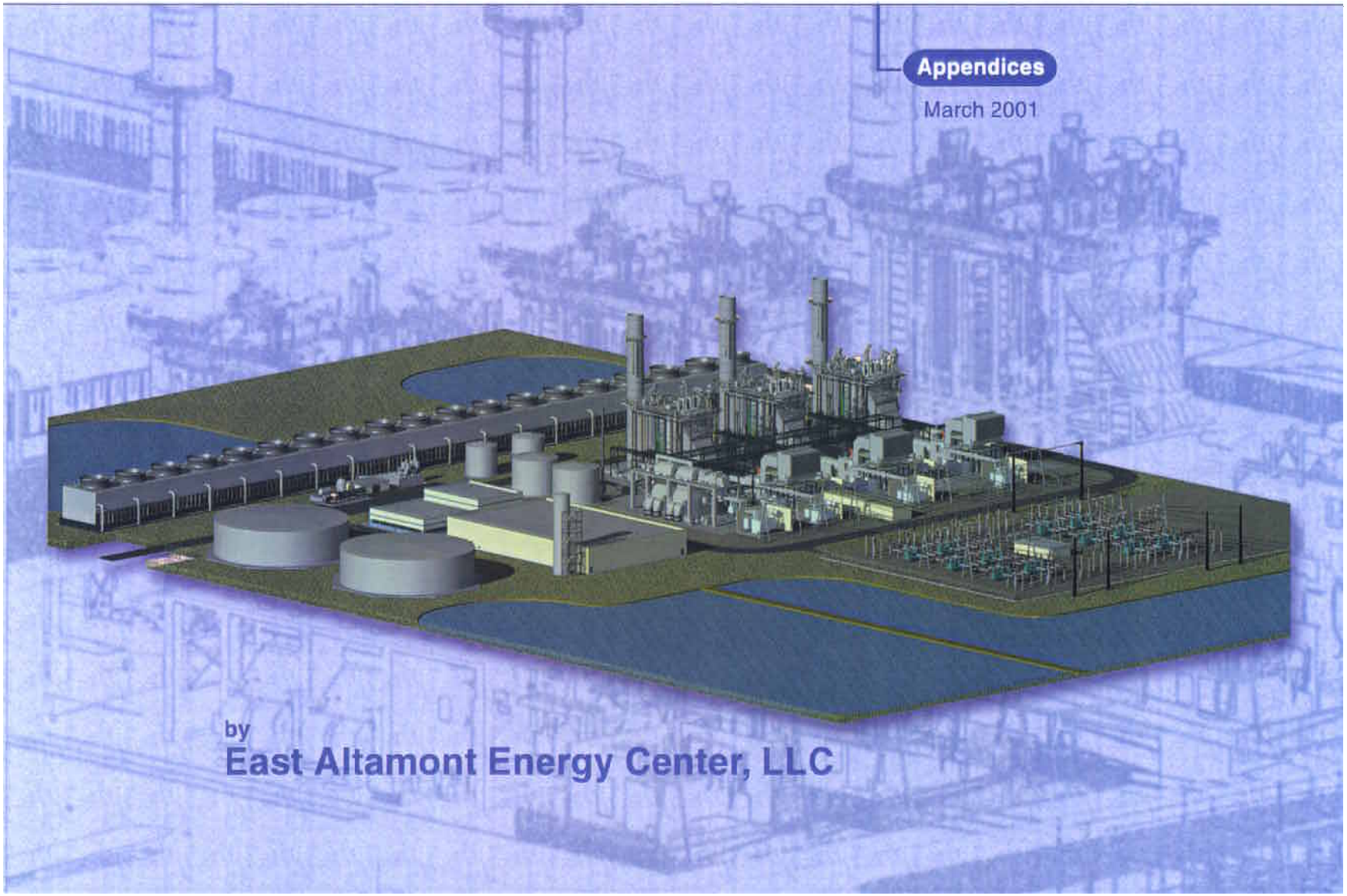
Application for Certification for

East Altamont Energy Center

Submitted To:

California Energy Commission Sacramento, California



Appendices

March 2001

by

East Altamont Energy Center, LLC

Appendices for East Altamont Energy Center Application for Certification

Sections

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- 1B Owners Adjacent to the Site and Linear Corridors
- 1C Persons Who Prepared the AFC

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- 5.4A System Impact Study Plan
- 5.5A EMF and Powerline Concepts
- 5.5B Electric Field Data Sheets
- 5.5C Audible Noise Data Sheets
- 5.5D Magnetic Field Data Sheets

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- 6.1A Application for Service

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8.5 Noise
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- 10D Electrical Engineering Design Criteria
- 10E Control Engineering Design Criteria
- 10F Chemical Engineering Design Criteria

Appendix 1A

Exhibit "A"

Those parcels of land in the unincorporated area, County of Alameda, State of California, described as follows:

Parcel One:

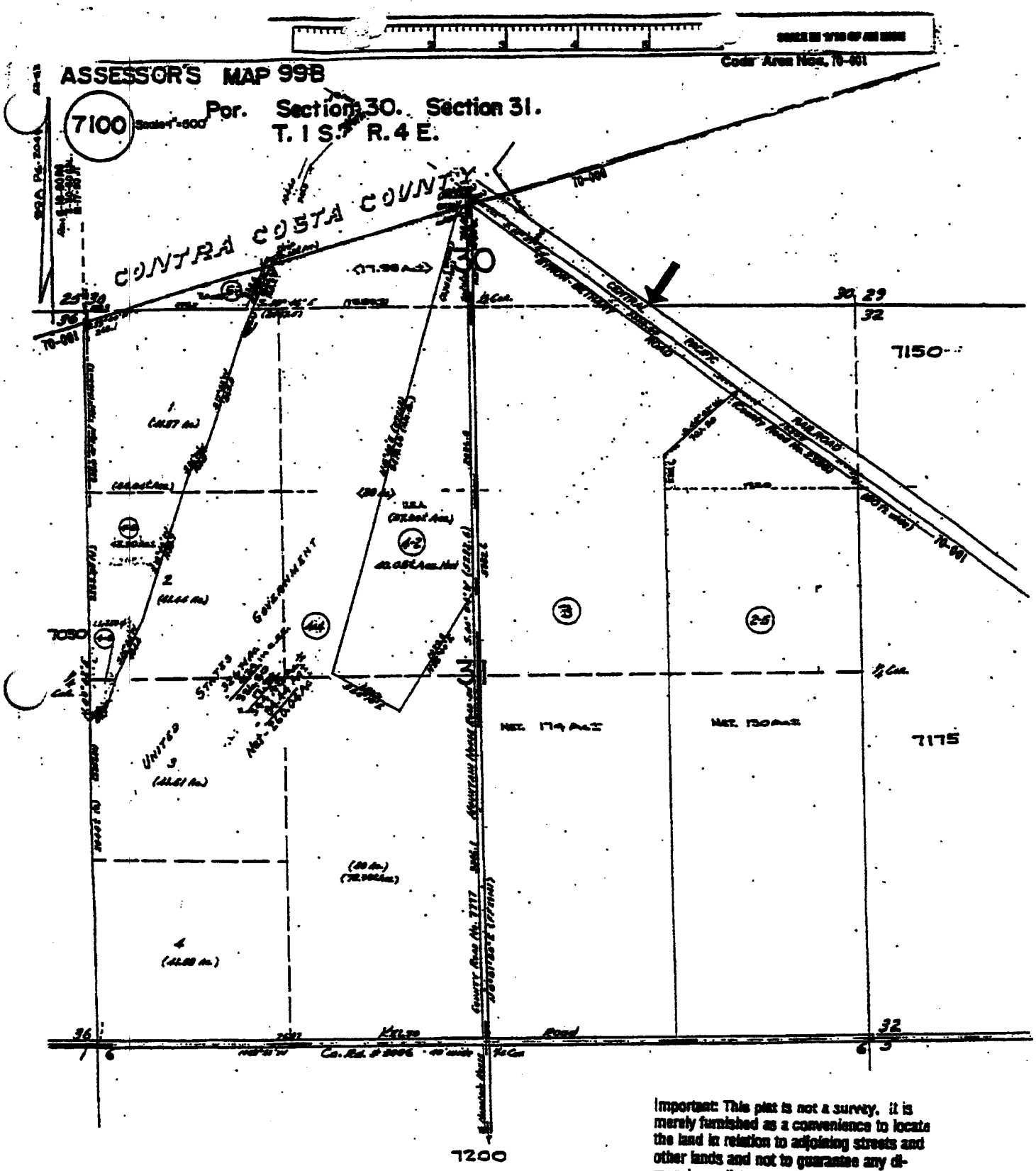
The west half of the southeast quarter, and southwest quarter of the northeast quarter of Section 31, in Township 1 South, Range 4 East, Mount Diablo Base and Meridian.

Parcel Two:

A portion of the north half of the northeast quarter of Section 31 and a portion of the southwest quarter of the southeast quarter of Section 30, both in Township 1 South, Range 4 East, Mount Diablo Base and Meridian, more particularly described as follows:

Beginning at the quarter corner common to said Sections 30 and 31 and running thence north along the west line of the southeast quarter of the southeast quarter of said Section 30, a distance of 830.00 feet to a point on the southwestern line of the right of way of the Southern Pacific Railroad; thence along said last named line south 51° 57' east 2338.60 feet thence south 48° 02' west 701.30 feet to a point on the east line of the northwest quarter of the northeast quarter of said Section 31; thence along said last named line 239.60 feet to the northeast corner of the southwest quarter of the northeast quarter of said Section 31; thence along the north line of said southwest quarter west 1320.10 feet to a point on the western line of the northwest quarter of the northeast quarter of said Section 31; thence north along said last named line 1320.00 feet to the point of beginning.

APN 099B-7100-003



ACM 50

Res. of Sur. No. 233 (R.S. Bk. 5 Pg. 84) (Por. 2-5, 3)
Reference: Res. of Sur. Neil Fabian Ppty. (R.S. Bk. 2 Pg. 14)

Appendix 1B

ARNAUDO BROS
(099B-7175-006-00)
16505 TRACY BL
TRACY CA 95376

ARNAUDO BROTHERS
(209-040-10)
16505 S TRACY BLVD
TRACY CA 95376

BETTENCOURT FRANK C & MARY E
(001-051-006-3)
20578 S WAGNER RD
RIPON CA 95366

BRUNS PROPERTIES
(001-041-054-6)
239 MAIN ST #E
PLEASANTON CA 94566

BYRON-BETHANY IRRIGATION D
(001-041-030-6)
BRUNS RD
BYRON CA 94514

CALIFORNIA STATE OF
(001-031-021-7)
BOX 7791 RINCON ANNEX
SAN FRANCISCO CA 94120

CALIFORNIA STATE OF
(001-041-012-4)
BOX 7791 RINCON ANNEX
SAN FRANCISCO CA 94120

CALIFORNIA STATE OF
(001-041-024-9)
BOX 7791 RINCON ANNEX
SAN FRANCISCO CA 94120

CALIFORNIA STATE OF
(001-041-035-5)
BRUNS RD
BYRON CA 94514

CALIFORNIA STATE OF
(001-081-028-1)
BOX 7791 RINCON ANNEX
SAN FRANCISCO CA 94120

CARLSON HEINZ & GISELE
(001-041-007-4)
200 KENNY CT
SANTA CRUZ CA 95065

CARLSON HEINZ & GISELE
(001-041-041-3)
200 KENNY CT
SANTA CRUZ CA 95065

CASTELLO ANTHONY J & PHYLLIS H
(099B-7200-004-00)
2681 A MOUNTAIN HOUSE RD
TRACY CA 95376

CHEVRON USA INC
(001-041-042-1)
P O BOX 285
HOUSTON TX 77001

CHEVRON USA INC
(001-041-049-6)
P O BOX 285
HOUSTON TX 77001

CORDES JACQUELYN
(209-160-05)
1677 PARKVIEW LANE
CHICO CA 95926

COSTA EVELYN TR
(099B-7150-010-08)
P O BOX 1185
TRACY CA 95378

COSTA EVELYN TR
(099B-7150-011-00)
PO BOX 1185
TRACY CA 95378

COSTA EVELYN TRE
(001-061-007-9)
P O BOX 1185
TRACY CA 95376

COSTA JOHNNIE L & J
(209-310-08)
222 ALVARADO WAY
TRACY CA 95376

COUNTY OF ALAMEDA
(099B-7175-005-01)
1221 OAK ST #536
OAKLAND CA 94612

CUNHA FLP
(209-160-01)
1885 W CYPRESS
OAKLEY CA 94561

CUNHA ROY
(209-160-10)
PO BOX 23893
PLEASANT HILL CA 94523

CUNHA ROY A
(209-160-08)
PO BOX 23893
PLEASANT HILL CA 94523

CUNHA ROY A & MARK K
(001-041-044-7)
P O BOX 23893
PLEASANT HILL CA 94523

CUNHA ROY A & MARK K
(001-041-045-4)
P O BOX 23893
PLEASANT HILL CA 94523

D & P FAMILY LIMITED PARTNERSHIP
(209-150-02)
25986 CARBONA CT
TRACY CA 95376

DAVIS STANFORD A & P
(209-150-01)
17700 W BYRON RD
TRACY CA 95376

DEXTER ALBERT F & SHARON & MIKE J
(099B-7175-005-02)
17499 KELSO RD
LIVERMORE CA 94514

ENOS MARTIN M & JEAN H TRE
(001-041-051-2)
8716 ALMENDRA WY
TRACY CA 95376

ENOS MARTIN M & JEAN H TRE
(001-041-053-8)
8716 ALMENDRA WY
TRACY CA 95376

ENOS MARTIN M & JEAN H TRS
(099B-7100-004-05)
8716 ALMENDRA WY
TRACY CA 95376

FISH ARNOLD M & JOAN M
(209-160-03)
17570 W BETHANY RD
TRACY CA 95376

FRANCO HENRY & ANITA ETAL
(099B-7100-002-05)
RT#1 BX 29-17200 KELSO RD
BYRON CA 94514

FRANCO HENRY & ANITA ETAL
(099B-7175-001-00)
RT#1 BX 29-17200 KELSO RD
BYRON CA 94514

GOMES MARIE FARMS CX
(099B-7030-002-02)
1130 MARIAN CT
TRACY CA 95376

GRIFFITH DONALD D & GRACE A
(099B-7030-003-04)
15616 KELSO RD
BYRON CA 94514

GRIFFITH DONALD D ETAL
(099B-7030-003-03)
15616 KELSO RD
BYRON CA 94514

HOLCK THELMA ETAL
(099B-7100-003-00)
8406 TERRACE DR
STOCKTON CA 95212

JESS DONALD L & JOAN TRS
(099B-7050-001-03)
3100 MT HOUSE RD
TRACY CA 95376

JESS DONALD L & JOAN TRS
(099B-7050-001-05)
3100 MT HOUSE RD
TRACY CA 95376

JESS DONALD L & JOAN TRS
(099B-7050-002-00)
3100 MT HOUSE RD
TRACY CA 95376

JESS DONALD L & JOAN TRS
(099B-7050-004-04)
3100 MT HOUSE RD
TRACY CA 95376

JESS NELL L TR
(099B-7500-004-03)
3250 MOUNTAIN HOUSE RD
BYRON CA 94514

JESS NELL L TR
(099B-7500-004-04)
3250 MOUNTAIN HOUSE RD
BYRON CA 94514

KUHN GARY L & DOLORES E
(099B-7200-001-00)
4378 MOUNTAIN HOUSE RD
TRACY CA 95376

LEE STEVE S & PUANG J
(099B-7050-001-10)
3643 FERRY LN
FREMONT CA 94555

LITTLE DOUGLAS R & SYLVIA T
(099B-7050-003-11)
17250 W VON SOSTON RD
TRACY CA 95376

LIVERMORE EQUITY GROUP
(099B-7030-001-00)
4070 SPRING MTN RD
ST HELENA CA 94574

MALDONADO JUAN DANIEL & GRACE
(209-160-04)
17600 W BETHANY RD
TRACY CA 95376

MICHAEL THOMAS A & CATHERINE M TRS
(099B-7050-003-10)
RT 1 BOX 35-D
BYRON CA 94514

MOORE SHELDON G & NANCY D
(001-081-020-8)
7555 HERDLYN RD
BYRON CA 94514

MOUNTAIN HOUSE SCHOOL
(099B-7200-003-01)

PAKZAD FEREYDOON
(209-040-04)
18764 W BYRON RD
TRACY CA 95376

PANGILINAN NAPOLEON & MIRIAN
(099B-7050-003-12)
15559 KELSO RD
BYRON CA 94514

PATTESON FRANCES P
(099B-7150-014-00)
1852 W 11TH ST #143
TRACY CA 95376

PATTESON FRANCES P
(209-030-18)
P O BOX 64
TRACY CA 95376

PETERSON LA VERNE & JANE
(099B-7050-003-08)
15991 KELSO RD
BYRON CA 94514

PETERSON LAVERNE & JANE
(099B-7050-003-09)
15991 KELSO RD
BYRON CA 94514

PGE CX 135 1 95 1
(099B-7030-002-01)
77 BEALE ST PO X 770000
SAN FRANCISCO CA 94177

PIMENTEL VELMA C
(209-150-27)
1127 E GRANTLINE RD
TRACY CA 95376

PIMENTEL VELMA C
(209-150-30)
8297 W GRANTLINE RD
TRACY CA 95376

RANKINS AG INC
(209-150-29)
17400 W BETHANY RD
TRACY CA 95376

ROFFONI TRACY LIMITED PARTNERSHIP
(099B-7175-002-00)
122 E BETTERAVIA RD
SANTA MARIA CA 93454

ROFFONI TRACY LTD PTP
(209-030-15)
122 E BETTERAVIA RD
SANTA MARIA CA 93454

SANDHU MOHINDER & KULWANT KAUR
(001-051-009-7)
8197 JADE CIR
DUBLIN CA 94568

SANTUCCI LOUIS & D M
(209-040-03)
2215 CHARDONNAY WAY
LIVERMORE CA 94550

SCHROPP WERNER R & IRMGARD S
(099B-7200-002-03)
P O BOX 1076
WEST SACRAMENTO CA 95691

SCHROPP WERNER R & IRMGARD S
(099B-7200-002-04)
P O BOX 1076
WEST SACRAMENTO CA 95691

SHAIBI SALEH NASHER
(001-051-008-9)
290 W 10TH ST
PITTSBURG CA 94565

SIMONICH DANIEL J & DENISE L
(099B-7100-005-00)
441 W 20TH ST
TRACY CA 95376

SIMONICH DANIEL J & DENISE L
(001-051-007-1)
441 W 20TH ST
TRACY CA 95376

SIMONICH DANIEL J & DENISE L
(001-051-010-5)
441 W 20TH ST
TRACY CA 95376

SIMONICH LEROY W & RHODA H
(099B-7100-004-06)
MOUNTAIN HOUSE RD
LIVERMORE CA 94550

SOUZA THELMA
(209-310-07)
8738 W VALPICO RD
TRACY CA 95376

SP CX 872 1 16A 2
(099B-7150-016-00)
PO BOX 2500
BROOMFIELD CO 80038

TRIMARK COMMUNITIES
(209-040-11)
3120 TRACY BLVD SUITE C
TRACY CA 95376

TRIMARK COMMUNITIES INC
(209-030-04)
3120 TRACY BLVD #C
TRACY CA 95376

TRIMARK COMMUNITIES PTP
(209-030-05)
3120 TRACY BLVD SUITE A
TRACY CA 95376

TRIMARK COMMUNITIES PTP
(209-030-06)
3120 TRACY BLVD SUITE A
TRACY CA 95376

TRIMARK COMMUNITIES PTP
(209-040-02)
3120 TRACY BLVD SUITE A
TRACY CA 95376

TRIMARK COMMUNITIES PTP
(209-040-09)
3120 TRACY BL SUITE C
TRACY CA 95376

TRIMARK COMMUNITIES PTP
(209-160-02)
3120 TRACY BLVD SUITE C
TRACY CA 95376

UNION PACIFIC RAILROAD COMPANY
(209-030-17)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-030-20)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-030-21)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-040-07)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-040-08)
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OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-150-17)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-160-06)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNION PACIFIC RAILROAD COMPANY
(209-160-11)
1416 DODGE ST ROOM 830
OMAHA NE 68179

UNITED STATES OF AMERICA
(001-051-004-8)
P O BOX 3402
GOLDEN CO 80401

UNITEDSTATES OF AMERICA
(099B-7030-003-01)

UNITEDSTATES OF AMERICA
(099B-7050-005-00)

UNITEDSTATES OF AMERICA
(099B-7100-004-02)
P O BOX 3402
GOLDEN CO 80401

UNITEDSTATES OF AMERICA
(099B-7100-004-04)
94514

UNITEDSTATES OF AMERICA
(099B-7200-005-00)

UNITEDSTATES OF AMERICA
(099B-7350-004-00)

VAUGHAN MARIE B HEIRS OF EST
(099B-7175-003-00)
552 VALLE VISTA AVE
OAKLAND CA 94610

VAUGHAN WILLIAM W & M Y
(209-030-14)
3211 LAKESHORE AV
OAKLAND CA 94610

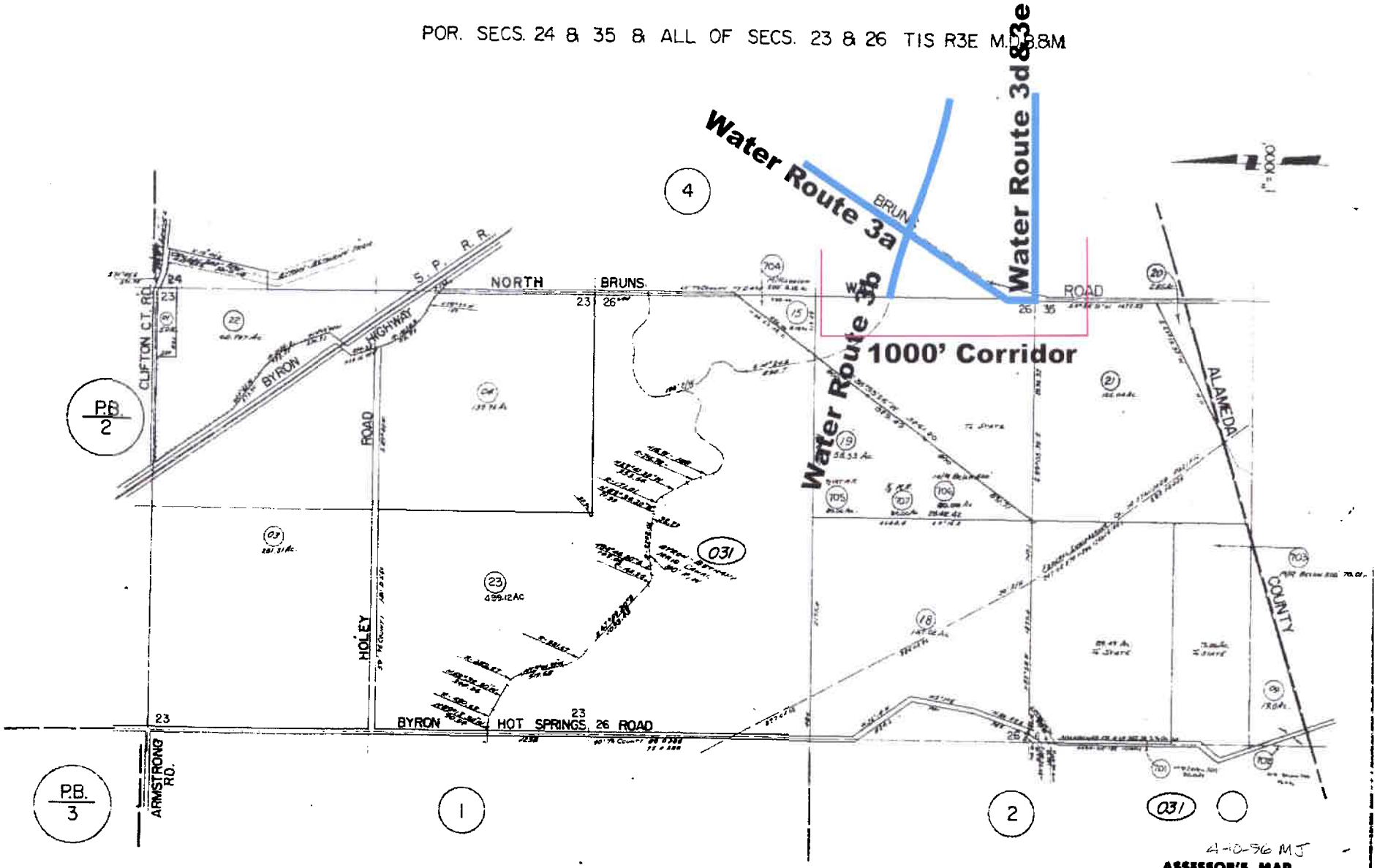
WARNOCK JAMES & CAROL
(001-051-003-0)
7720 BYRON HWY
BYRON CA 94514

WATSON HOWARD F & JO ANN M
(001-041-034-8)
7777 BRUNS RD
BYRON CA 94514

WEST SIDE IRRIG DIST
(209-310-11)
X

WEST SIDE IRRIG DISTRICT
(209-160-09)
X

POR. SECS. 24 & 35 & ALL OF SECS. 23 & 26 T1S R3E M.D.B.&M.



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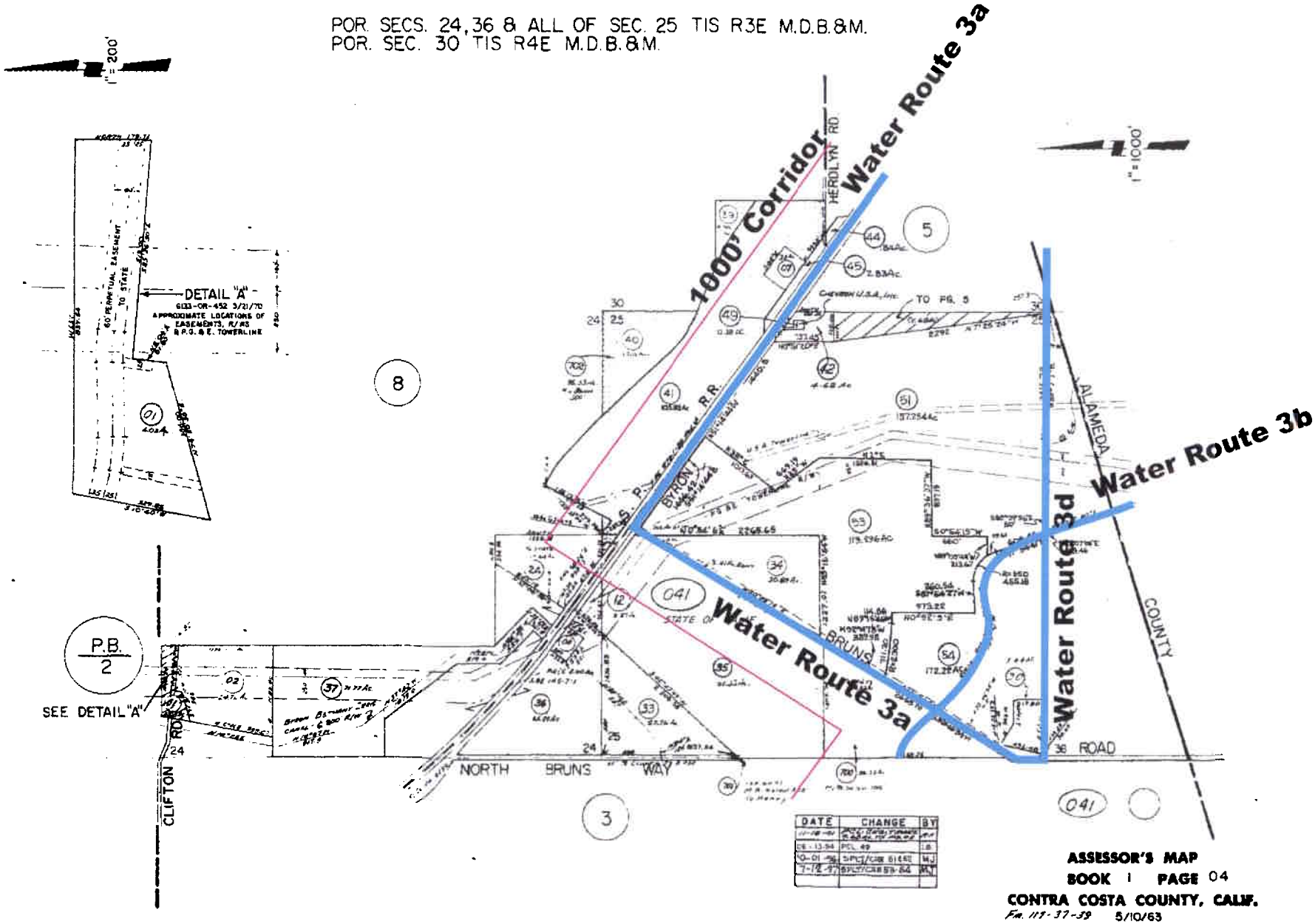
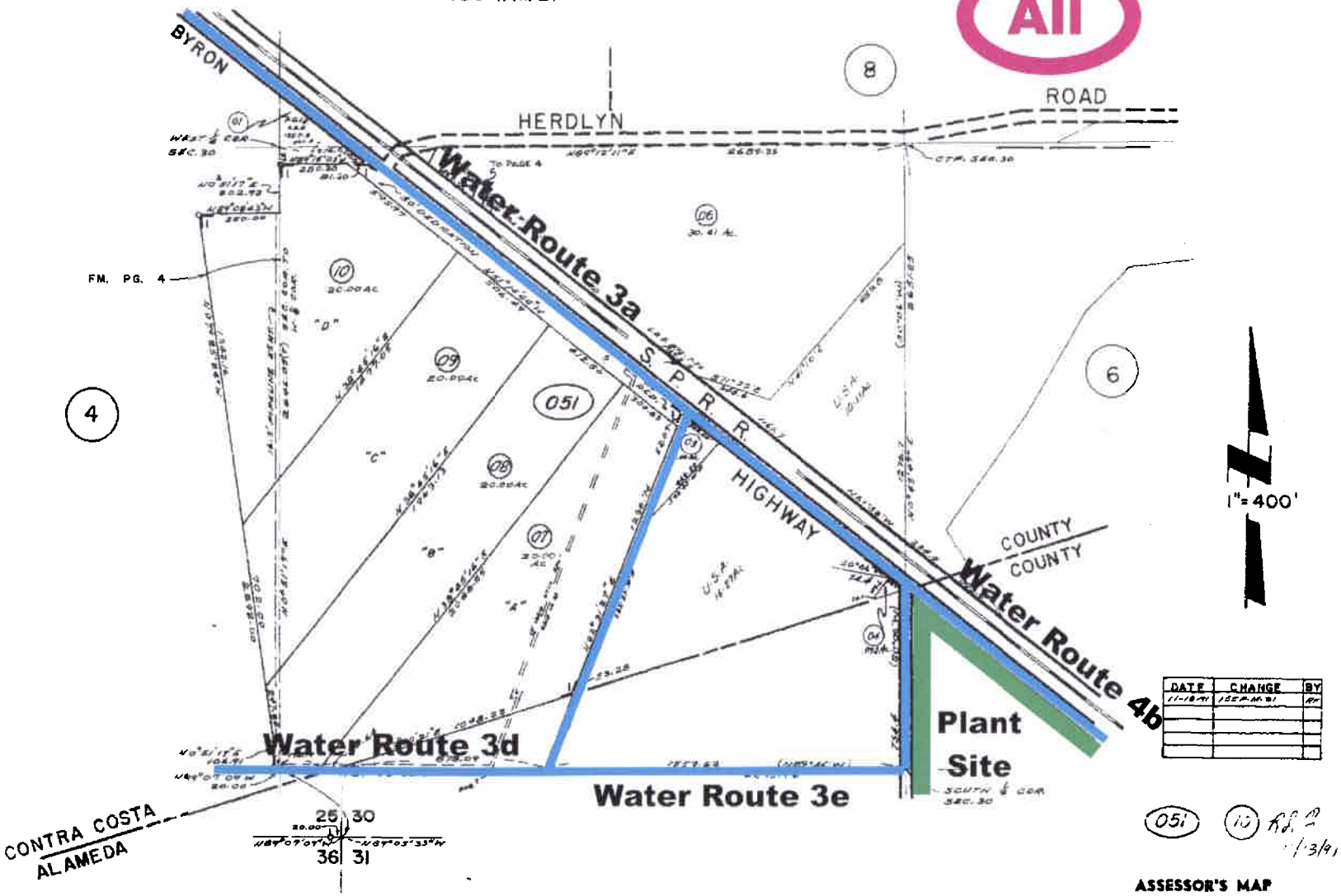
POR. SECS. 24, 36 & ALL OF SEC. 25 TIS R3E M.D.B.&M.
POR. SEC. 30 TIS R4E M.D.B.&M.



001-04

POR. SW 1/4 SEC. 30 T1S R4E M·D·B·&M·
1-155 P.M. 21 10-29-91

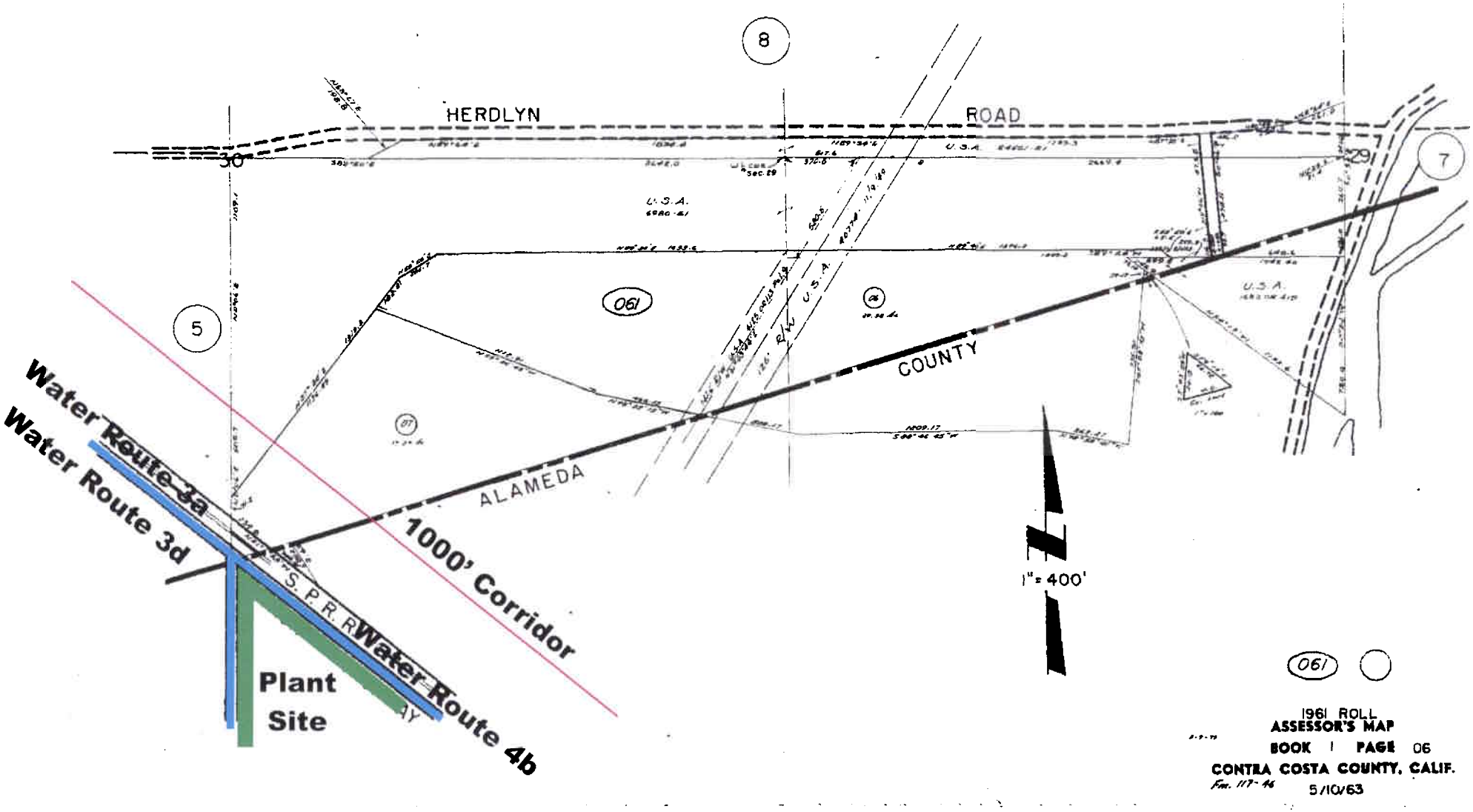


ASSESSOR'S MAP
BOOK 1 PAGE 05
CONTRA COSTA COUNTY, CALIF.
Fm. 117-45 5/10/63

001-05

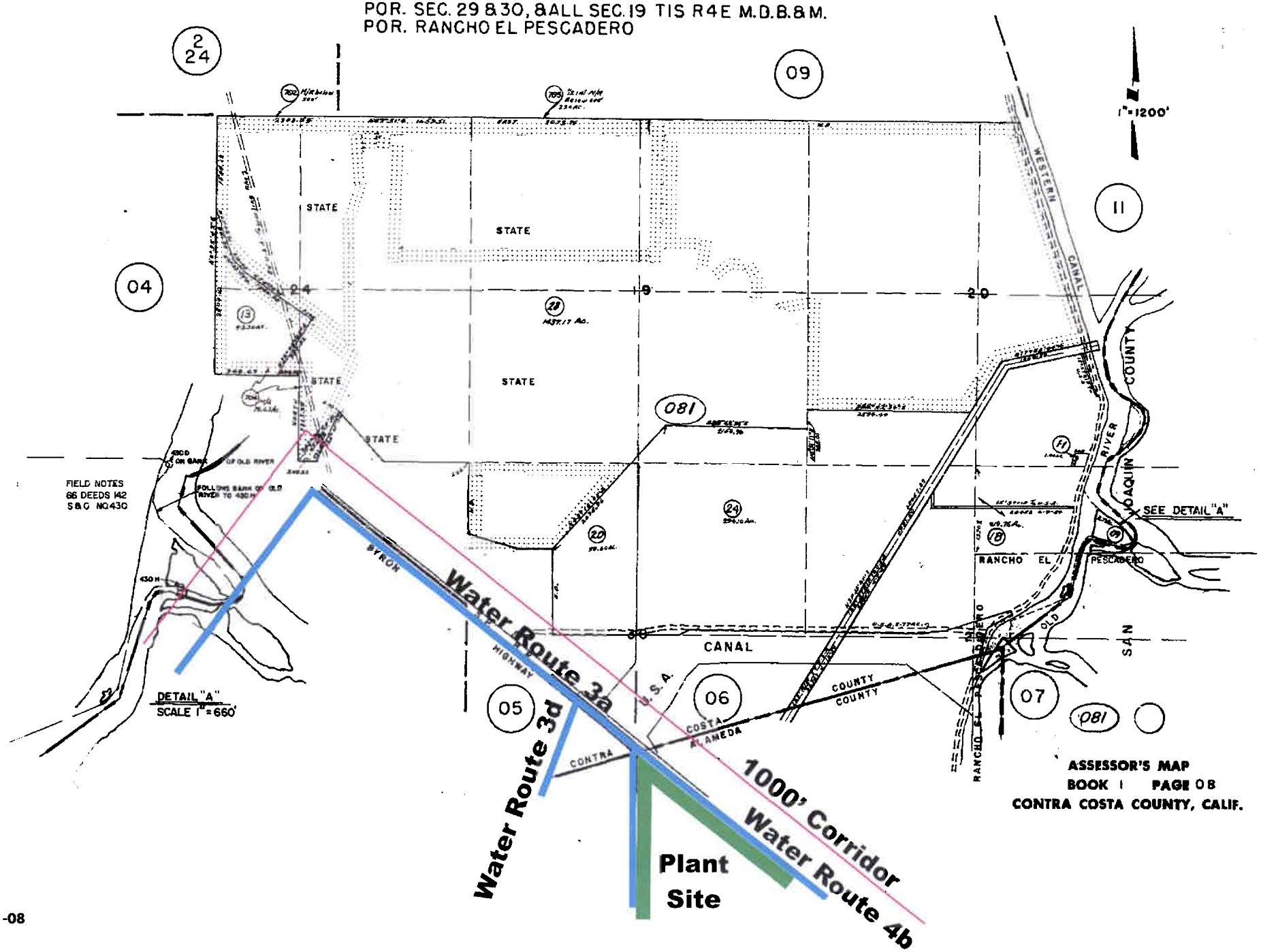
POR. SE 1/4 SEC. 30 & POR SW 1/4 SEC. 29 T1S R4E M·D·B·&M·

TAX CODE AREA



001-06

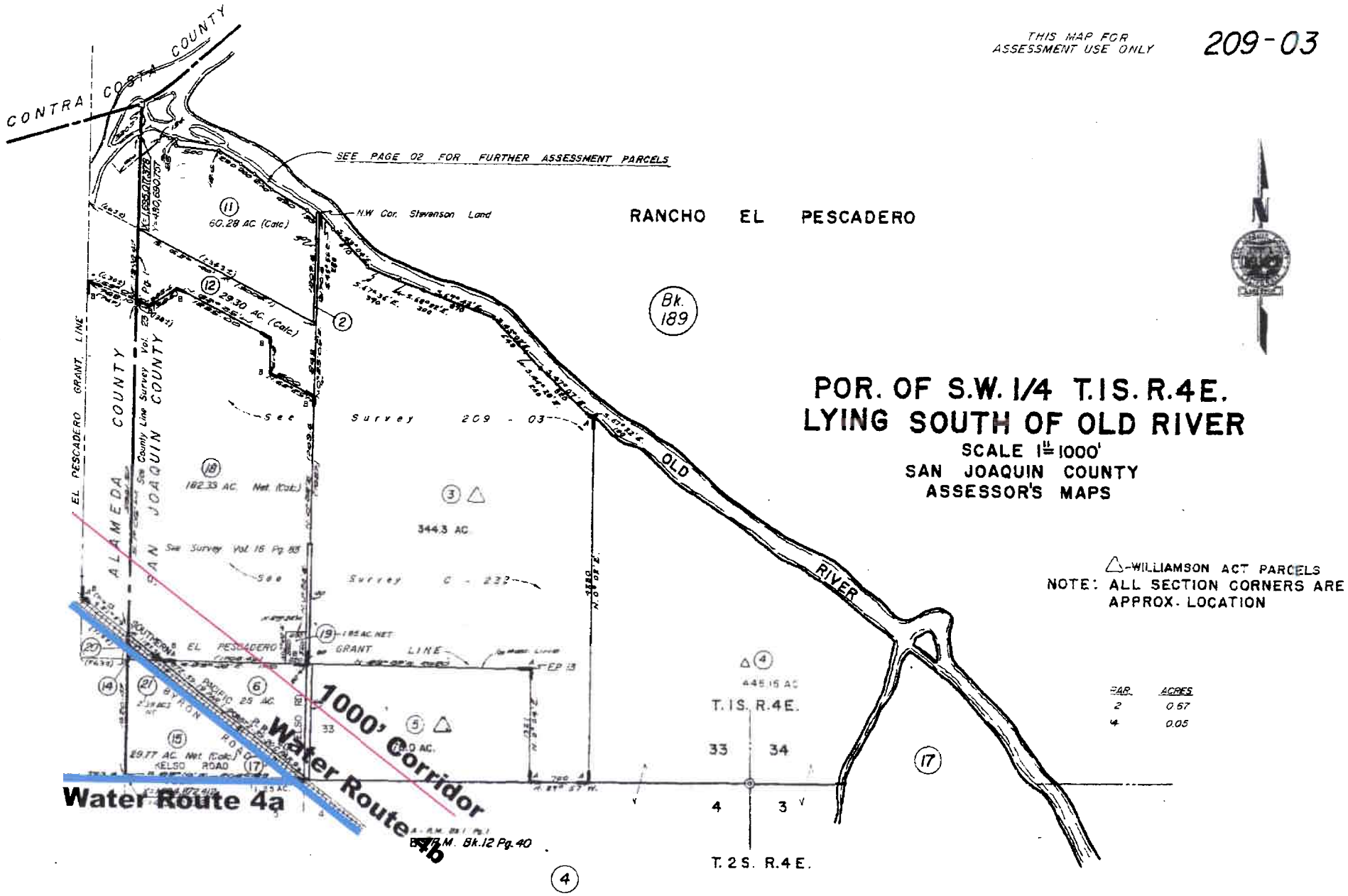
POR. SEC. 24 T1S R3E M.D.B.&M.
POR. SEC. 29 & 30, & ALL SEC. 19 T1S R4E M.D.B.&M.
POR. RANCHO EL PESCADERO



001-08

THIS MAP FOR ASSESSMENT USE ONLY

209-03



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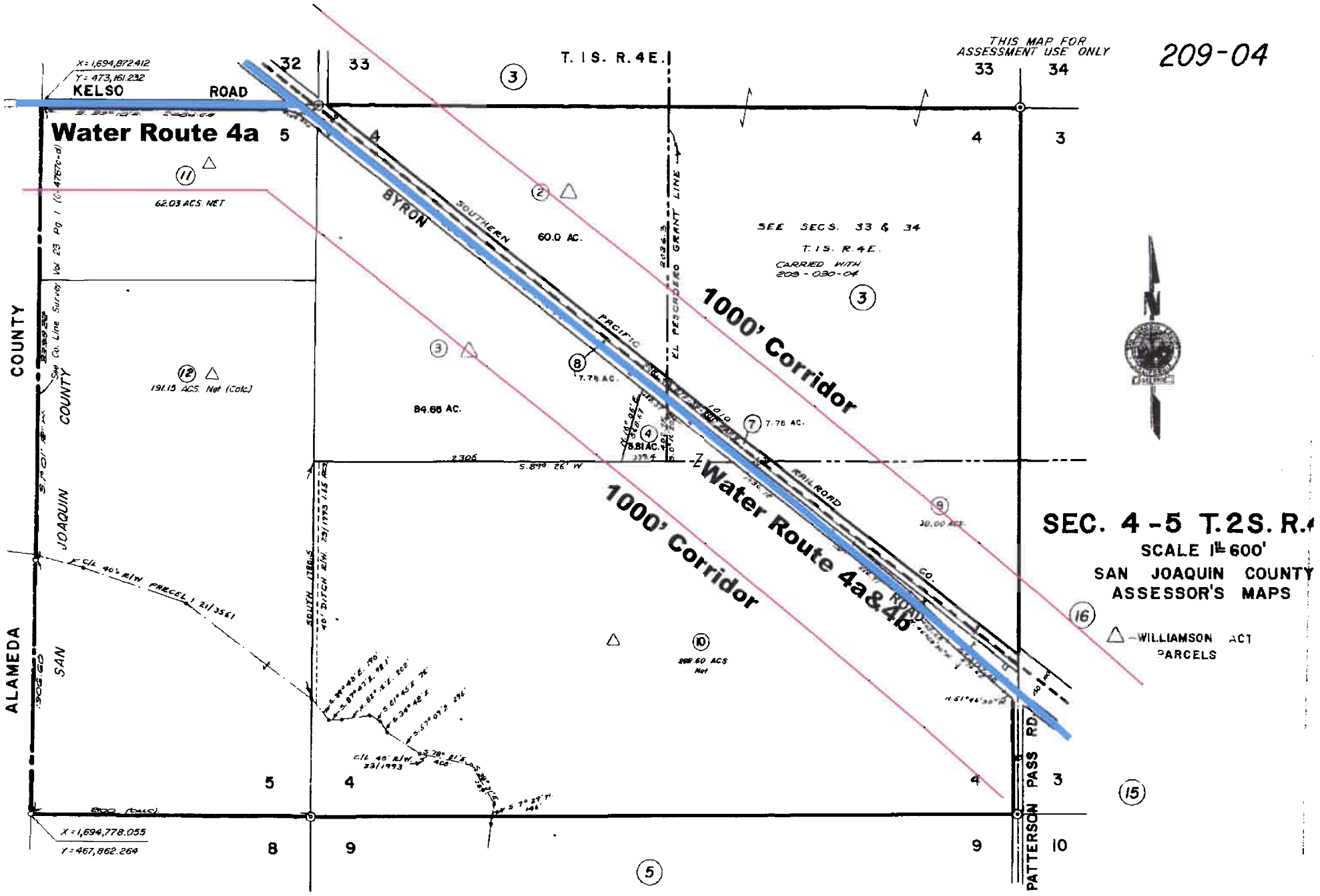
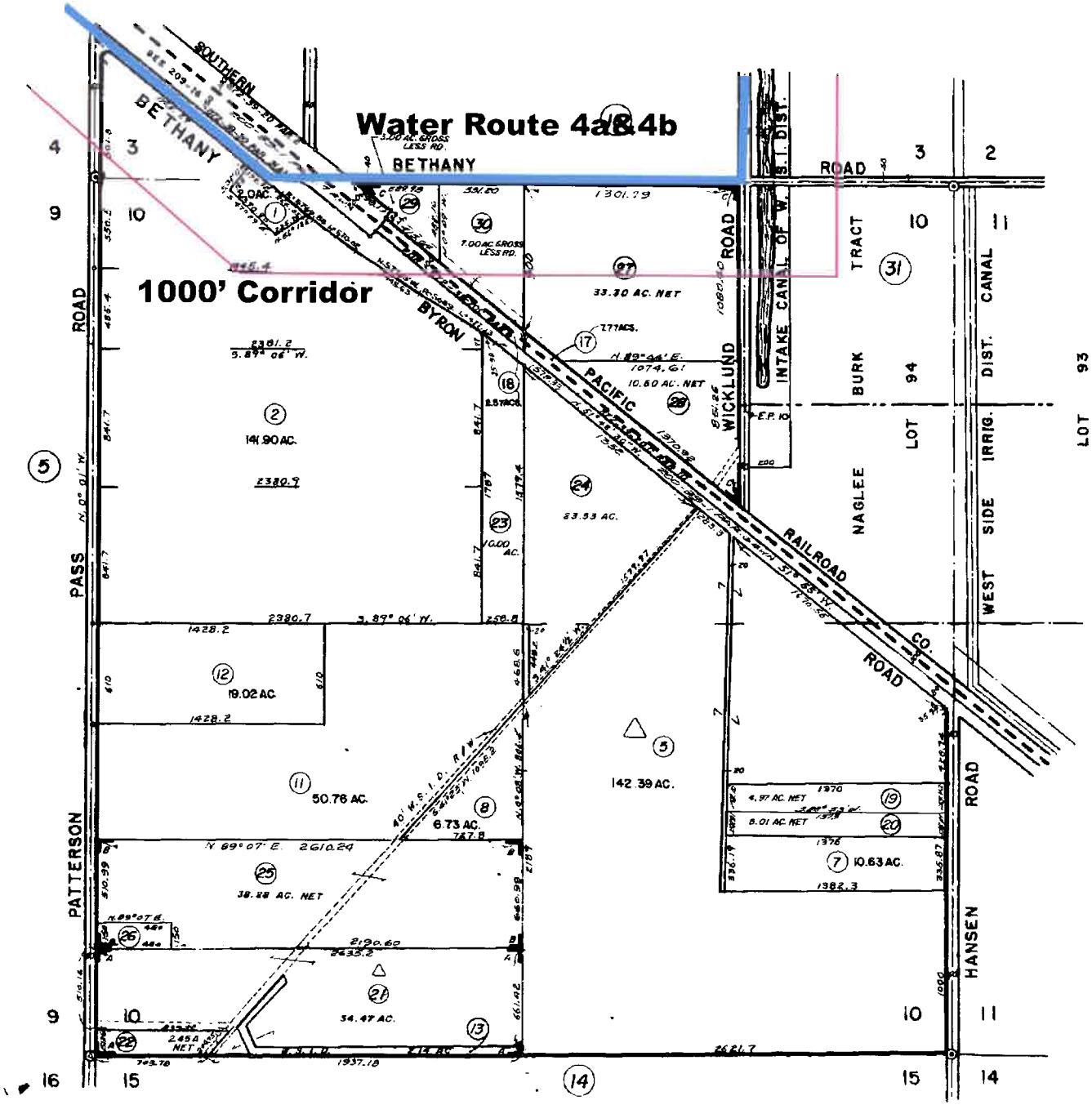

THIS MAP FOR ASSESSMENT USE ONLY
209-04
T. 1 S. R. 4 E.
X = 1,694,872.412
Y = 473,161.232
KELSO ROAD
Water Route 4a
62.03 ACS. NET
191.15 ACS. Net (Calc.)
60.0 AC.
84.66 AC.
7.75 AC.
8.81 AC.
SEE SECS. 33 & 34
T. 1 S. R. 4 E.
CARRIED WITH
209 - 030 - 04
1000' Corridor
1000' Corridor
Water Route 4a&4b
BYRON
SOUTHERN PACIFIC RAILROAD
EL PESCADERO GRANT LINE
30.00 ACS.
288.60 ACS Net
SAN JOAQUIN COUNTY
ALAMEDA COUNTY
PATTERSON PASS RD.
X = 1,694,778.055
Y = 467,862.264
SEC. 4 - 5 T. 2 S. R.
SCALE 1" = 600'
SAN JOAQUIN COUNTY
ASSESSOR'S MAPS
△ - WILLIAMSON ACT PARCELS

209-04



THIS MAP FOR ASSESSMENT USE ONLY

209-15

SEC. 10 T.2S.R.4E.

SCALE 1" = 600'

SAN JOAQUIN COUNTY
ASSESSOR'S MAPS

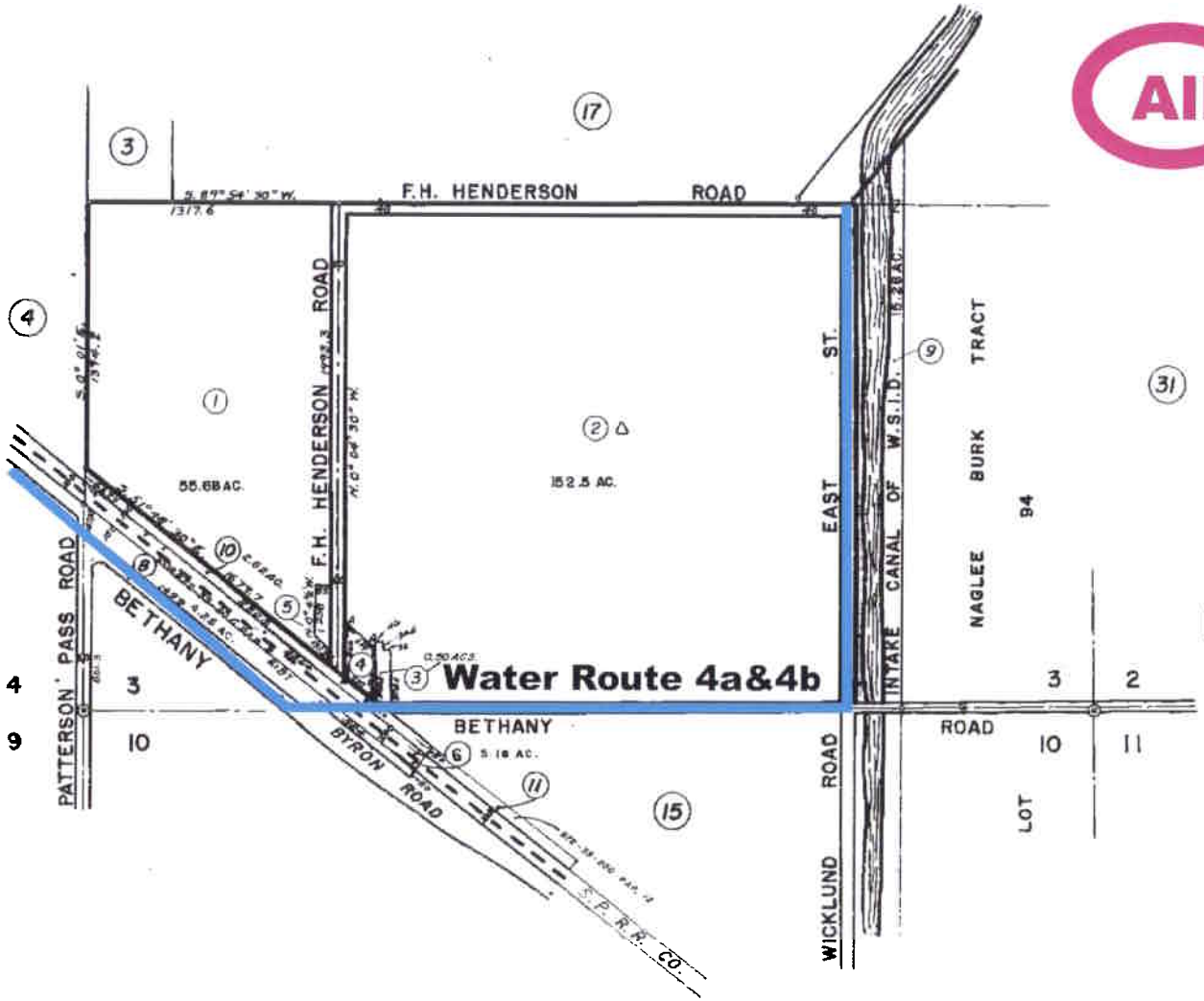
△ -WILLIAMSON ACT PARCELS

A – P. M. Bk. 5 Pg. 171
B – P. M. Bk. 14 Pg. 185
C – R. S. Bk. 30 Pg. 78

(18)

THIS MAP FOR ASSESSMENT USE ONLY

209-16



POR. OF SEC. 3 T.2S.R.4E.

SCALE 1" = 600'

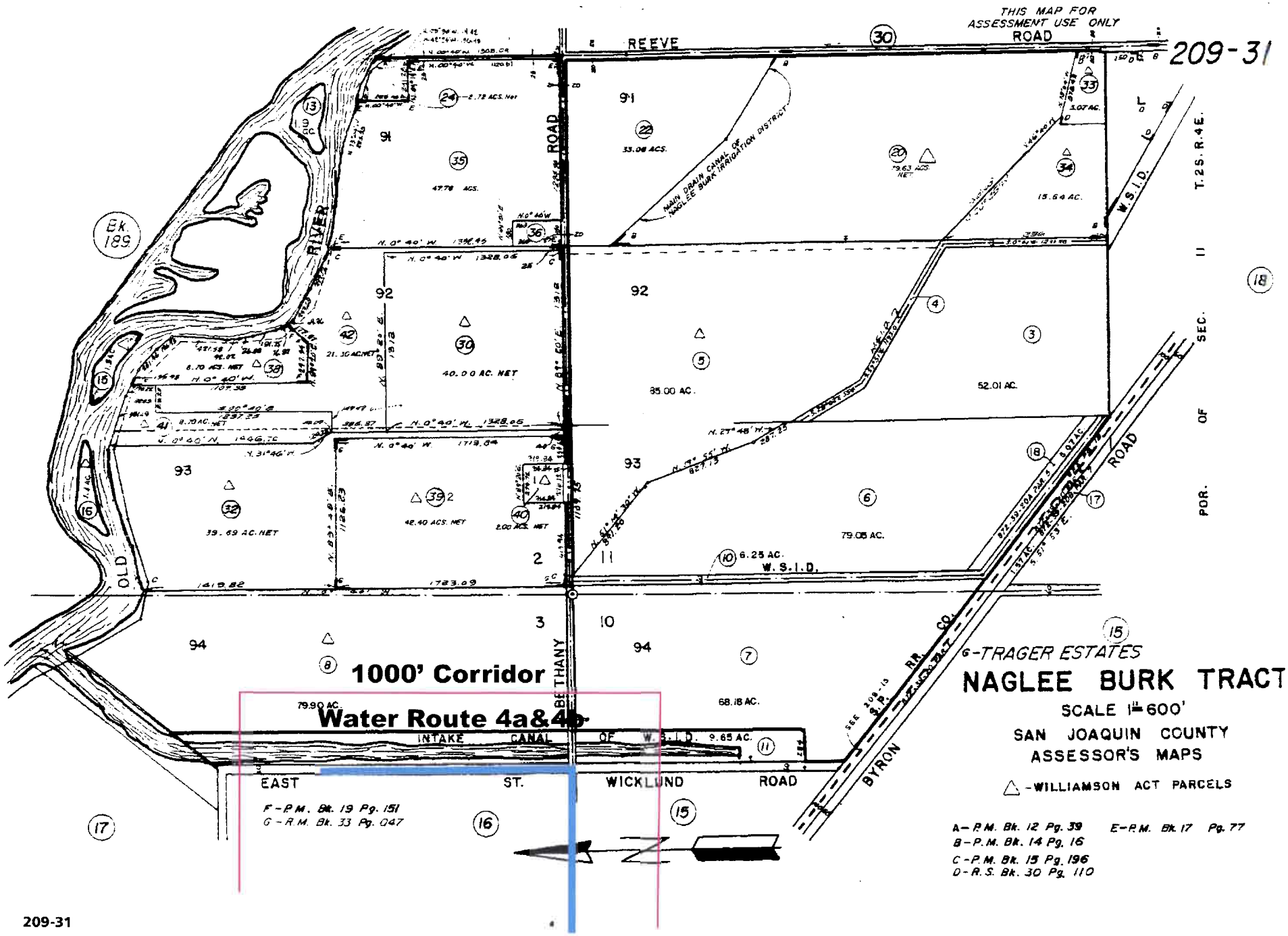
SAN JOAQUIN COUNTY

ASSESSOR'S MAPS

△-WILLIAMSON ACT PARCELS

A- R.S. Bk. Pg. 84

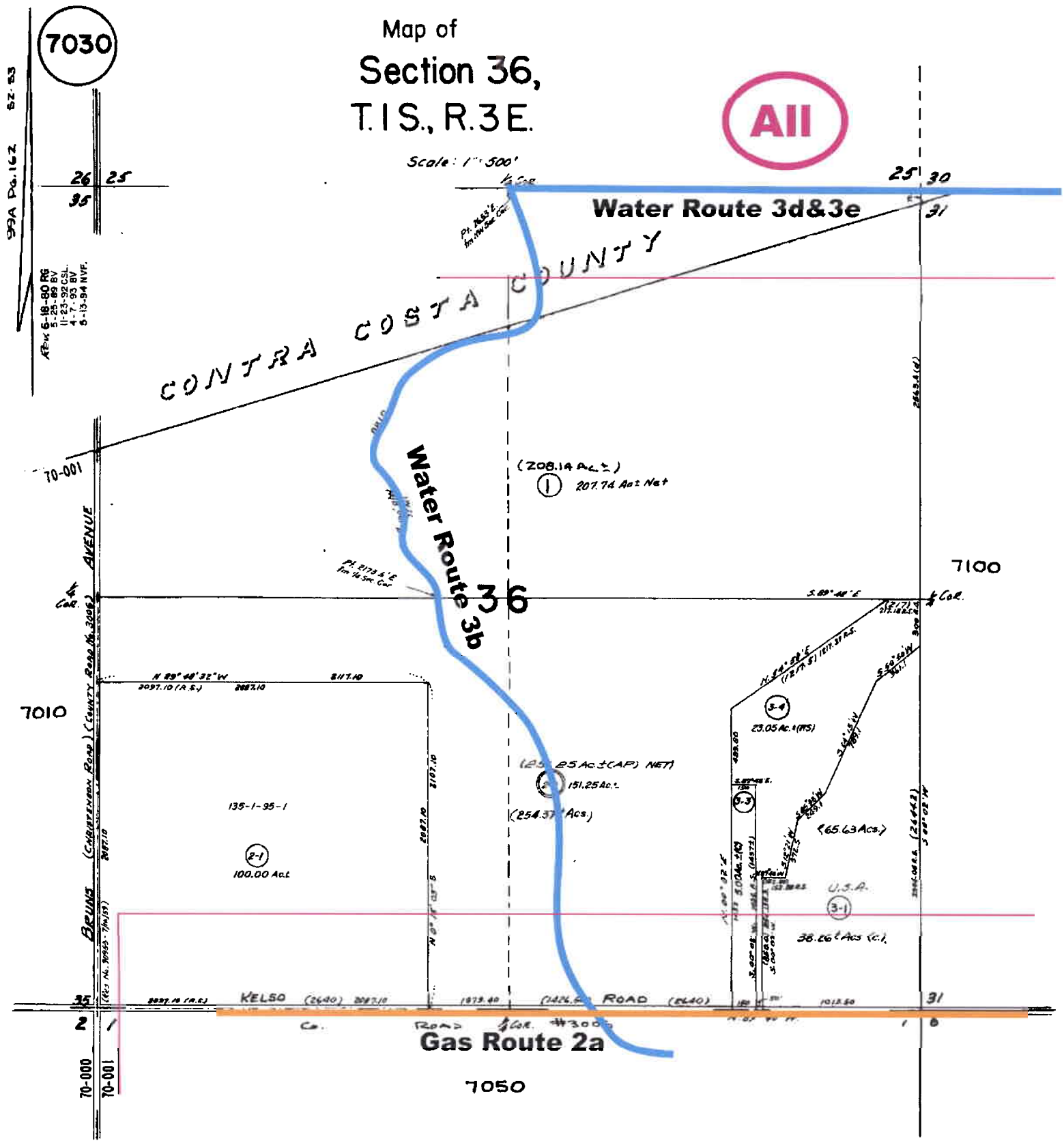
209-16


THIS MAP FOR ASSESSMENT USE ONLY
209-31
REEVE ROAD
BETHANY ROAD
OLD RIVER
INTAKE CANAL OF W.S.I.D.
EAST ST. WICKLUND ROAD
BYRON RR. CO.
W.S.I.D.
MAIN DRAIN CANAL OF NAGLEE BURK IRRIGATION DISTRICT
T.2S.R.4E.
POR. OF SEC. 11
Bk. 189
1000' Corridor
Water Route 4a&4b
G-TRAGER ESTATES
NAGLEE BURK TRACT
SCALE 1"=600'
SAN JOAQUIN COUNTY
ASSESSOR'S MAPS
△-WILLIAMSON ACT PARCELS
A-P.M. Bk. 12 Pg. 39
B-P.M. Bk. 14 Pg. 16
C-P.M. Bk. 15 Pg. 196
D-R.S. Bk. 30 Pg. 110
E-P.M. Bk. 17 Pg. 77
F-P.M. Bk. 19 Pg. 151
G-R.M. Bk. 33 Pg. 047
79.90 AC.
68.18 AC.
9.65 AC.
6.25 AC.
79.05 AC.
52.01 AC.
85.00 AC.
40.00 AC. NET
42.40 ACS. NET
39.69 AC. NET
47.78 ACS.
33.08 ACS.
15.64 AC.
79.63 ACS. NET
21.30 AC. NET
2.72 ACS. Net
3.07 AC.
1.9 AC.
8.70 ACS. NET
2.00 ACS. NET
N

209-31

ASSESSOR'S MAP 99B

Code Area Nos. 70-001



Note: For description of B.B.I.D. R/W, see Q47044 Bk. 2433 Di Pg. 325
Ref: R.S. 815 13/68
Ref: R.S. 1140 17/61

998-7030

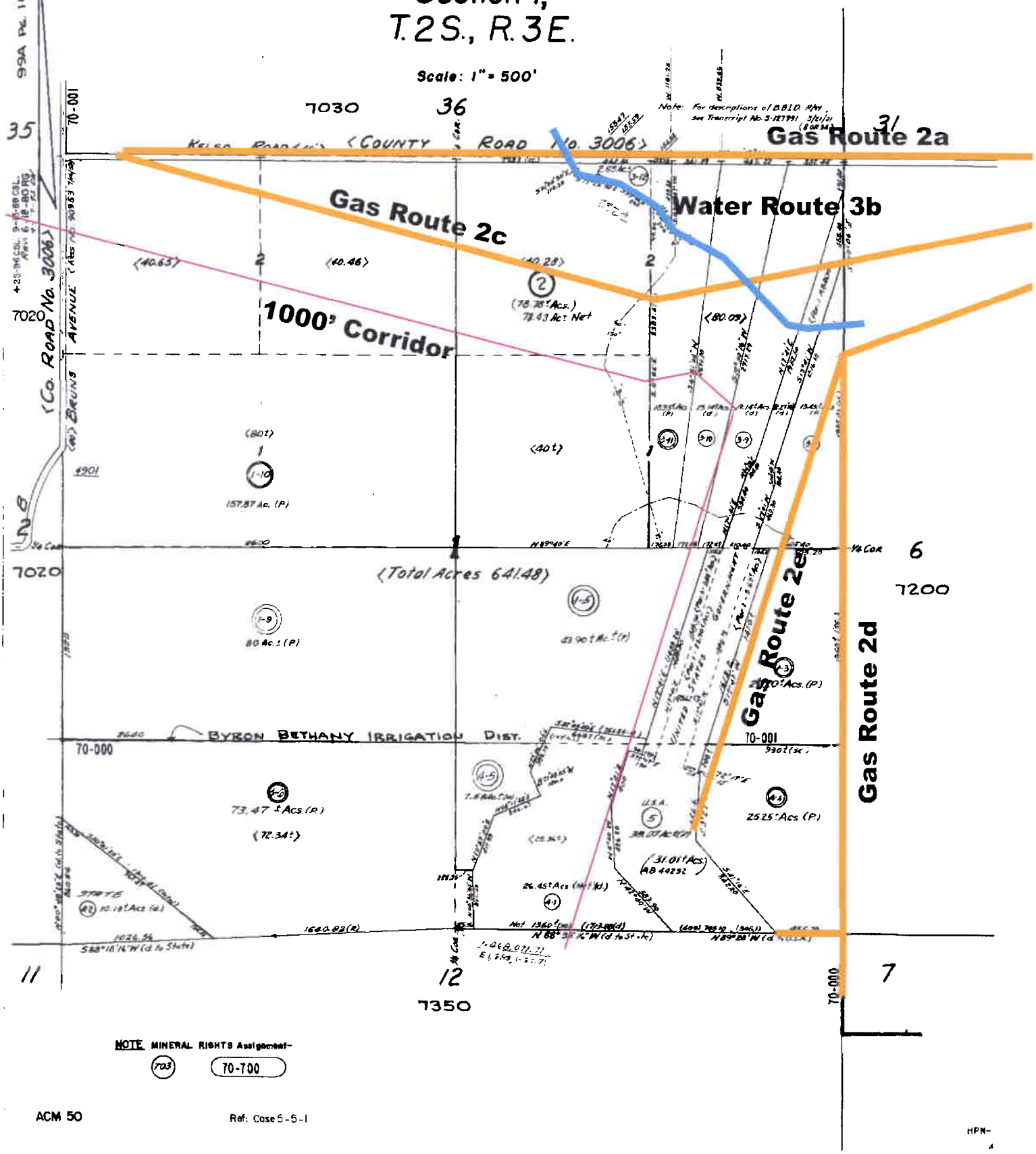
ASSESSOR'S MAP 99B

Code Area Nos.
70-000 70-700
70-001

7050

Map of
Section 1,
T.2S., R.3E.

Scale: 1" = 500'



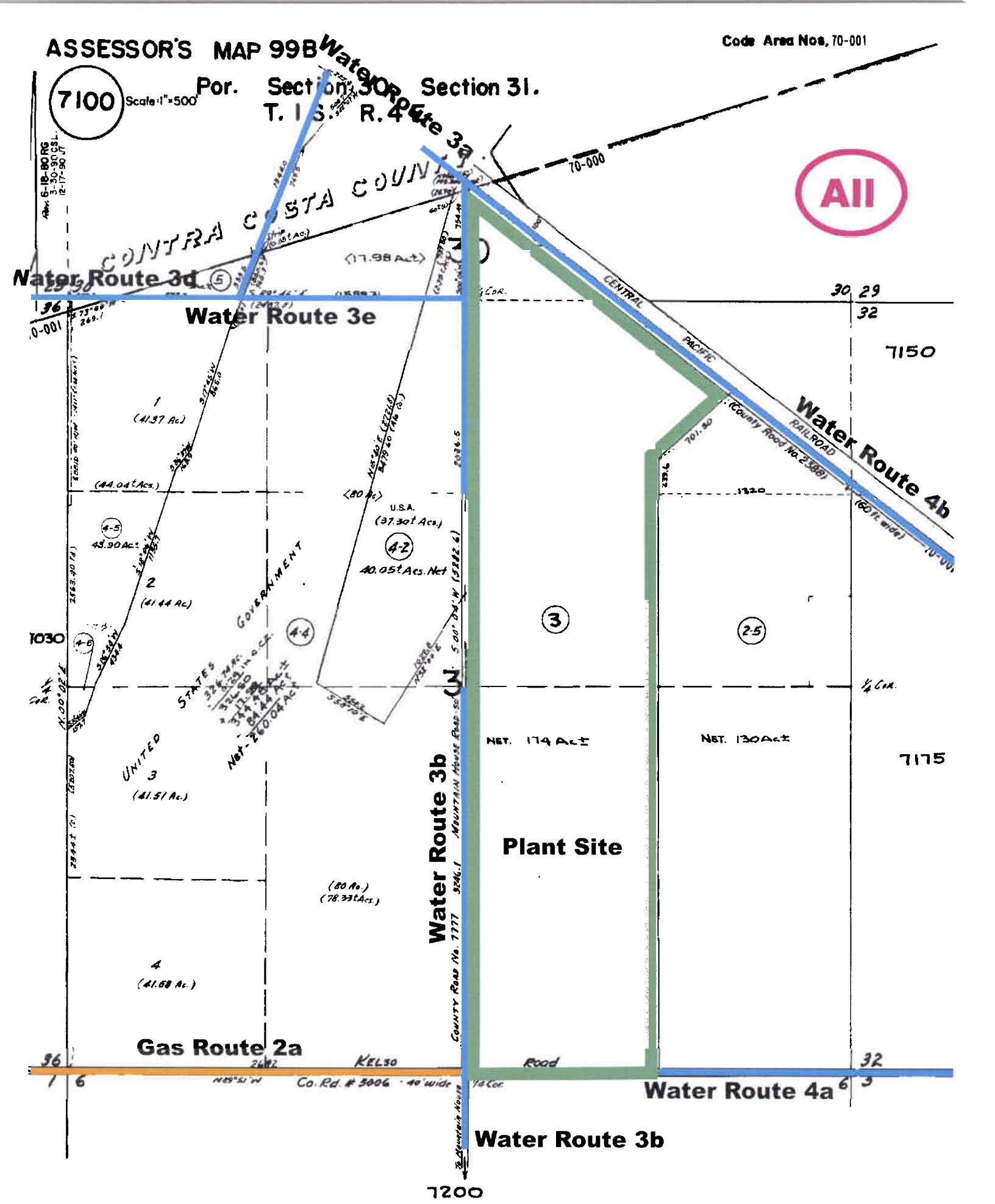
NOTE MINERAL RIGHTS Assignment-
703 70-700

ACM 50

Ref: Case 5-5-1

HPN-

998-7050


ASSESSOR'S MAP 99B
Code Area Nos. 70-001
7100
Scale 1"=500'
Por. Section 30. Section 31.
T. 1 S. R. 4 E.
Water Route 3a
CONTRA COSTA COUNTY
70-000
All
Water Route 3d
Water Route 3e
CENTRAL PACIFIC RAILROAD
(County Road No. 2388)
(60 ft. wide)
Water Route 4b
7150
(17.98 Ac.)
(41.37 Ac.)
(44.04± Acs.)
43.90 Ac.±
(41.44 Ac.)
(41.51 Ac.)
(41.68 Ac.)
(80 Ac.)
(78.33± Acs.)
U.S.A.
(37.30± Acs.)
40.05± Acs. Net
UNITED STATES GOVERNMENT
Net - 260.04 Ac.±
NET. 174 Ac.±
NET. 130 Ac.±
7175
Water Route 3b
Plant Site
MOUNTAIN HOUSE ROAD
COUNTY ROAD No. 7777
Gas Route 2a
KELSO Road
Co. Rd. # 3006 · 40' wide
Water Route 4a
Water Route 3b
7200

998-7100

ASSESSOR'S MAP 99B

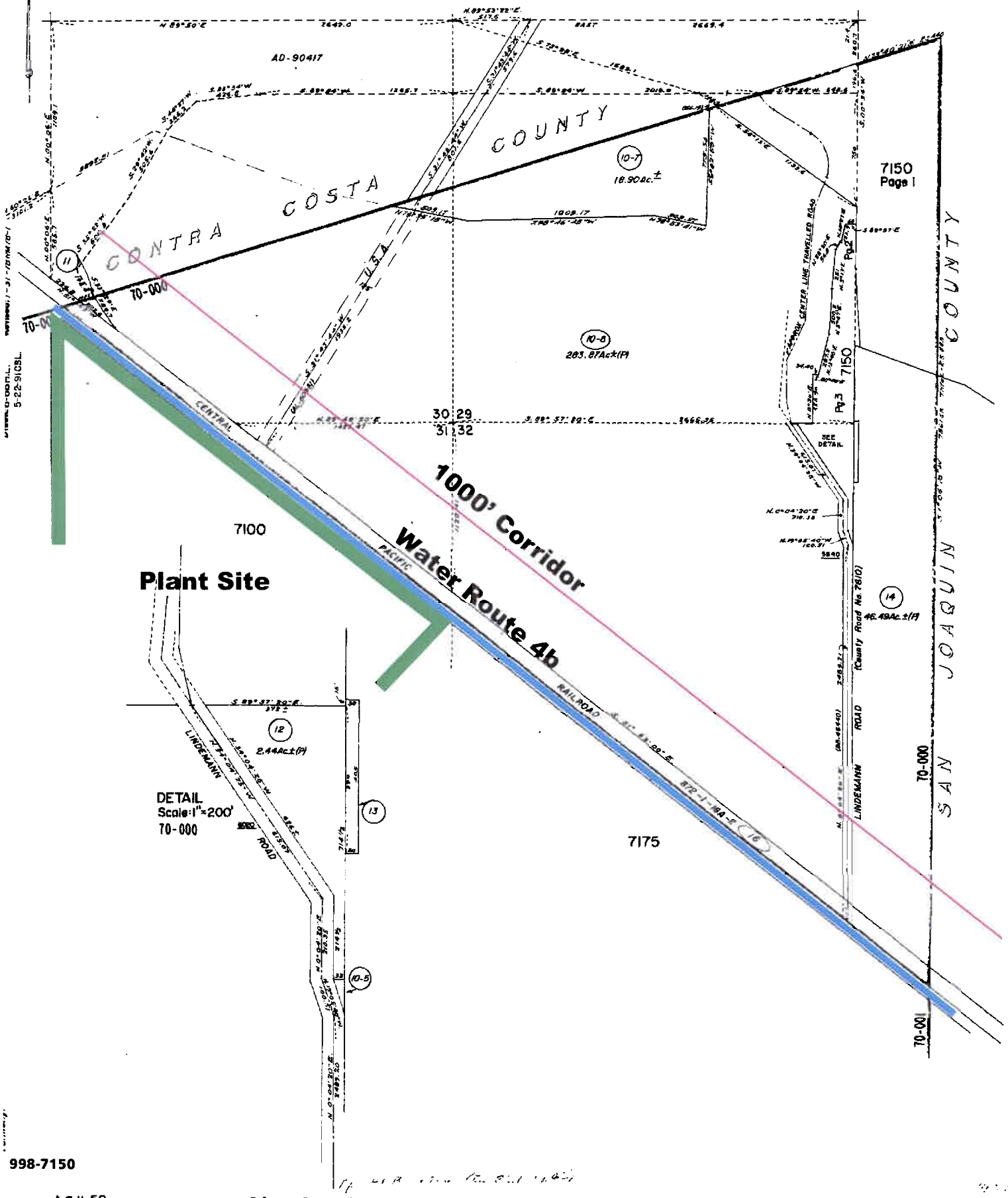
Code Area Mod. 70-000

7150 Scale: 1" = 500'

Page 4

T. 1 S., R. 4 E. (Portion Section 29,30,31,32)

Plat of the Rancho El Pescadero (A.M. Pico and H.M. Naglee) (Bk. "C" Pat. Pg. 462)



998-7150

A.C.M. 50

Reference: Record of Survey No. 233 (R.S. Bk. 5 Pg. 84) RS368 (RS Bk. 7 Pg. 38) R.S. 440 (R.S. Bk. 9 Pg. 1)

ASSESSOR'S MAP 99B

Code Area Nos. 70-001

7175

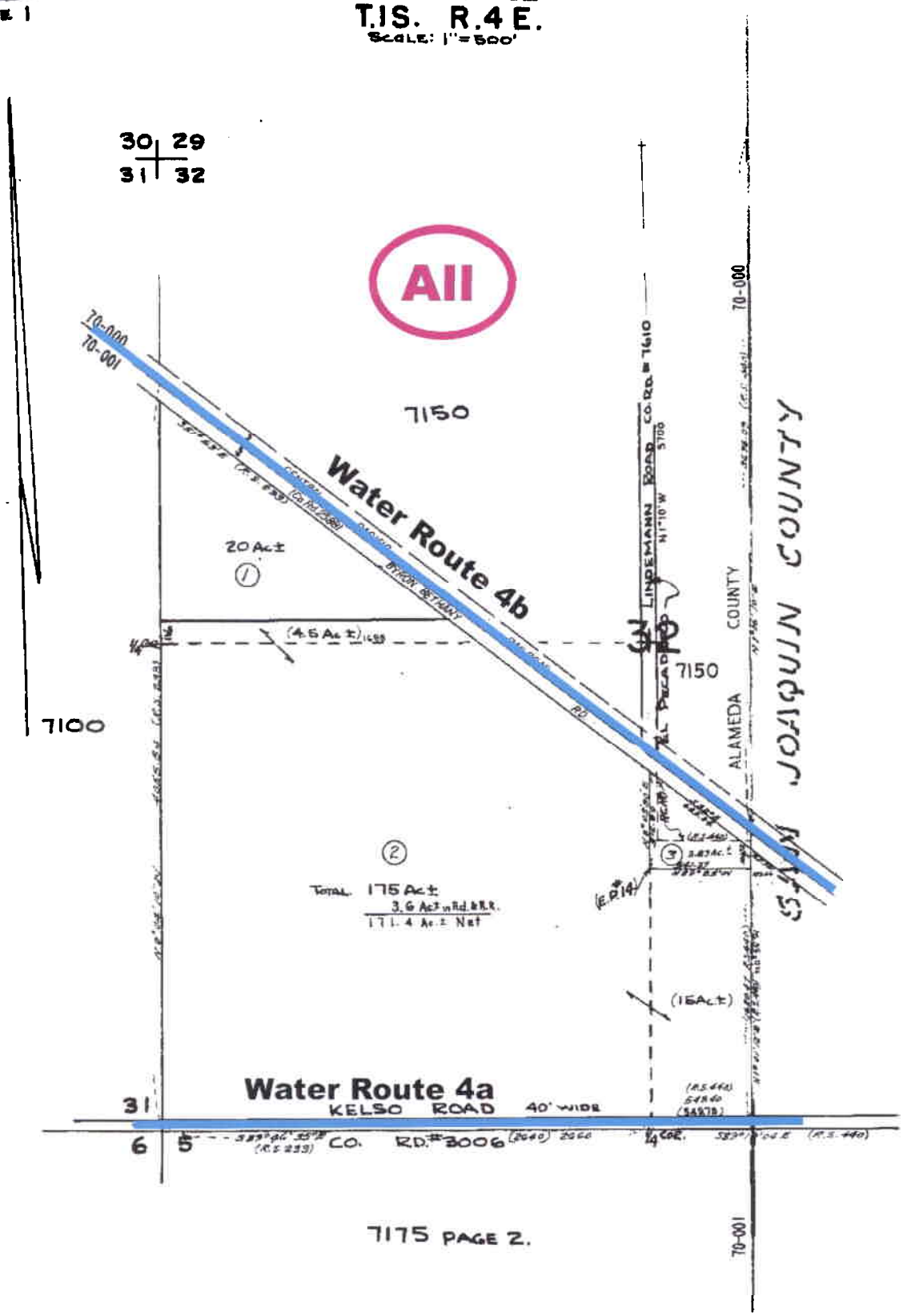
PAGE 1

Plat of the Rancho El Pescadero (A.M. Pico and H.M. Naglee) (Bk. "C" Pat. Pg. 462)

Por. Section 32.
T.1S. R.4E.
SCALE: 1" = 500'

99A Pg. 206 52-53

Corrected: 6 18 20 RC



7175 PAGE 2.

998-7175 pg 1

A.C.M. 50

Reference: Rec. of Sur. No. 233 (R.S. Bk. 5 Pg. 84) (Par. 1 and 2) — R.S. 440 (R.S. Bk. 9 Pg. 1)

Ref. Case 2-28-30.

ASSESSOR'S MAP 99B

Code Area Nos. 70-001

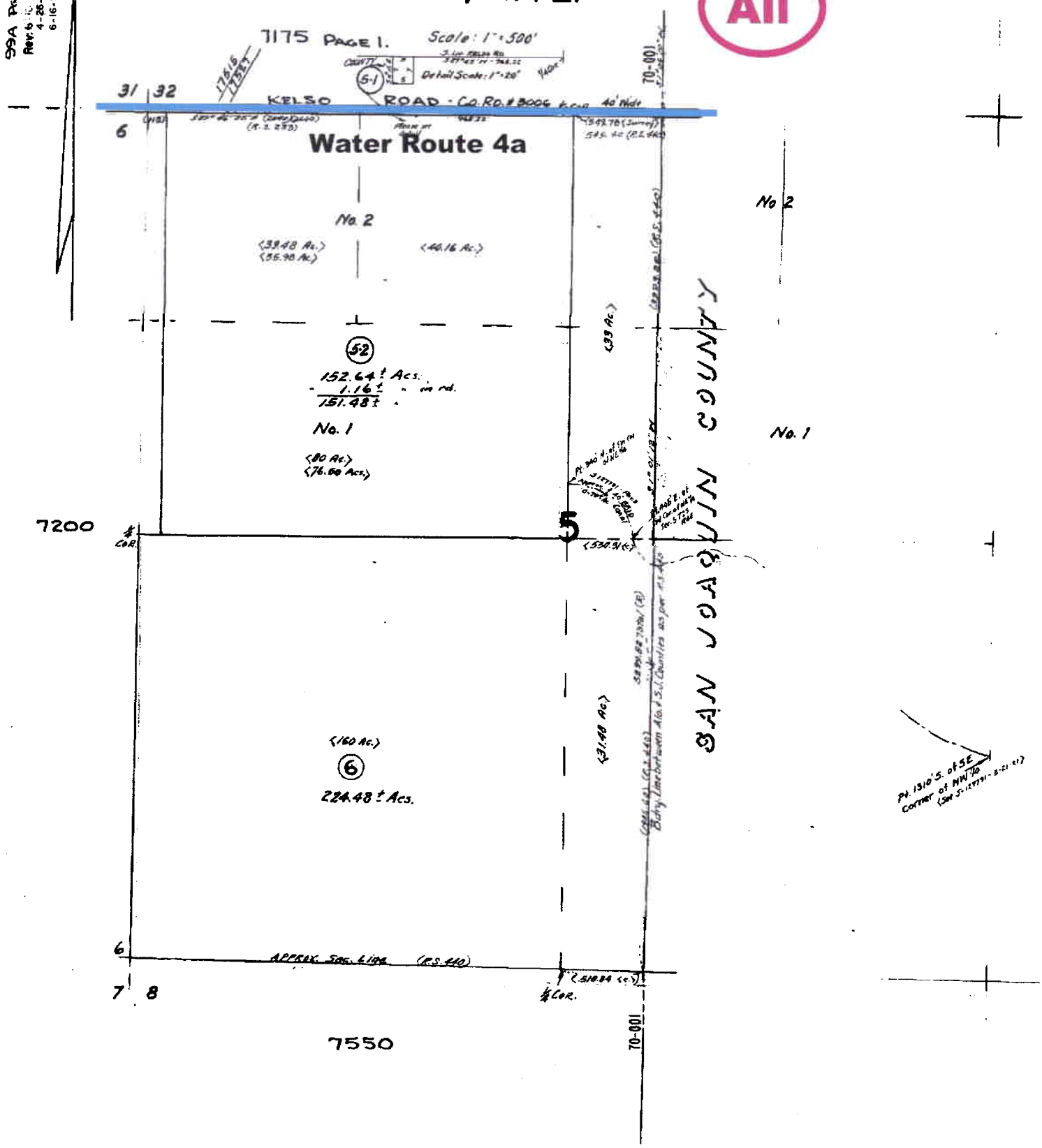
7175

PAGE 2

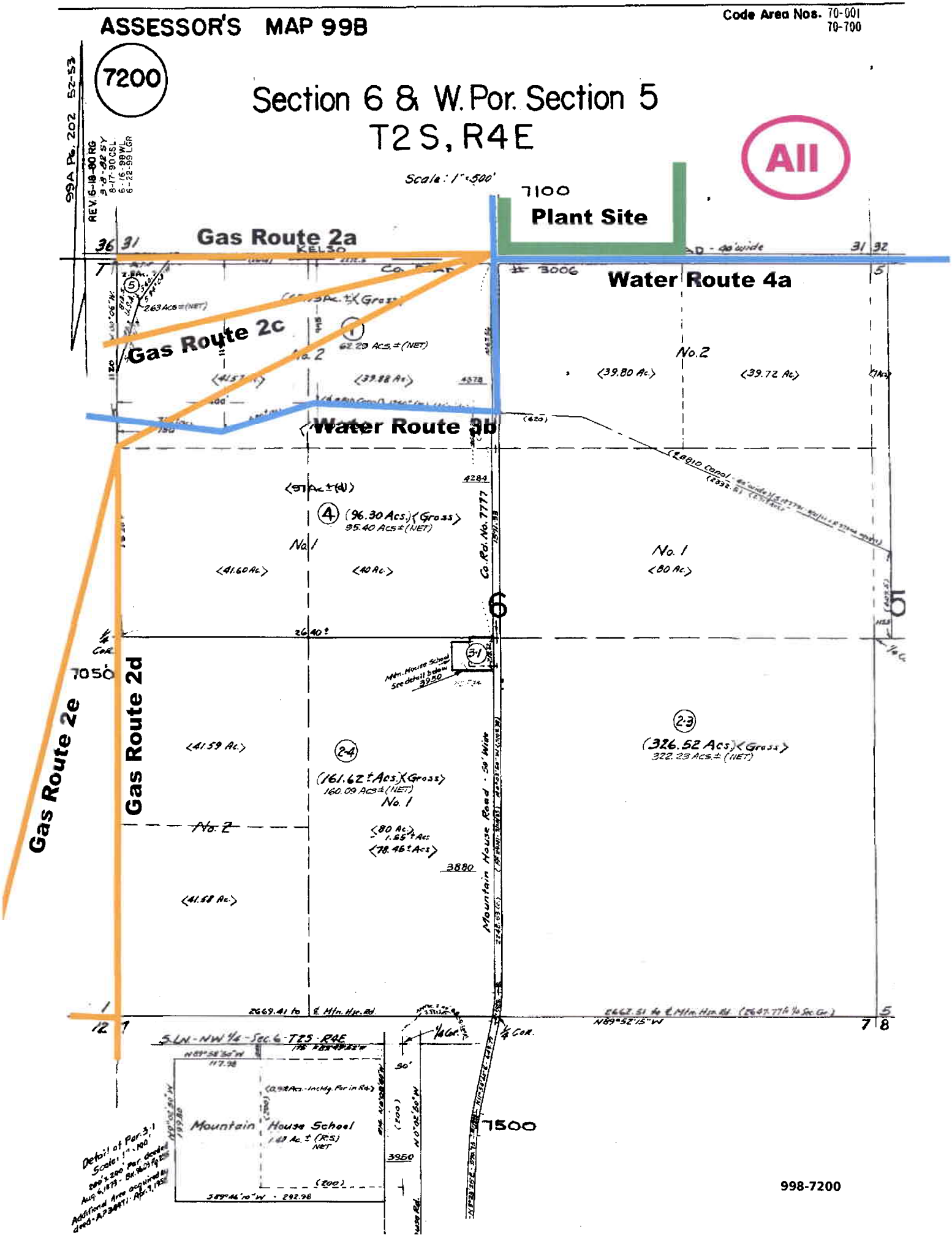
99A Pg. 200 52-53
Rev. 6-10-80 RG
4-26-83 KT
6-16-98 WL

Section 5, (Por.)
T.2 S., R.4 E.

All



Ref. – R.S. 233 (R.S. Bk. 5 Pg. 84), R.S. 440 (R.S. Bk. 9 Pg. 1)


ASSESSOR'S MAP 99B
Code Area Nos. 70-001
70-700
7200
Section 6 & W. Por. Section 5
T2S, R4E
All
Scale: 1" = 500'
7100
Plant Site
Gas Route 2a
Water Route 4a
Gas Route 2c
Water Route 3b
Gas Route 2d
Gas Route 2e
No. 2
No. 1
(96.30 Acs.) <Gross>
95.40 Acs ± (NET)
(326.52 Acs.) <Gross>
322.23 Acs. ± (NET)
(161.62 ± Acs.) <Gross>
160.09 Acs ± (NET)
Mountain House Road - 50' Wide
Co. Rd. No. 7777
Mountain House School
7500
7050
998-7200

ASSESSOR'S MAP 99 B

7350

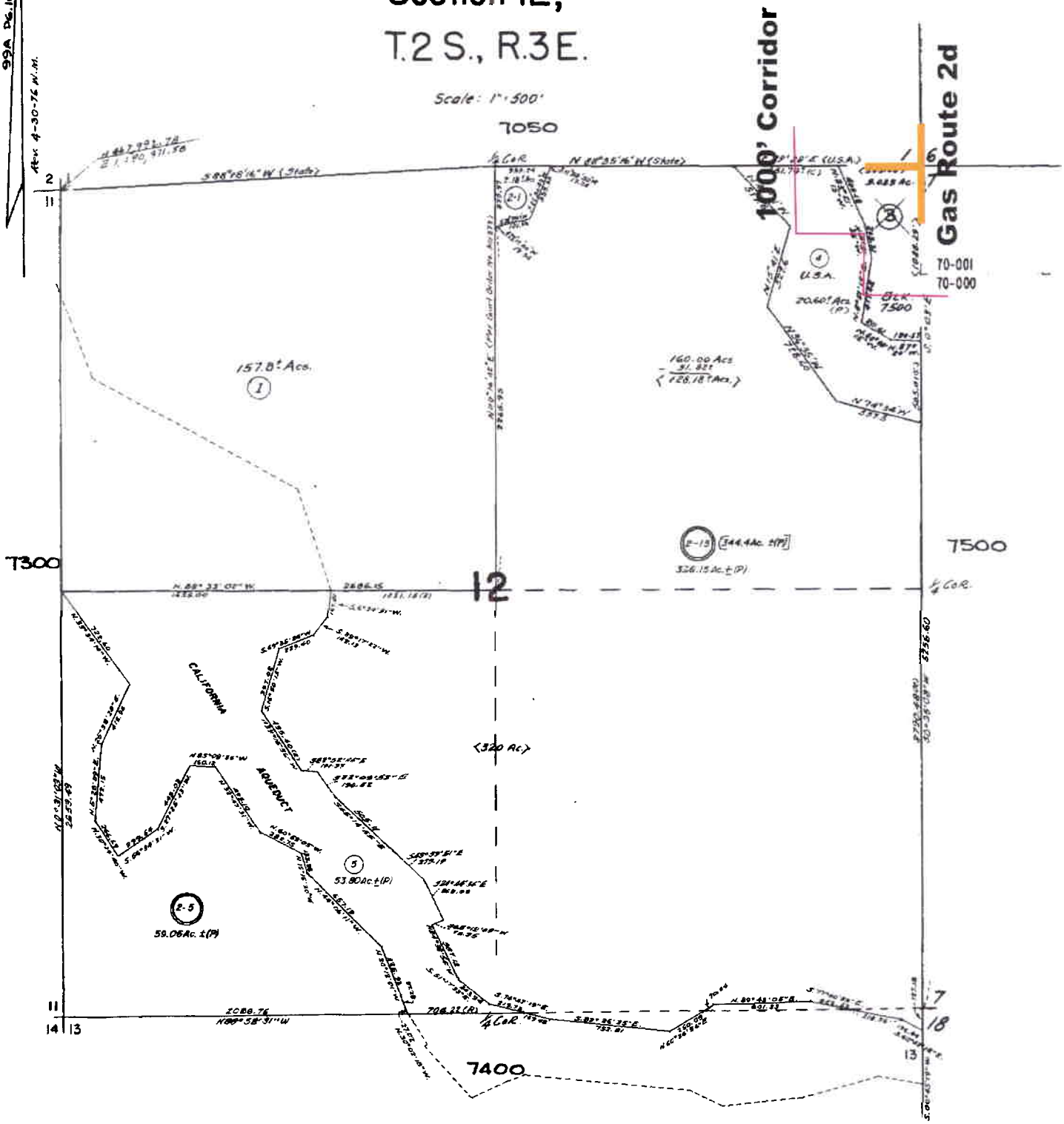
Code Area Nos.
70-000

Map of

Section 12,

T.2 S., R.3E.

Scale: 1" = 500'



998-7350

ACM 50

Ref: Case 5-5-1

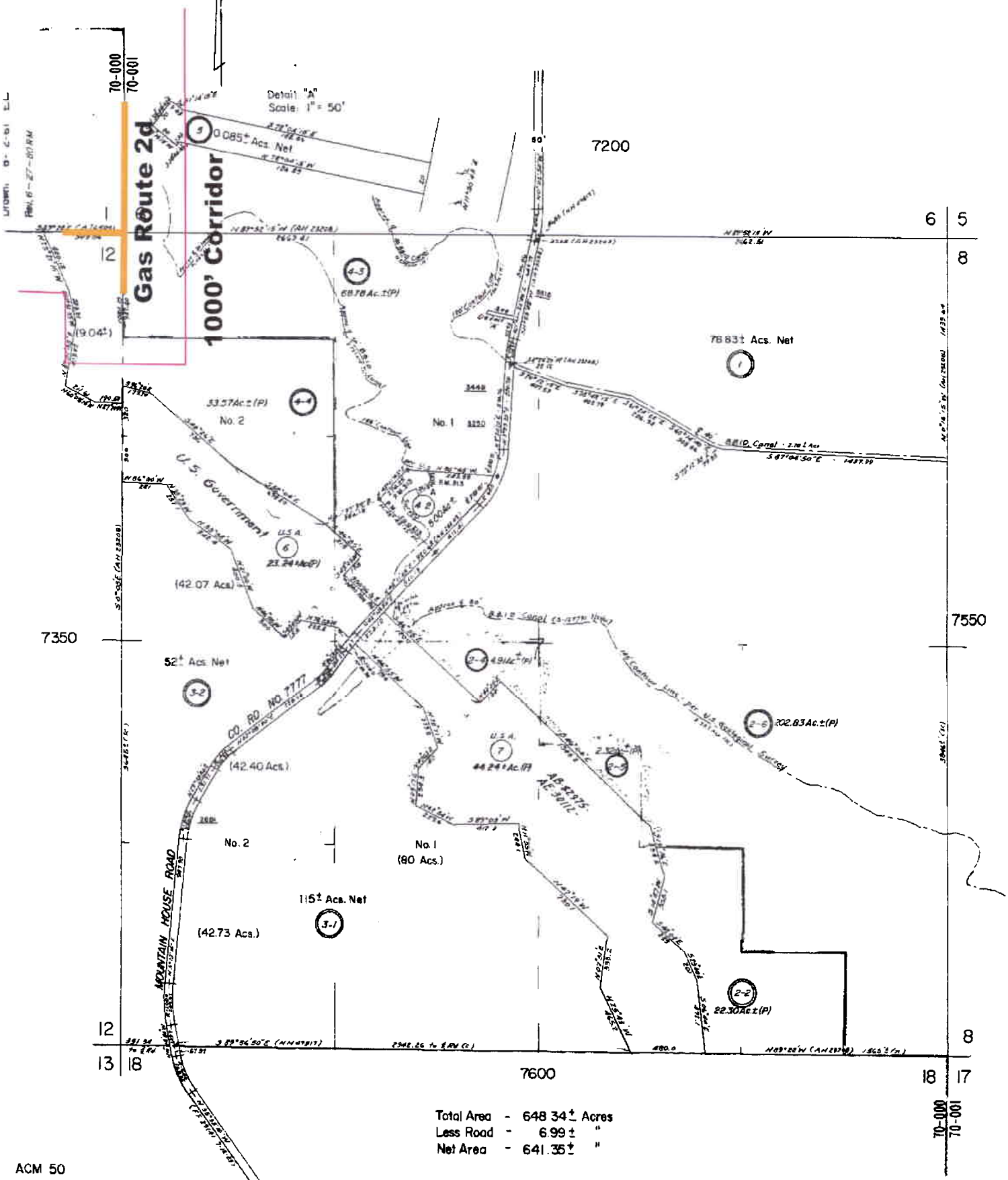
ASSESSOR'S MAP 99B

Code Area Nos. 70-000
70-001

7500

Scale: 1" = 500'

SECTION 7
T.2 S. - R.4E.
PARCEL MAP 313 (Bk.54 Pg.91)



Total Area - 648.34± Acres
Less Road - 6.99± "
Net Area - 641.35± "

ACM 50

998-7500

Appendix 1C

APPENDIX 1C

Persons Who Prepared the AFC

Section	Title	Preparer	Company
	Project Director	Alicia Torre	Calpine
	CH2M HILL Project Manager	Jerry Salamy	CH2M HILL
1.0	Executive Summary	EJ Koford	CH2M HILL
2.0	Project Description	Jerry Salamy, EJ Koford, Jim McLucas	CH2M HILL, Calpine
3.0	Demand Conformance	Jerry Salamy	CH2M HILL
4.0	Facility Closure	Jerry Salamy	CH2M HILL
5.0	Electric Transmission	Robert Millies	Commonwealth
6.0	Natural Gas Supply	EJ Koford, Chris Delaney	CH2M HILL
7.0	Water Supply	Andrea Gardner	CH2M HILL
8.0	Environmental Information		
8.1	Air Quality	Gary Rubenstein	Sierra Research
8.2	Biological Resources	EJ Koford, Russ Huddleston	CH2M HILL
8.3	Cultural Resources	James Bard	CH2M HILL
8.4	Land Use	Kathryn Carrasco	CH2M HILL
8.5	Noise	Farshad Farhang	CH2M HILL
8.6	Public Health	John Lowe	CH2M HILL
8.7	Worker Safety	Trish Danby	CH2M HILL
8.8	Socioeconomics	Fatuma Yusuf, John Carrier	CH2M HILL
8.9	Agriculture and Soils	EJ Koford, Steve Long	CH2M HILL
8.10	Traffic and Transportation	Brian Hoeft	CH2M HILL
8.11	Visual Resources	Tom Priestley	Harfa-MW
8.12	Hazardous Material Handling	Monique Spears	CH2M HILL
8.13	Waste Management	Monique Spears	CH2M HILL
8.14	Water Resources	EJ Koford, Toni Pezzetti	CH2M HILL
8.15	Geologic Hazards and Resources	Tom Lae, John Livingston	CH2M HILL
8.16	Paleontological Resources	Lanny Fisk	PaleoResource Consultants
9.0	Alternatives	Jerry Salamy	CH2M HILL
10.0	Engineering	Jim McLucas	Calpine

Appendices

1A	Legal Description		Petroleum Properties
1B	Adjacent Property Owners		Data Pro
1C	List of Preparers	Monique Spears	CH2M HILL
5.0	Electric Transmission	Robert Millies	Commonwealth
8.1	Air Quality	Gary Rubenstein	CH2M HILL
8.2	Biological	EJ Koford	CH2M HILL
8.3	Cultural Resources	James Bard	CH2M HILL
8.5	Noise	Farshad Farhang	CH2M HILL
8.8	Environmental Justice	Mark Assam, John Carrier	CH2M HILL
8.8B	Contact Reports	Kathryn Carrasco	CH2M HILL
8.14	Water Resources	EJ Koford, Toni Pezzetti	CH2M HILL
8.16	Paleontological Resources	Lanny Fisk	PaleoResource Consultants
10	Engineering	Jim McLucas	Calpine

Appendix 5.1-A

INTERCONNECTION DATA SHEET
CALPINE EAST ALTAMONT ENERGY CENTER

FAX

CALPINE PITTSBURG, INC
P. O. BOX 551,
PITTSBURG, CA 94565

Date 13-Sep-00

Number of pages including cover sheet 21

To:

Miriam Mirzadeh

Phone 916 353-4552

Fax Phone 916 985-1935

CC:

From:

Alan Roth

Phone 925 431-1303

Fax Phone 925 431-1313

REMARKS:

☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please comment

Miriam,

Attached is the machine data for the East Altamont Energy Center.

The three combustion turbine step ups will be rated 140/187/234 MVA, OA/FA/FA @ 65 degC, Z = 10%.

The steam turbine step up will be rated 402/536/670 MVA, OA/FA/FA @ 65 degC, Z = 10%.

If you need additional data, I can be reached today at 925 600-2083, or the rest of the week at the number above.

Thanks.

Alan

SIZE	DWG NO	SH	REV
A	585A1174	3	-

MACHINE SATURATION DATA

S/1.0 = 0.05 Machine saturation may be calculated from the data of curves A and B of
S/1.2 = 0.23 "ESTIMATED SATURATION AND SYNCHRONOUS IMPEDANCE CURVES".
"S/1.0" is the field amp difference from B to A divided by the field amp of A at 1.0 pu voltage.

X/R RATIO

X/R = 182.02 X/R ratio equals "XPP/DV" * base reactance / armature DC resistance at 100 C

OTHER DATA

WR² 372,854

ANSI ROTOR SHORT-TIME THERMAL CAPACITY, I2SQT	=	10
GAS TURBINE-GENERATOR COMBINED INERTIA CONSTANT, H	=	4.76 kW SEC/kVA
THREE PHASE ARMATURE WINDING CAPACITANCE	=	1.103 MICROFARADS
ARMATURE WINDING DC RESISTANCE (PER PHASE)	=	0.00167 OHMS (100 C)
FIELD WINDING DC RESISTANCE	=	0.189 OHMS (125 C)
FIELD CURRENT AT RATED kVA, ARM VOLTAGE, AND PF	=	1816.9 AMPS
FIELD CURRENT AT RATED kVA AND ARM VOLTAGE, 0 PF LAGGING (FOR SYSTEMS STUDY ONLY - NOT ALLOWABLE OPERATING POINT)	=	1892.0 AMPS

GENERATOR RATING

BASE LOAD	0 FT ALTITUDE -	40 DEG C
234000 KVA -	0.85 PF -	199000 KW -
3600 RPM -	2 POLE -	3 PHASE
60 HERTZ -	18000 A.C. VOLTS -	7506 A.C. AMPS -
WYE CONNECTED	0.49 SCR -	30.0 PSIG -

TOTAL TEMPERATURES ARE GUARANTEED NOT TO EXCEED		INSULATION MATERIAL
STATOR COILS	100. DEG C BY EMBEDDED DETECTOR	ARMATURE - CLASS F
COLLECTOR	125. DEG C BY THERMOMETER	
FIELD COILS	110. DEG C BY RESISTANCE	FIELD - CLASS F

DIELECTRIC TESTS - BETWEEN COILS AND GROUND, 60 HERTZ AC FOR 1 MIN

STATOR 37000 VOLTS RMS
ROTOR 3200 VOLTS RMS

GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 3

SIZE	DWG NO	SH	REV
A	585A1174	2	-

ESTIMATED GENERATOR ELECTRICAL DATA

This data is an estimate only, and is based on the generator electrical design.
Actual manufacturing tolerances will cause some variation from these values.
Armature "VOLTS" and "AMPS" are rms values.

MGD309 GENERATOR DESIGN NUMBER F317T41 DATE 25-JUL-99

ATB-2- 234000 KVA, 3600 RPM, 18000 VOLTS, 0.85 PF, 40.0°C Air, 30.0 PSIG
198900 KW, 7508 AMPS, 0.49 SCR, 320 FLD VOLTS, 0 FT ALT. WYE CONN

REACTANCE DATA - (PER UNIT)	DIRECT AXIS		QUADRATURE AXIS	
SATURATED SYNCHRONOUS	X/DV	2.140	X/QV	2.042
UNSATURATED SYNCHRONOUS	X/DI	2.140	X/QI	2.042
SATURATED TRANSIENT	XP/DV	0.239		
UNSATURATED TRANSIENT	XP/DI	0.322	XP/Q	0.497
SATURATED SUBTRANSIENT	XPP/DV	0.168	XPP/QV	0.161
UNSATURATED SUBTRANSIENT	XPP/DI	0.228	XPP/QI	0.220
SATURATED NEGATIVE SEQUENCE	X/2V	0.159		
UNSATURATED NEGATIVE SEQUENCE	X/2I	0.217		
SATURATED ZERO SEQUENCE	X/0V	0.107		
UNSATURATED ZERO SEQUENCE	X/0I	0.140		
LEAKAGE REACTANCE, OVEREXCITED	X/LM,OEX	0.189		
LEAKAGE REACTANCE, UNDEREXCITED	X/LM,UEX	0.189		

FIELD TIME CONSTANT DATA - (SEC AT 125C)	DIRECT AXIS		QUADRATURE AXIS	
OPEN CIRCUIT	TP/D0	4.767	TP/Q0	0.409
THREE PHASE SHORT CIRCUIT TRANSIENT	TP/D3	0.530	TP/Q	0.409
LINE TO LINE SHORT CIRCUIT TRANSIENT	TP/D2	0.622		
LINE TO NEUTRAL SHORT CIRCUIT TRANSIENT	TP/D1	0.898		
SHORT CIRCUIT SUBTRANSIENT	TPP/D	0.023	TPP/Q	0.023
OPEN CIRCUIT SUBTRANSIENT	TPP/D0	0.033	TPP/Q0	0.071

ARMATURE DC COMPONENT TIME CONSTANT DATA - (SEC AT 100C)		
THREE PHASE SHORT CIRCUIT	T/A3	0.349
LINE TO LINE SHORT CIRCUIT	T/A2	0.349
LINE TO NEUTRAL SHORT CIRCUIT	T/A1	0.311

ARMATURE WINDING SEQUENCE RESISTANCE DATA - (PER UNIT)		
POSITIVE	R/1	0.004
NEGATIVE	R/2	0.014
ZERO	R/0	0.007

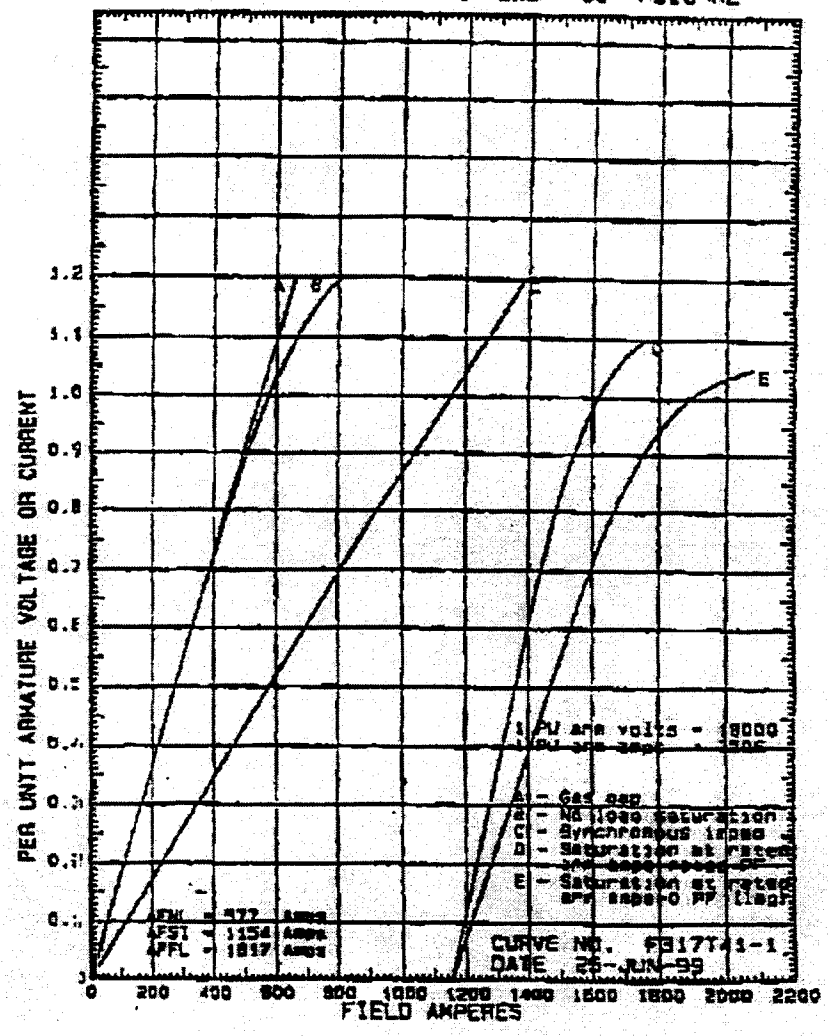
Reactance, Resistance and Time Constant data may be interpreted per IEEE 115, section VII.
The base reactance ("UNIT") is calculated by the armature kV squared / MVA.
base reactance = 1.63

R&P-12

GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 2

SIZE	DWG NO	SH	REV
A	585A1174	4	.

ESTIMATED SATURATION AND SYNCHRONOUS IMPEDANCE CURVES
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2

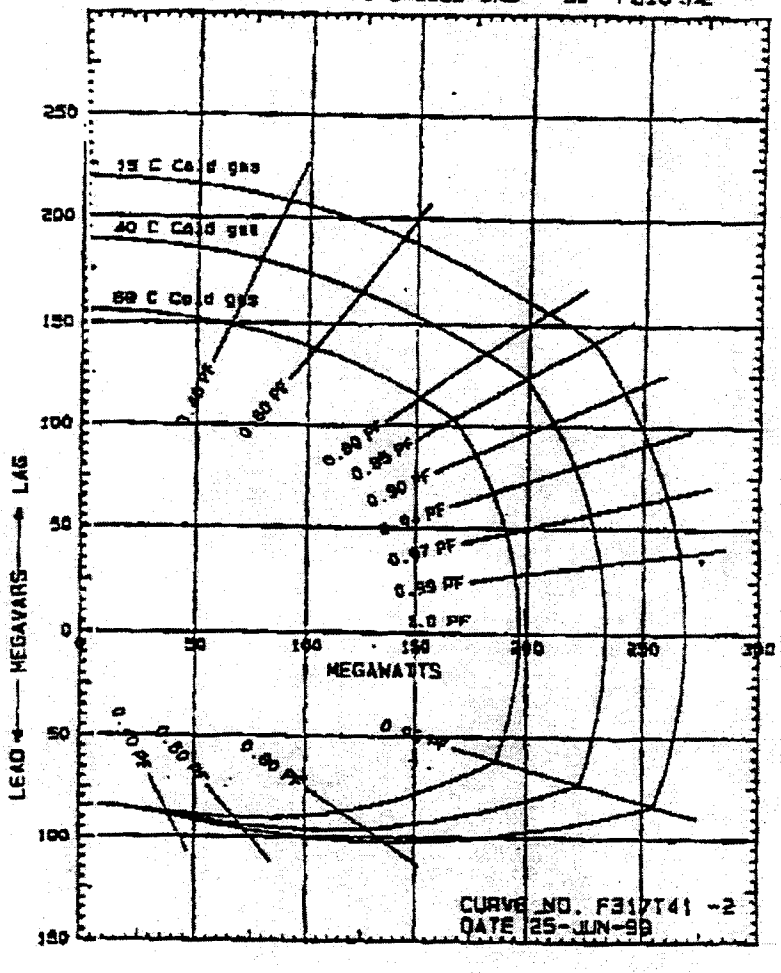


GENERAL ELECTRIC COMPANY	SIZE	CAGE CODE	DWG NO
GE Power Generation SCHENECTADY, NY	A		585A1174
DRAWN Elena Smith			
ISSUED	SCALE		SHEET 4

SIZE	DWG NO	SH	REV
A	585A1174	5	-

ESTIMATED REACTIVE CAPABILITY CURVES

234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2

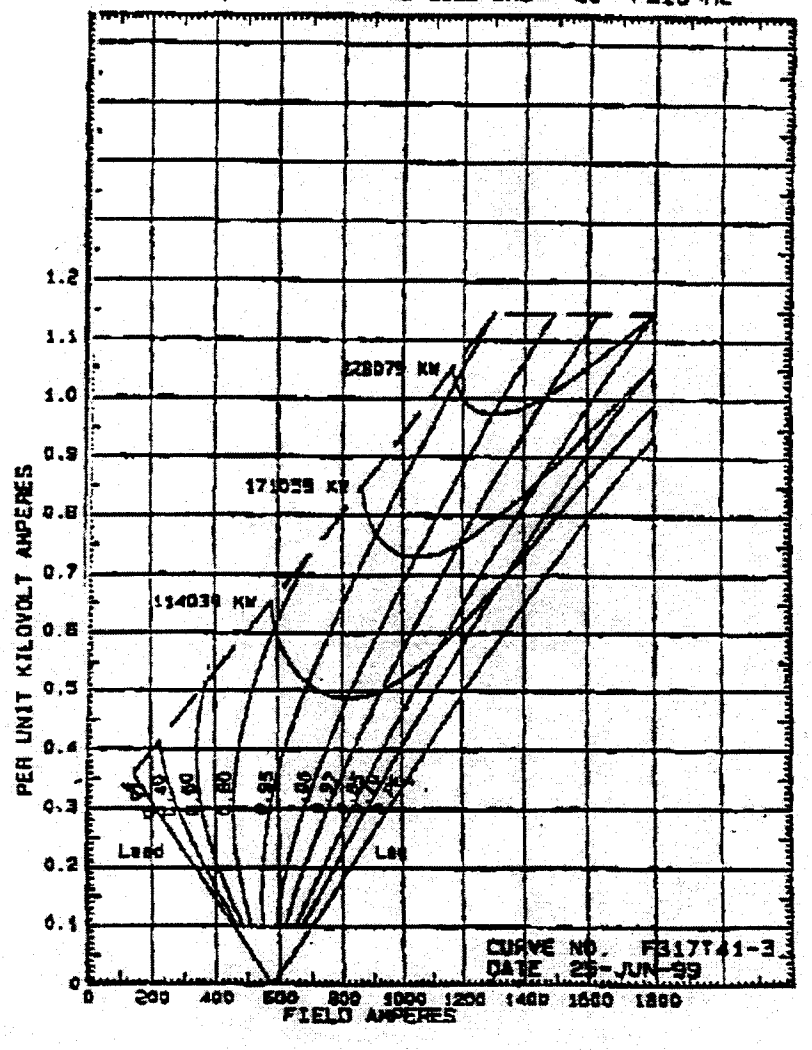


GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 5

SIZE	DWG NO	SH	REV
A	585A1174	6	-

ESTIMATED EXCITATION V CURVES

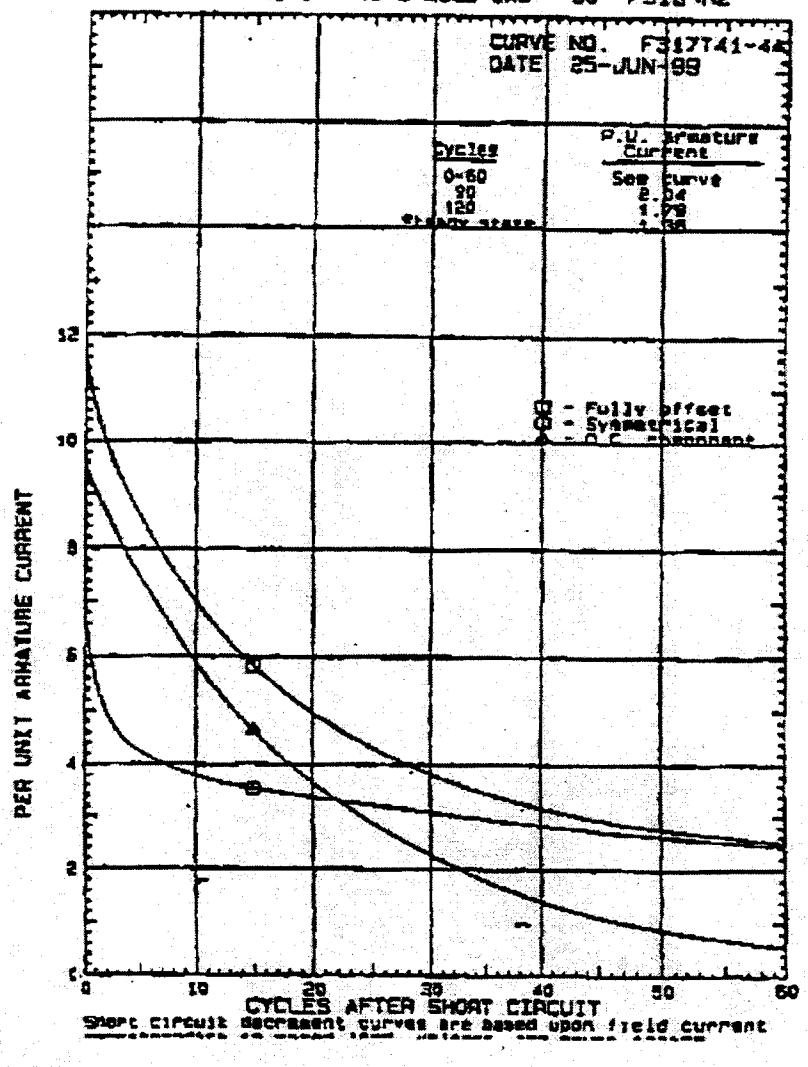
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2



GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 6

SIZE	DWG NO	SH	REV
A	585A1174	7	.

ESTIMATED THREE PHASE SHORT CIRCUIT DECREMENT CURVE
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2

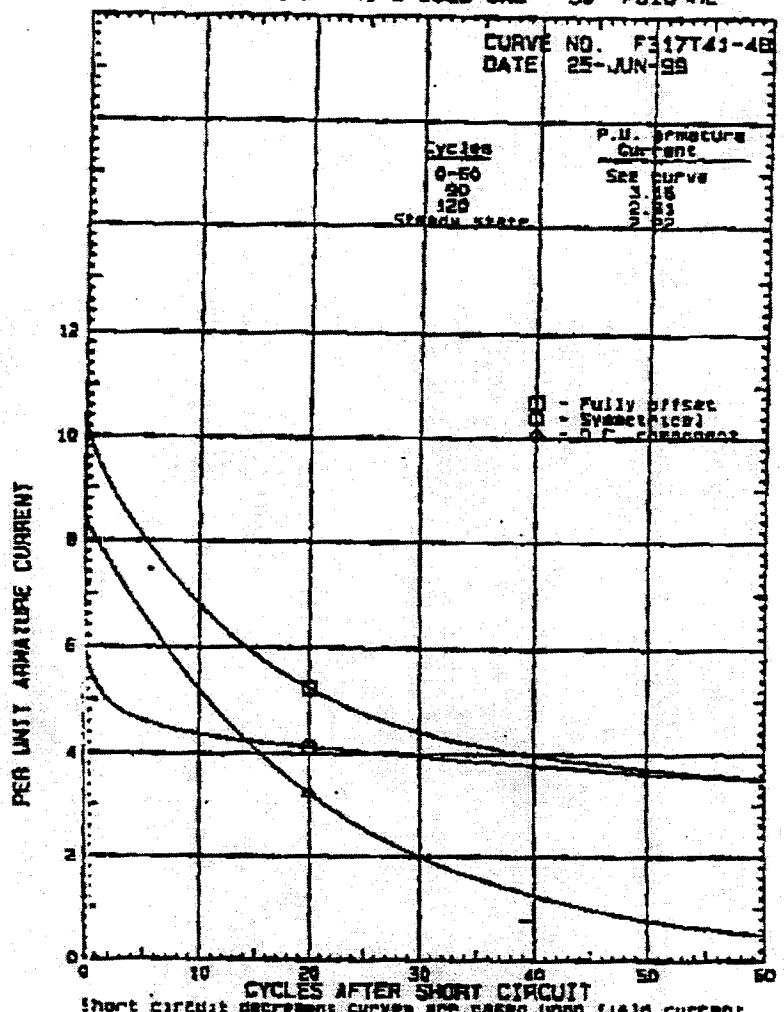


Short circuit decrement curves are based upon field current

GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE	CAGE CODE	DWG NO
GE Power Generation	A		585A1174
DRAWN			
ISSUED	SCALE		SHEET 7

SIZE	DWG NO	SH	REV
A	585A1174	8	-

ESTIMATED LINE TO LINE SHORT CIRCUIT DECREMENT CURVE
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2

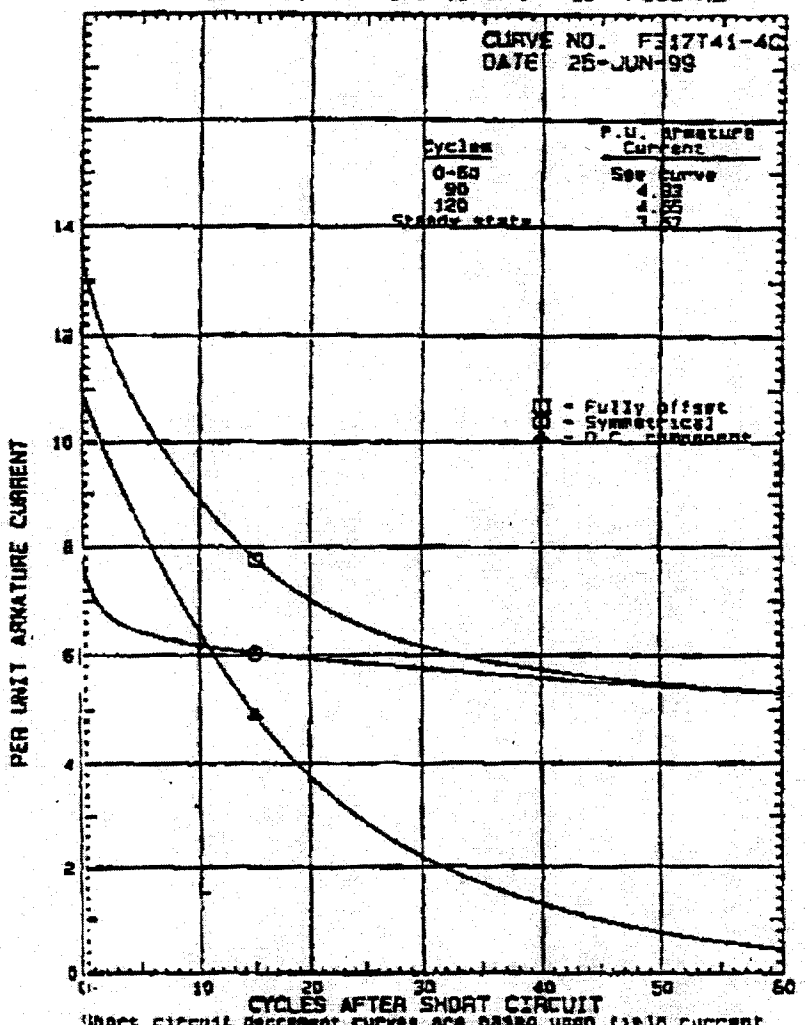


Short circuit decrement curves are based upon field current corresponding to rated load voltage and power factor

GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 8

SIZE	DWG NO	SH	REV
A	585A1174	9	-

ESTIMATED LINE TO NEUTRAL SHORT CIRCUIT DECREMENT CURVE
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2



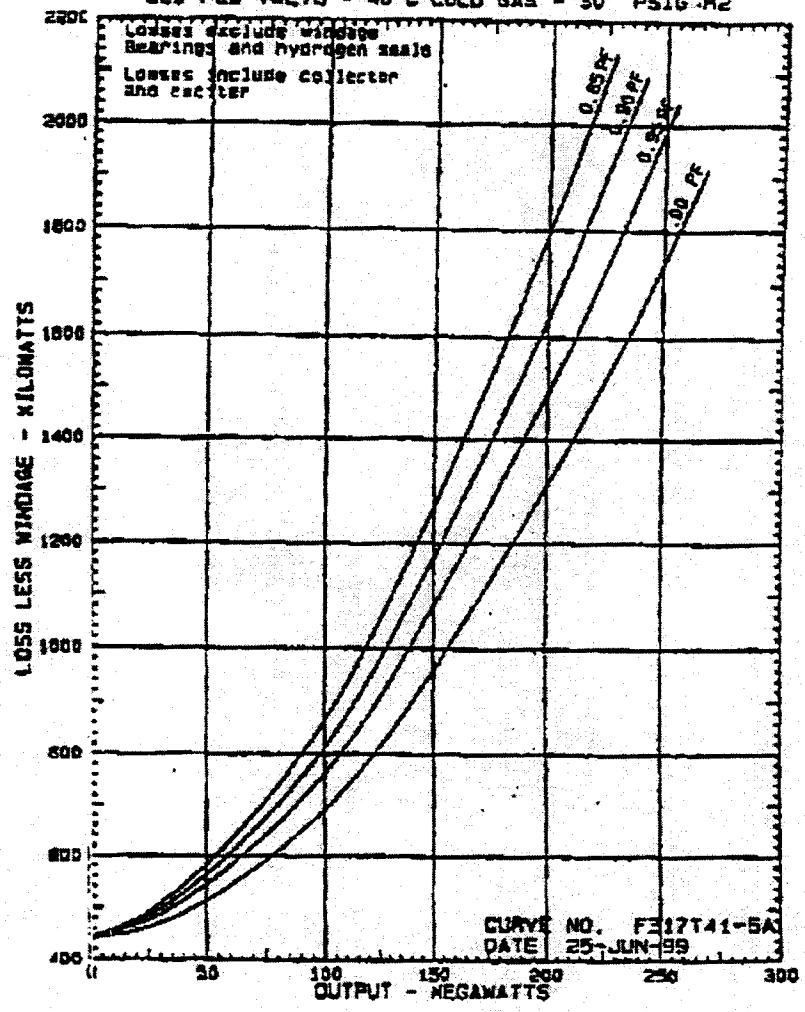
Short circuit decrement curves are based upon field current corresponding to rated load voltage and power factor

GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE	CAGE CODE	DWG NO
DRAWN Dan Sadel		A		585A1174
ISSUED		SCALE		SHEET 9

SIZE	DWG NO	SH	REV
A	585A1174	10	-

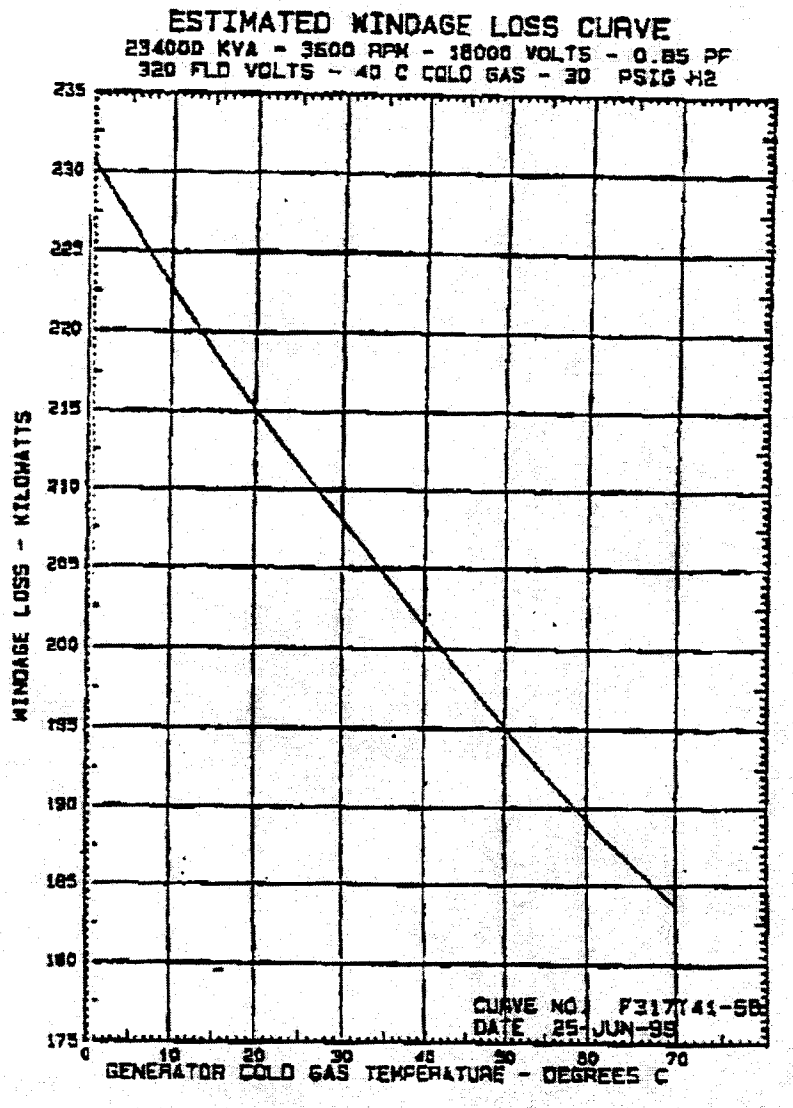
ESTIMATED LOSS CURVE

234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2



GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE	CAGE CODE	DWG NO
DRAWN		A		585A1174
ISSUED		SCALE		SHEET 10

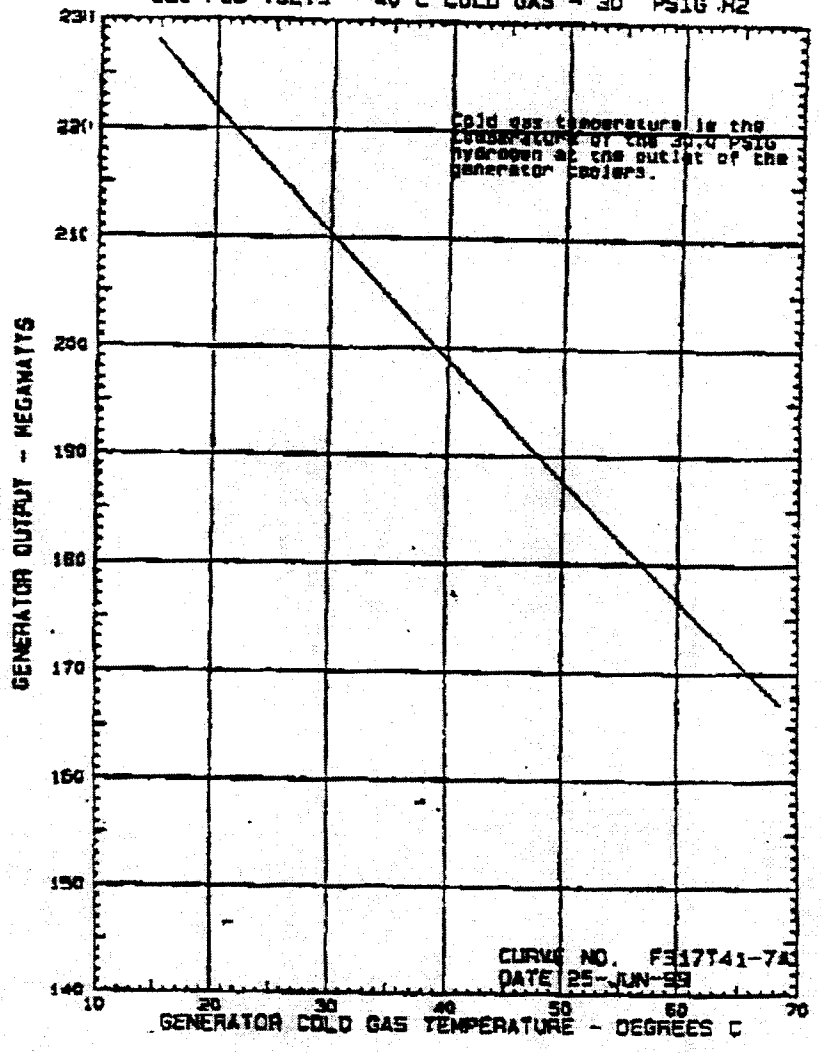
SIZE	DWG NO	SH	REV
A	585A1174	11	-



GE Power Generation	GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE A	CAGE CODE	DWG NO 585A1174
DRAWN				
ISSUED		SCALE		SHEET 11

SIZE	DWG NO	SH	REV
A	585A1174	12	-

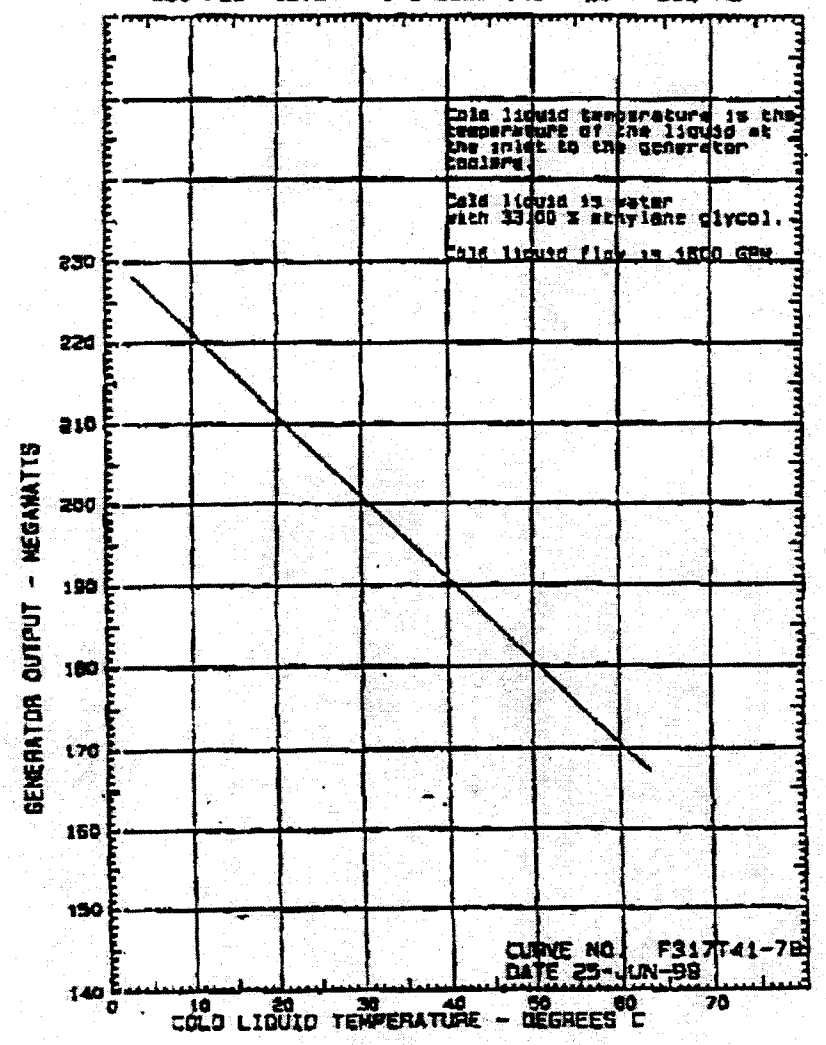
GENERATOR OUTPUT AS A FUNCTION OF COLD GAS TEMPERATURE
234000 KVA - 3600 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2



GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE	CAGE CODE	DWG NO
GE Power Generation	A		585A1174
DRAWN			
ISSUED	SCALE		SHEET 12

SIZE	DWG NO	SH	REV
A	585A1174	13	-

GENERATOR OUTPUT AS A FUNCTION OF COLD LIQUID TEMPERATURE
234000 KVA - 3800 RPM - 18000 VOLTS - 0.85 PF
320 FLD VOLTS - 40 C COLD GAS - 30 PSIG H2



GENERAL ELECTRIC COMPANY SCHENECTADY, NY	SIZE	CAGE CODE	DWG NO
GE Power Generation	A		585A1174
DRAWN	SCALE		SHEET 13

PRELIMINARY

Generator Data Requirements(Case 670 MVA)

- **Ratings and Capabilities**

1. Nameplate kV Rating (nominal design voltage) 19 kV

2. MVA Rating

MVA Rating		@ H_2 Press.	
a.	670MVA	60psig(410kPa·g)	
b.		psig	Refer to ES-CAL0001a-3
c.		psig	Refer to ES-CAL0001a-3

Generator Nameplate Rating

d.	670MVA	60psig(410kPa·g)

3. Rated Power Factor 0.85 (Lag)

4. Rated Speed 3,600 min^{-1}

5. Rated Turbine Capability

6. Field Voltage at Rated Load 550 V

7. Field Current at Rated Load 4,550 A

8. No-load Field Voltage at Generator Rated Voltage 148 V

9. Air Gap Field Voltage at Generator Rated Voltage 132 V

10. Field Resistance 0.083 ohms 20 °C

- **Inertia**

1. ~~WR²~~ GD² for Generator and Exciter 28.7 ~~lb·ft²~~ $ton \cdot m^2$
2. ~~WR²~~ GD² for Turbine ~~lb·ft²~~ $ton \cdot m^2$
3. Calculated H constant kW sec. @ 670 MVA

- **Losses and Efficiency**

1. Open circuit core loss	740			kW
2. Windage loss	770			kW
3. H_2 seal and exciter friction loss	780			kW
4. Stator I^2R Loss at rated power and voltage	95	°C	400	kW
5. Rotor I^2R Loss at rated power and voltage	95	°C	1,070	kW
6. Stray Load loss	750			kW
7. Excitation losses	130			kW

- **Generator Time Constants**

1. T'do (Direct axis open circuit transient time constant)	6.0	sec
2. T"do (Direct axis open circuit subtransient time constant)	0.032	sec
3. T'qo (Quadrature axis open circuit transient time constant)	1.3	sec
4. T"qo (Quadrature axis open circuit subtransient time constant)	0.05	sec
5. Ta3 (Short circuit time constant)	0.26	sec

- **Generator Impedances**

1.	MVA base for all impedance data	670 MVA
2.	kV base for all impedance data	19 kV

Parameter		Description	p.u. value
3.	Xd	Direct axis synchronous reactance (unsaturated)	2.14
4.	Xq	Quadrature axis synchronous reactance (unsaturated)	2.11
5.	X'd	Direct axis transient reactance (unsaturated)	0.320
6.	X'ds	Direct axis transient reactance (saturated)	0.291
7.	X'q	Quadrature axis transient reactance (unsaturated)	0.504
8.	X'qs	Quadrature axis transient reactance (saturated)	0.434

9.	X"d	Direct axis subtransient reactance (unsaturated)	0.252
9-1.	X"ds	Direct axis subtransient reactance (saturated)	0.217
10.	X"q	Quadrature axis subtransient reactance (unsaturated)	0.252
11.	X_L	Armature leakage reactance(saturated)	0.176
12.	R_1	Positive sequence armature resistance at 75° C	0.003
13.	R_2	Negative sequence armature resistance at 75° C	0.06
14.	X_2	Negative sequence armature reactance at rated voltage	0.252
15.	X_0	Positive sequence armature resistance at 75° C	0.125
16.	R_{dc}	Direct current armature resistance at 75° C	0.0020

17. Generator neutral grounding resistance _____ohms
(secondary resistance converted to primary side)

18. Generator neutral grounding reactance _____ohms

- **Required Characteristic Curves and Diagrams**

Real and reactive power capability curves ··· Refer to ES-CAL0001a-3

2. Saturation curve, full load and no-load ··· Refer to ES-CAL0001a-1

3. "V" curves ··· Refer to ES-CAL0001a-2

4. Governor overspeed response curve ···

- **Excitation System Data**

1. Excitation system type static excitation

2. Voltage regulator model name TOSHIBA

3. Excitation system model, supply block diagram and model parameters in IEEE[1,2] or PSS/E format

··· Refer to EXCITATION SYSTEM FUNCTION BLOCK DIAGRAM (Case 670 MVA)

4. Voltage compensation, supply block diagram and settings if used

---

[1] IEEE Standard 421.5-1992 "IEEE Recommended Practice for Excitation System Models for Power System Stability Studies"
[2] IEEE Digital Excitation Task Force, "Computer Models for Representation of Digital-Based Excitation Systems," IEEE Transactions on Energy Conversion, Vol. 11, No. 3, September 1996

··· Refer to EXCITATION SYSTEM FUNCTION BLOCK DIAGRAM (Case 670 MVA)

5. Voltage regulator overexcitation limiters, supply block diagram and model parameters in IEEE[3] format.

··· Refer to EXCITATION SYSTEM FUNCTION BLOCK DIAGRAM (Case 670 MVA)

6. Power System Stabilizer (if used), supply Power System Stabilizer block diagram and model parameters in IEEE or PSS/E format

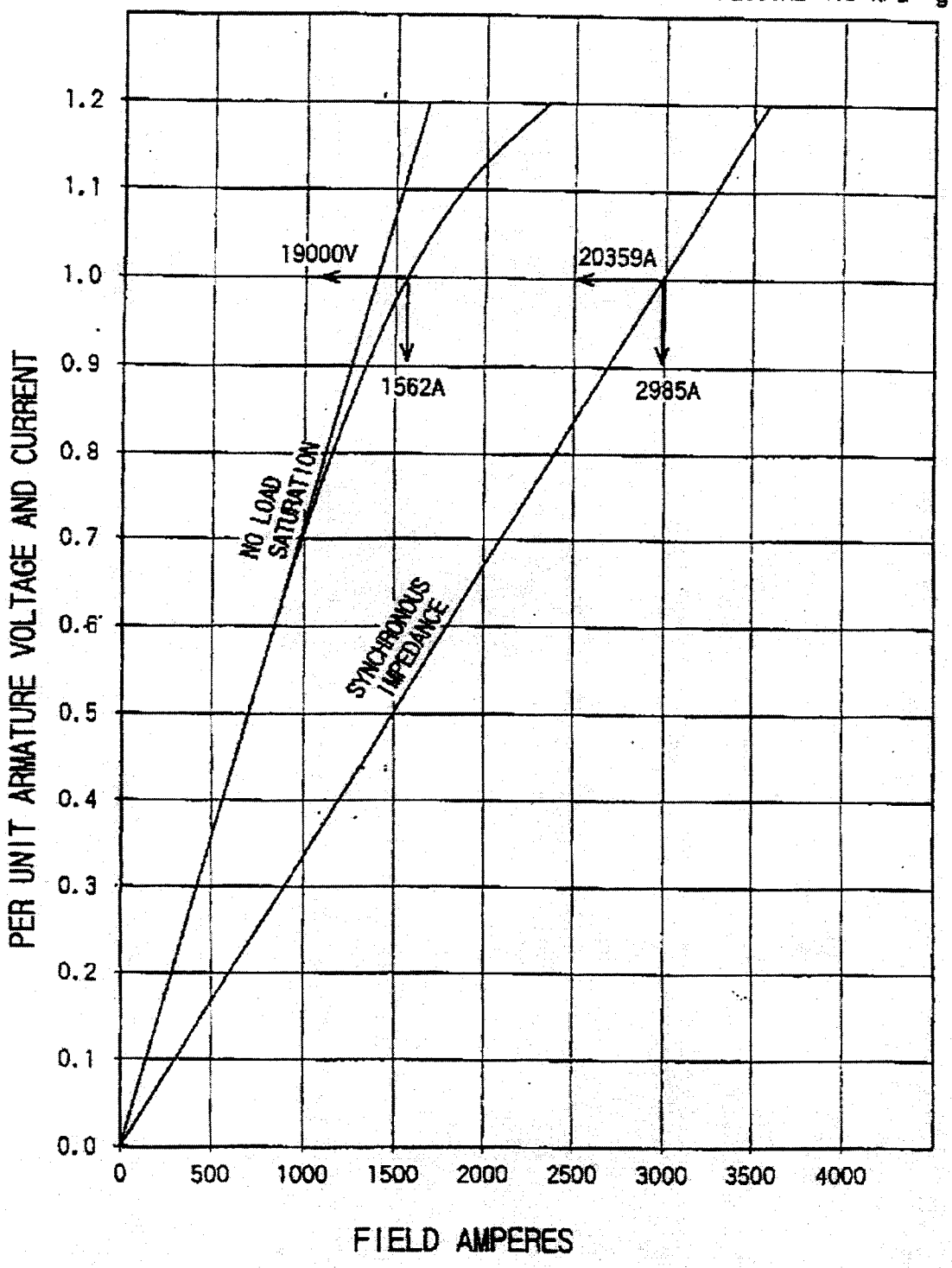
··· Refer to EXCITATION SYSTEM FUNCTION BLOCK DIAGRAM (Case 670 MVA)

[3] IEEE Committee Report, "Recommended Models for Overexcitation Limiting Devices," IEEE Transactions on Energy Conversion, Vol. 10, No. 4, December 1995

ESTIMATED SATURATION AND SYNCHRONOUS IMPEDANCE CURVES

TAKS-2P-670000kVA-LCH-19000V-20360A-60Hz-0.85PF

HYDROGEN PRESSURE 410 kPa・g

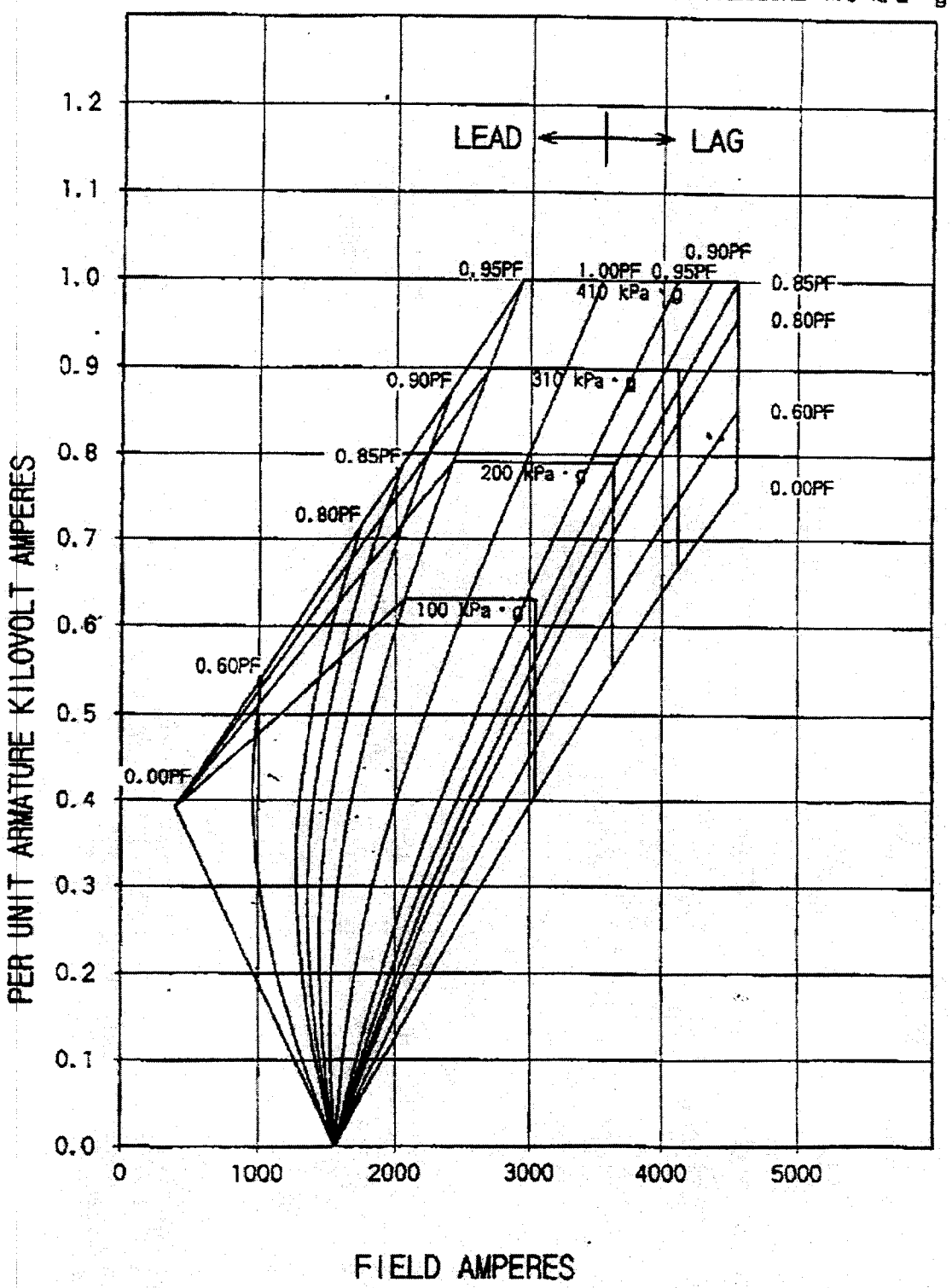


ES-CAL0001a-1

ESTIMATED 'V' CURVES

TAKS-2P-670000kVA-LCH-19000V-20360A-60Hz-0.85PF

HYDROGEN PRESSURE 410 kPa・g

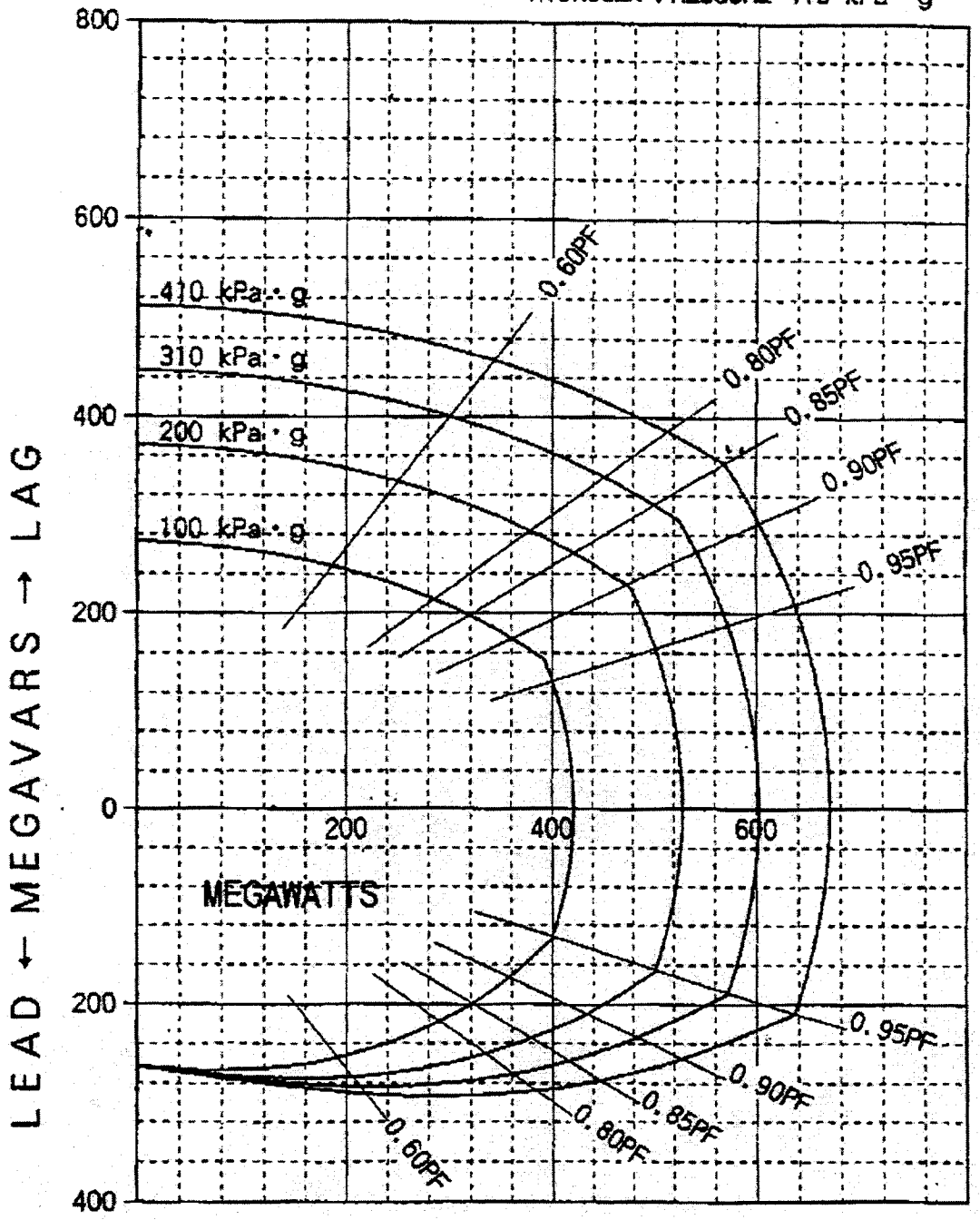


ES-CAL0001a-2

ESTIMATED REACTIVE CAPABILITY CURVES

TAKS-2P-670000kVA-LCH-19000V-20360A-60Hz-0.85PF

HYDROGEN PRESSURE 410 kPa・g



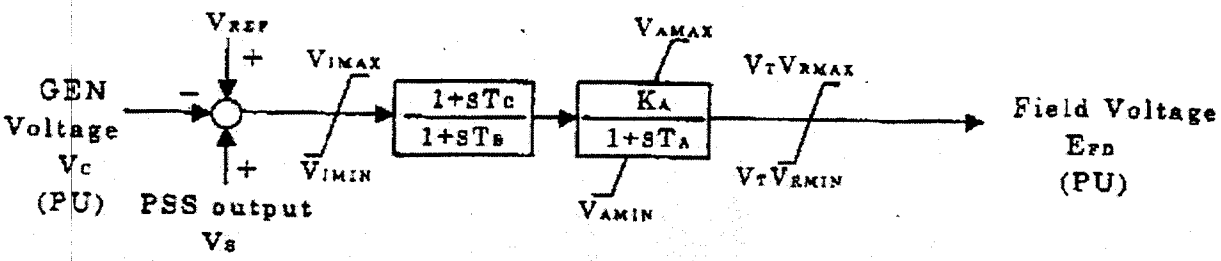
ES-CAL0001a-3

TOSHIBA

Transfer Function Diagram of Excitation System

1. AVR

TYPE : ST1A



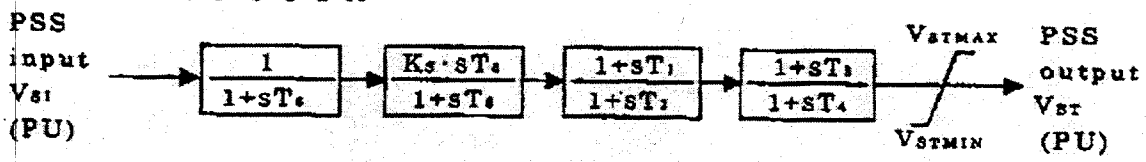
Constant Table

Symbol	T_C	T_B	K_A	T_A	V_{IMAX}	V_{IMIN}	V_{AMAX}	V_{AMIN}	V_{RMAX}	V_{RMIN}
Unit	SEC	SEC	PU	SEC	PU	PU	PU	PU	PU	PU
Const.	0.7	6.6	400	0.03	0.3	-0.3	4.4	-3.1	5.9	-4.1

(Tdo'= 6.0 SEC)

2. PSS

TYPE : PSS1A



Setting Table

Setting	Symbol	Unit	Range	Value
gain	K_S	PU	0.2～2	-0.80
wash-out	T_S	SEC	1～10	2.00
lead time const.1	T_1	SEC	0.02～2	0.15
lag time const.1	T_2	SEC	0.02～2	0.25
lead time const.2	T_3	SEC	0.02～2	1.00
lag time const.2	T_4	SEC	0.02～2	1.00
upper limit	V_{STMAX}	PU	0.03～0.2	0.10
lower limit	V_{STMIN}	PU	-0.03～-0.2	-0.10

Constant Table

Constant	Symbol	Unit	Value
TRD time const.	T_r	SEC	0.03

PSS input : POWER

Appendix 5.4-A

SYSTEM IMPACT STUDY PLAN
CALPINE EAST ALTAMONT ENERGY CENTER

Calpine East Altamont Energy Center
System Impact Study Plan

I. Background and Purpose

The purpose of this System Impact Study (SIS) is to identify the preliminary direct interconnection requirements for the proposed Calpine East Altamont Energy Center (EAEC) planned to be on-line by June 2004. EAEC will loop the Tracy-Westley 230 kV line into its proposed project site, located just east of Tracy Substation. In this study it is assumed that the Tracy-Westley 230 kV line will be un-bundled into two lines from EAEC to Tracy, as shown in Figure 1, attached. The results of the SIS will be utilized as a basis for a subsequent detailed facility interconnection study.

A study group will initially include Western, Pacific Gas & Electric (PG&E), Modesto Irrigation District (MID), Turlock Irrigation District (TID), Calpine and the California Independent System Operator (CAISO). Western and PG&E will conduct the initial studies and other utilities and interested stakeholders will be invited to participate later. Western will coordinate the overall study. The study work assignments will be distributed among the individual participants in accordance with their own agreement with Calpine.

II. Study Schedule

The following schedule is designed for the joint study effort.

Milestone	Date
Finalize the Study Plan	September 28, 2000
Western to send all base cases to PG&E for changes	October 6, 2000
PG&E to complete changes and return base cases to Western	November 1, 2000
Base cases out for comment	November 7, 2000
Comments on base cases due back to Western	November 17, 2000
Preliminary short circuit results for the initial configuration out for review	November 17, 2000
Base cases re-issued for final comments	December 15, 2000
Contingency list for all facilities out for comments	December 15, 2000
Comments on the contingency list due back to Western/PG&E	December 20, 2000
Preliminary power flow results out for review	January 12, 2001
Preliminary stability results out for review	January 19, 2001

Comments on all preliminary results due back	February 2, 2001
Finalize the study results	February 23, 2001
Draft study report out for comments	March 2, 2001
Comments on the draft study report due back	March 16, 2001
Final study report issued	March 30, 2001

III. Base Case and Interconnection Configuration

PG&E's Annual Transmission Assessment 2005 Heavy Summer Full-Loop Power Flow Base Case will be used for the studies. This case represents a summer peak load in northern California. Additional Base Case assumptions are summarized in the table below, which will be finalized by the study group.

2005 SUMMER PEAK NORTH-TO-SOUTH CASE SUMMARY	
Study Path	**Flow (MW)**
PACI + COTP	4500 (Sensitivity studies will be performed at 4800 as well as lower COI levels.)
PDCI	2652 @ Sylmar
Midway – Vincent	Maximum up to 3000 MW
Planning Area Load	**MW**
PG&E	~ 27,795
Sacramento Area (also included in PG&E)	3140 (SMUD), 320 (Roseville)
Generation	**MW**

Sutter, DEC, LMEC, MEC, SECAL, Moss Landing, FPLE (Elverta), La Paloma, Sunrise	Sutter: 525 LMEC: 500 DEC: 880 MEC: 600 MLPP: 1080 CC SECAL: 590 FPLE (Elverta): 560 La Paloma: 1110 Sunrise: 330 As these units are added, power balance shall be maintained by first proportionally reducing the generation in SCE and SDG&E and then by reducing imports from the north
Morro Bay # 4	Reference (Swing Bus)
Northern California Hydro	3623.5 MW (90.3 %)
QF	Historical diversity level by unit

The Base Case will include the following assumptions:

- Load conditions in the area as described in the base case
- A third 230-kV line from either O'Banion or Sutter to Elverta
- City of Lodi load remains on PG&E system, existing system configuration
- Round Mountain - Table Mountain Series Capacitor Upgrade
- Additional 500/230-kV Transformer at Tracy, Tesla and Metcalf
- A new Tesla-Newark 230 kV line
- Static Capacitors (350 MVAR) at Metcalf 500 kV
- Static Capacitors (100 MVAR) at Martin 115 kV
- Newark-San Mateo 230 kV line looping into Ravenswood Substation
- Newark Substation Bank #7, 9 and 11 TCAP
- Transmission and sub-transmission reinforcements committed by management (all area utilities) to be in-service on or before 2004

Sensitivity Cases

- 2004 Spring, Integrated CAISO Assessment case
- New power plant at Rancho Seco

2004 SPRING NORTH-TO-SOUTH CASE SUMMARY	
Study Path	**Flow (MW)**
PACI + COTP	4000 (Sensitivity studies will be performed at 4800 as well as lower COI levels.)
PDCI	3100 @ Sylmar
Midway – Vincent	3000 MW
Planning Area Load	**MW**
PG&E	~ 17,067
Sacramento Area (also included in PG&E)	1551 (SMUD), 155 (Roseville)
Generation	**MW**
Sutter, DEC, LMEC, MEC, SECAL, Moss Landing, FPLE (Elverta), La Paloma, Sunrise	Sutter: 408 LMEC: 0 DEC: 730 MEC: 470 MLPP: 0 CC SECAL: 472 FPLE (Elverta): 0 La Paloma: 0 Sunrise: 140 As these units are added, power balance shall be maintained by first proportionally reducing the generation in SCE and SDG&E and then by reducing imports from the north
Morro Bay # 4	Reference (Swing Bus)
Northern California Hydro	1671.2 MW (41.7 %)
QF	Historical diversity level by unit

The initial EAEC interconnection configuration will be based on Calpine's proposal as shown in Figure 1. This configuration may be revised or changed during the course of the study based on performance merit and the overall system impact. The study team may make recommendations for additional studies as needed.

IV. Methodology and Approach

A. Power Flow Analysis

Western will develop the base cases in accordance with PG&E, complete the power flow analysis, determine the impacts on all utilities, and present the preliminary interconnection feasibility study results to the study group and stakeholders. PG&E will conduct the power flow analysis within PG&E's Area 5.

~~B.~~ *P-V Analysis*

Develop P-V curves for the base case and for the worst single and double contingencies. PV curves will be developed in accordance with the WSCC Voltage Stability criteria. The P-V analysis will be performed by Western.

~~X.~~ *Q-V Analysis*

VQ analysis will be performed based on WSCC voltage stability and reactive margin criteria. Reactive margin will be measured at selected 230-kV buses, for 230 kV contingencies, and at the Tesla, Tracy, and Table Mountain buses for 500 kV contingencies. The Q-V analysis will also be performed by Western.

D. Transient Stability Analysis

Using the 2005 base case selected contingencies will be simulated to verify transient stability. This will determine whether the Project would adversely impact system stability following those contingencies. The study group will develop a list of contingencies. PG&E will conduct transient stability analysis within PG&E's Area 5.

E. System Protection & Short Circuit Analysis

Short circuit studies will be conducted to determine the fault duties for the immediate substation and adjacent substations. The results will be shown in tables indicating the available fault before and after interconnection of the Project. In addition, overstressed equipment resulted from interconnecting the Project will be identified. Western and PG&E will conduct the short circuit analysis jointly.

F. Contingencies to Model

The following contingencies will be simulated for the study:

ISO Category "B" Outages

All participants will prepare line outage list and provide to the study group for their respective areas.

ISO Category "C" Outages

All participants will prepare line outage list and provide to the study group for their respective areas.

500 kV Outages

The following 500 kV outages will be run using post-transient power flow analysis incorporating the appropriate remedial actions (RAS):

500-kV Single Line Outages	500-kV Double Line Outages
Malin – Round Mountain	Malin – Round Mountain
Captain Jack – Olinda	Round Mountain - Table Mountain
Round Mountain – Table Mountain	Table Mountain-Tesla/Vaca Dixon
Table Mountain-Tesla	Tesla – Los Banos & Tracy - Los Banos
Olinda – Tracy	Tracy – Tesla & Tesla - Los Banos
Table Mountain – Vaca Dixon	Tracy – Tesla & Tracy - Los Banos
Vaca Dixon – Tesla	
Tesla – Los Banos	
Tracy – Los Banos	

V. Cost estimate for EAEC interconnection

System Impact Study will not include any cost estimate.

VI. Study Costs

Each study group participant will be responsible for their share of the study cost in accordance with their individual agreement with Calpine.

VII. Possible Subsynchronous Resonance Phenomenon

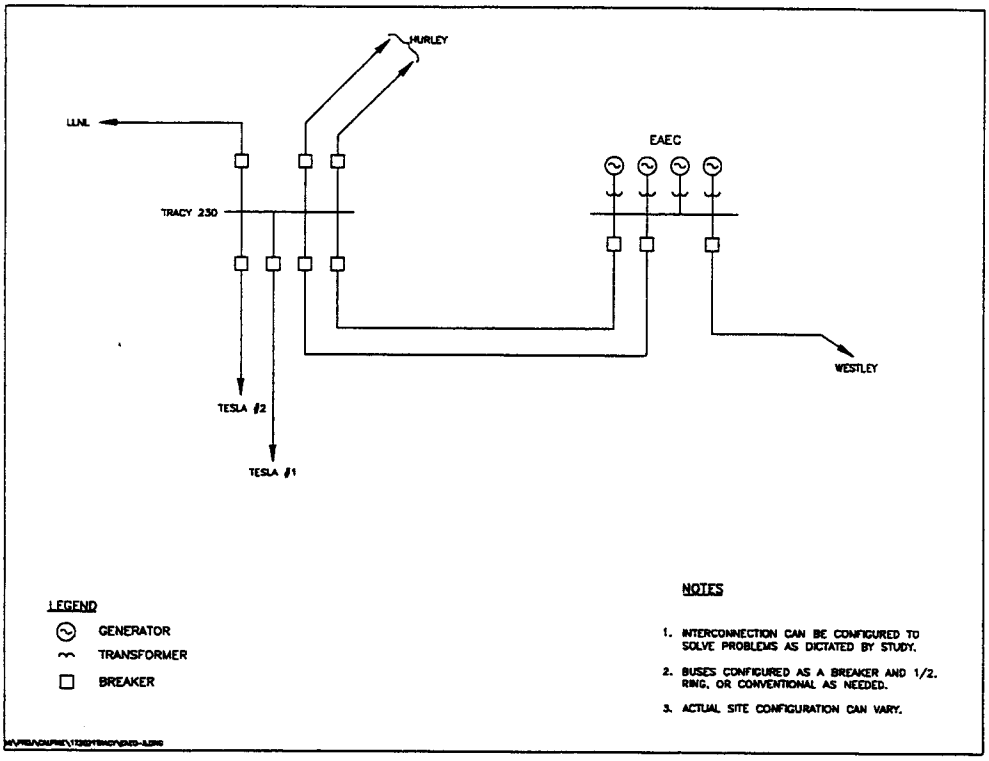
The purpose of this section is to alert the Applicant that new generating facilities in close proximity of the 500 kV series capacitor sites in the PG&E service area could possibly be subject to the subsynchronous resonance (SSR) phenomenon.

When generators connect at a location that is strongly coupled to a series-compensated transmission system, an interaction between the generator and the system may occur. This interaction is called SSR, and, as the name implies, occurs at frequency under 60 hertz. SSR would occur if, following a system disturbance or switching operation (such as the switching of a generator controller or line switching), a current was induced at a frequency that is the same or nearly the same as one of the complementary frequencies. The complementary frequencies are defined as the difference between 60 hertz and the mechanical frequencies of the turbine, the generator, and the turbine-generator shaft. SSR has the possibility of occurring at steam generators sited at a point in an electrical system where it will "see" (i.e. is electrically close to) the series compensation. SSR, should it occur, could lead to fatigue and possible failure of the turbine-generator shafts. In fact, such failure occurred in the transmission system in the Western United States in the early 1970s before this phenomenon was well understood.

ABB Power T&D Company, Inc. (ABB) has conducted a screening analysis assessing the SSR issue for PG&E as part of a PG&E/ABB evaluation of the PG&E 500 kV series capacitor banks. This analysis indicates that SSR could possibly occur in PG&E service area.

Tracy and Tesla Substation both have 500 kV series capacitors on the 500 kV system. It is the developer's responsibility to assess the risk of such possible SSR phenomenon for its proposed project. An SSR evaluation will not be part of this study.

ATTACHMENT - ***Figure 1****: Conceptual Interconnection Design (provided by Calpine.)*



Appendix 5.5-A

EMF AND POWER LINE CONCEPTS FOR CALPINE EAEC AFC PROJECT

EMF CHARACTERISTICS

The power system frequency in the United States is 60 cycles per second or 60 hertz (Hz). At 60 Hz the electromagnetic field is calculated as two separate fields: an electric field and a magnetic field. These fields are a naturally occurring phenomenon associated with electricity. The electric and magnetic fields have the same frequency as the electricity that creates them. Thus, the fields that are the subject of this report are 60 Hz fields. Electric field concepts are presented below, followed by a discussion of magnetic fields.

Electric Fields

The quantity of electricity is defined in terms of electric charge. "Electric charge, like mass, length, and time, is accepted as a fundamentally assumed concept, required by the existence of forces measurable experimentally: other definitions of electromagnetic quantities are developed on the bases of these four concepts."[1]

The potential energy stored in an electric charge is measured in volts. Voltage on a wire is often described as analogous to water pressure in a pipe.

An electric field exists wherever there is an electric charge. The electric field is an invisible force that exists in space between positive and negative electric charges. An electric field has a direction associated with it, from positive charge to negative charge. It is measured in units of kilovolts per meter (kV/m). An electric field is present wherever there is electrical energy, including home wiring, appliances, and power lines. Electric fields have the following characteristics:

1. The strength of the electric field is proportional to the voltage of the electric system causing it. Thus, a high-voltage power line would have a higher electric field than low-voltage house wiring.

2. The strength of the electric field decreases as the distance from the source increases. Thus, moving farther from a power line will reduce the field.

3. An electric field is stopped by ground and can be shielded by enclosing it within a grounded metallic object. Trees, bushes, houses, etc., will also significantly attenuate electric fields.

4. Two electric fields may tend to add together or cancel each other depending upon whether they are in the same or opposite directions.

5. Electric fields will induce a charge on ungrounded metallic objects within the field. Thus, electric utilities take precautions to ground fences and metal buildings that are very close to transmission lines.

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[1] IEEE Standard Dictionary of Electrical and Electronics Terms

6. People are able to detect the presence of some electric fields by sensation of small body hairs. This detection depends upon the strength of the field and the sensitivity of the person.

Magnetic Fields

A magnetic field is produced whenever electric current flows. Current is the movement of electric charges and is measured in amperes (also called amps). The magnetic field is an invisible force that exists in space around the current source. The unit used to measure magnetic field is milliGauss (mG).

The characteristics of magnetic fields are listed below. In many ways, magnetic fields differ from electric fields described above.

1. The strength of a magnetic field is proportional to current. The relevance of this will be discussed in more detail in the section on power lines.

2. The strength of a magnetic field decreases as the distance from the source increases. Thus, moving farther from a power line will reduce the magnetic field, similar to the electric field.

3. A magnetic field is not stopped by ground and is not significantly attenuated by buildings, trees, etc. It is attenuated only if the current source is enclosed by a magnetic material.

4. Two magnetic fields may tend to add together or cancel each other depending upon whether they are in the same or opposite direction.

5. A magnetic field will induce current in a conducting metallic loop. This is a concern to electric utilities where pipelines or railroads are close to and parallel to power lines. Precautions are taken to prevent the induced currents from causing interference to the corrosion protection system on pipelines or to communication systems on railroads.

6. People are not able to sense the presence of a magnetic field.

A magnetic field will be found near household appliances and home wiring, as well as power lines.

To review the terminology, voltage is a measure of the potential energy of the electrical charge, analogous to the potential energy of water pressure inside a pipe. An electric field is associated with voltage. Current is the movement of electrical charge in a wire, analogous to the flow of water in a pipe. A lamp plugged into the household wall outlet will have voltage to the switch, but current will flow only when the switch is turned on. A magnetic field is associated with current.

Measurement and Calculation of EMF

The measurement of the strength of electric and magnetic fields is made with readily available meters. A different meter is needed to measure each. The Institute of Electrical and Electronic Engineers (IEEE) develops and publishes guidelines and standards for instrumentation and measurement procedures. Near power lines, the standards state that the fields are to be measured at 1 meter (3.28 feet) above ground. The field strengths given in this report are calculated at 1 meter above ground.

The electric and magnetic fields associated with a power line have a special orientation with regard to the power line. The electric field (near the power line) at 1 meter above ground is essentially vertical along the route of the power line. Magnetic fields, on the other hand, may have vertical and horizontal components. It is important, especially when making measurements, that orientation of the field be taken into consideration.

In this report, calculation of magnetic field strengths refers to the maximum field rather than a horizontal or vertical component.

POWER TRANSMISSION CONCEPTS

Power Line Voltages and Currents

The electric and magnetic fields are calculated for typical transmission line configurations. Transmission lines are almost always three-phase (three conductors servicing a particular load or customer). For the calculations in this report we have assumed the three phases to be balanced in voltage and current.

Electric utilities operate power lines at nearly constant voltage; normal operation is typically within 5 percent of the nominal voltage. Similarly, the voltage maintained within a house is nearly constant at 120 volts. The current over a power line, however, will vary considerably as power requirements change. This same situation occurs within a house. The electrical outlets in the home will all supply power at nearly 120 volts, but if no appliance is turned on, then no current flows. However, as refrigerators, lamps, and various appliances are turned on, more and more current flows to provide power. Thus, the current varies considerably depending upon the amount of power being used.

The electric field, which is proportional to voltage, will be nearly constant under a transmission line since the line is held at nearly constant voltage. On the other hand, the magnetic field, which is proportional to current, will vary greatly during the day as the power requirements on the transmission line vary. In discussing the magnetic field near a transmission line it is, therefore, important to distinguish the current that was used to determine the magnetic field level. In this report, discussion of magnetic fields will include reference to the associated current level.

Appendix 5.5-B

ELECTRIC FIELD DATA SHEETS
CROSS SECTIONS A, B AND C
FOR CALPINE EAEC AFC PROJECT

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section A

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section A1 (kV/m)	Maximum Field With EAEC Cross Section A2 (kV/m)
-500	0.006	0.006
-495	0.006	0.006
-490	0.006	0.006
-485	0.007	0.007
-480	0.007	0.007
-475	0.007	0.007
-470	0.007	0.007
-465	0.007	0.007
-460	0.007	0.007
-455	0.007	0.007
-450	0.008	0.008
-445	0.008	0.008
-440	0.008	0.008
-435	0.008	0.008
-430	0.008	0.008
-425	0.009	0.009
-420	0.009	0.009
-415	0.009	0.009
-410	0.009	0.009
-405	0.01	0.01
-400	0.01	0.01
-395	0.01	0.01
-390	0.01	0.01
-385	0.011	0.011
-380	0.011	0.011
-375	0.011	0.011
-370	0.012	0.012
-365	0.012	0.012
-360	0.012	0.012
-355	0.013	0.013
-350	0.013	0.013
-345	0.013	0.013
-340	0.014	0.014
-335	0.014	0.014
-330	0.015	0.015
-325	0.015	0.015
-320	0.016	0.016
-315	0.016	0.016
-310	0.017	0.017
-305	0.017	0.017
-300	0.018	0.018
-295	0.019	0.019
-290	0.019	0.019
-285	0.02	0.02
-280	0.021	0.021
-275	0.022	0.022
-270	0.022	0.022
-265	0.023	0.023
-260	0.024	0.024
-255	0.025	0.025

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section A1 (kV/m)	Maximum Field With EAEC Cross Section A2 (kV/m)
-250	0.026	0.026
-245	0.027	0.027
-240	0.029	0.029
-235	0.03	0.03
-230	0.031	0.031
-225	0.033	0.033
-220	0.034	0.034
-215	0.036	0.036
-210	0.037	0.037
-205	0.039	0.039
-200	0.041	0.041
-195	0.043	0.043
-190	0.045	0.045
-185	0.047	0.047
-180	0.049	0.049
-175	0.052	0.052
-170	0.054	0.054
-165	0.057	0.057
-160	0.06	0.06
-155	0.062	0.062
-150	0.065	0.065
-145	0.068	0.068
-140	0.071	0.071
-135	0.073	0.073
-130	0.075	0.075
-125	0.077	0.077
-120	0.078	0.078
-115	0.078	0.078
-110	0.077	0.077
-105	0.073	0.073
-100	0.067	0.067
-95	0.057	0.057
-90	0.043	0.043
-85	0.026	0.026
-80	0.035	0.035
-75	0.079	0.079
-70	0.146	0.146
-65	0.24	0.24
-60	0.369	0.369
-55	0.544	0.544
-50	0.778	0.778
-45	1.085	1.085
-40	1.471	1.471
-35	1.931	1.931
-30	2.427	2.427
-25	2.871	2.871
-20	3.127	3.127
-15	3.064	3.064
-10	2.644	2.644
-5	2.007	2.007

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section A

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section A1 (kV/m)	Maximum Field With EAEC Cross Section A2 (kV/m)
0	1.597	1.597
5	2.005	2.005
10	2.641	2.641
15	3.062	3.062
20	3.125	3.125
25	2.869	2.869
30	2.425	2.425
35	1.93	1.93
40	1.47	1.47
45	1.084	1.084
50	0.778	0.778
55	0.543	0.543
60	0.368	0.368
65	0.239	0.239
70	0.145	0.145
75	0.079	0.079
80	0.034	0.034
85	0.026	0.026
90	0.043	0.043
95	0.057	0.057
100	0.067	0.067
105	0.073	0.073
110	0.077	0.077
115	0.078	0.078
120	0.078	0.078
125	0.077	0.077
130	0.075	0.075
135	0.073	0.073
140	0.071	0.071
145	0.068	0.068
150	0.065	0.065
155	0.062	0.062
160	0.06	0.06
165	0.057	0.057
170	0.054	0.054
175	0.052	0.052
180	0.049	0.049
185	0.047	0.047
190	0.045	0.045
195	0.043	0.043
200	0.041	0.041
205	0.039	0.039
210	0.037	0.037
215	0.036	0.036
220	0.034	0.034
225	0.033	0.033
230	0.031	0.031
235	0.03	0.03
240	0.029	0.029
245	0.027	0.027
250	0.026	0.026

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section A1 (kV/m)	Maximum Field With EAEC Cross Section A2 (kV/m)
255	0.025	0.025
260	0.024	0.024
265	0.023	0.023
270	0.022	0.022
275	0.022	0.022
280	0.021	0.021
285	0.02	0.02
290	0.019	0.019
295	0.019	0.019
300	0.018	0.018
305	0.017	0.017
310	0.017	0.017
315	0.016	0.016
320	0.016	0.016
325	0.015	0.015
330	0.015	0.015
335	0.014	0.014
340	0.014	0.014
345	0.013	0.013
350	0.013	0.013
355	0.013	0.013
360	0.012	0.012
365	0.012	0.012
370	0.012	0.012
375	0.011	0.011
380	0.011	0.011
385	0.011	0.011
390	0.01	0.01
395	0.01	0.01
400	0.01	0.01
405	0.01	0.01
410	0.009	0.009
415	0.009	0.009
420	0.009	0.009
425	0.009	0.009
430	0.008	0.008
435	0.008	0.008
440	0.008	0.008
445	0.008	0.008
450	0.008	0.008
455	0.007	0.007
460	0.007	0.007
465	0.007	0.007
470	0.007	0.007
475	0.007	0.007
480	0.007	0.007
485	0.007	0.007
490	0.006	0.006
495	0.006	0.006
500	0.006	0.006

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section B

LATERAL DISTANCE (feet)	Maximum Field With EAEC Cross Section B (kV/m)
-500	0.014
-495	0.014
-490	0.014
-485	0.015
-480	0.015
-475	0.016
-470	0.016
-465	0.016
-460	0.017
-455	0.017
-450	0.018
-445	0.018
-440	0.019
-435	0.02
-430	0.02
-425	0.021
-420	0.021
-415	0.022
-410	0.023
-405	0.024
-400	0.025
-395	0.025
-390	0.026
-385	0.027
-380	0.028
-375	0.029
-370	0.031
-365	0.032
-360	0.033
-355	0.034
-350	0.036
-345	0.037
-340	0.039
-335	0.041
-330	0.042
-325	0.044
-320	0.046
-315	0.048
-310	0.051
-305	0.053
-300	0.055
-295	0.058
-290	0.06
-285	0.063
-280	0.066
-275	0.068
-270	0.071
-265	0.073
-260	0.075
-255	0.077

LATERAL DISTANCE (feet)	Maximum Field With EAEC Cross Section B (kV/m)
-250	0.078
-245	0.078
-240	0.076
-235	0.073
-230	0.066
-225	0.057
-220	0.043
-215	0.027
-210	0.038
-205	0.083
-200	0.149
-195	0.243
-190	0.372
-185	0.548
-180	0.782
-175	1.088
-170	1.475
-165	1.935
-160	2.43
-155	2.874
-150	3.13
-145	3.067
-140	2.647
-135	2.01
-130	1.6
-125	2.005
-120	2.64
-115	3.059
-110	3.121
-105	2.863
-100	2.418
-95	1.921
-90	1.459
-85	1.07
-80	0.762
-75	0.525
-70	0.348
-65	0.217
-60	0.122
-55	0.058
-50	0.04
-45	0.065
-40	0.088
-35	0.106
-30	0.119
-25	0.128
-20	0.134
-15	0.139
-10	0.142
-5	0.143

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section B

LATERAL DISTANCE (feet)	Maximum Field With EAEC Cross Section B (kV/m)
0	0.144
5	0.143
10	0.142
15	0.139
20	0.134
25	0.128
30	0.118
35	0.105
40	0.088
45	0.065
50	0.04
55	0.059
60	0.123
65	0.217
70	0.348
75	0.526
80	0.762
85	1.071
90	1.459
95	1.922
100	2.419
105	2.864
110	3.122
115	3.06
120	2.641
125	2.006
130	1.6
135	2.009
140	2.645
145	3.065
150	3.129
155	2.872
160	2.429
165	1.934
170	1.474
175	1.088
180	0.782
185	0.547
190	0.372
195	0.243
200	0.149
205	0.083
210	0.038
215	0.027
220	0.043
225	0.057
230	0.066
235	0.073
240	0.076
245	0.078
250	0.078

LATERAL DISTANCE (feet)	Maximum Field With EAEC Cross Section B (kV/m)
255	0.077
260	0.075
265	0.073
270	0.071
275	0.068
280	0.066
285	0.063
290	0.06
295	0.058
300	0.055
305	0.053
310	0.051
315	0.048
320	0.046
325	0.044
330	0.042
335	0.041
340	0.039
345	0.037
350	0.036
355	0.034
360	0.033
365	0.032
370	0.03
375	0.029
380	0.028
385	0.027
390	0.026
395	0.025
400	0.025
405	0.024
410	0.023
415	0.022
420	0.021
425	0.021
430	0.02
435	0.02
440	0.019
445	0.018
450	0.018
455	0.017
460	0.017
465	0.016
470	0.016
475	0.016
480	0.015
485	0.015
490	0.014
495	0.014
500	0.014

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section C

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section C1 (kV/m)	Maximum Field With EAEC Cross Section C2 (kV/m)
-1000	0.004	0.004
-990	0.004	0.004
-980	0.004	0.004
-970	0.004	0.004
-960	0.004	0.004
-950	0.004	0.004
-940	0.004	0.004
-930	0.004	0.004
-920	0.005	0.005
-910	0.005	0.005
-900	0.005	0.005
-890	0.005	0.005
-880	0.005	0.005
-870	0.005	0.005
-860	0.005	0.005
-850	0.005	0.005
-840	0.005	0.005
-830	0.006	0.006
-820	0.006	0.006
-810	0.006	0.006
-800	0.006	0.006
-790	0.006	0.006
-780	0.006	0.006
-770	0.006	0.006
-760	0.007	0.007
-750	0.007	0.007
-740	0.007	0.007
-730	0.007	0.007
-720	0.007	0.007
-710	0.008	0.008
-700	0.008	0.008
-690	0.008	0.008
-680	0.008	0.008
-670	0.009	0.009
-660	0.009	0.009
-650	0.009	0.009
-640	0.009	0.009
-630	0.01	0.01
-620	0.01	0.01
-610	0.01	0.01
-600	0.011	0.011
-590	0.011	0.011
-580	0.011	0.011
-570	0.012	0.012
-560	0.012	0.012
-550	0.013	0.013
-540	0.013	0.013
-530	0.014	0.014
-520	0.014	0.014
-510	0.015	0.015

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section C1 (kV/m)	Maximum Field With EAEC Cross Section C2 (kV/m)
-500	0.016	0.016
-490	0.016	0.016
-480	0.017	0.017
-470	0.018	0.018
-460	0.019	0.019
-450	0.019	0.019
-440	0.02	0.02
-430	0.021	0.021
-420	0.023	0.023
-410	0.024	0.024
-400	0.025	0.025
-390	0.027	0.027
-380	0.028	0.028
-370	0.03	0.03
-360	0.032	0.032
-350	0.034	0.034
-340	0.036	0.036
-330	0.039	0.039
-320	0.042	0.042
-310	0.045	0.045
-300	0.048	0.048
-290	0.052	0.052
-280	0.056	0.056
-270	0.06	0.06
-260	0.064	0.064
-250	0.068	0.068
-240	0.071	0.071
-230	0.073	0.073
-220	0.07	0.07
-210	0.06	0.06
-200	0.037	0.037
-190	0.033	0.033
-180	0.134	0.134
-170	0.335	0.335
-160	0.696	0.696
-150	1.273	1.273
-140	1.946	1.946
-130	2.152	2.152
-120	1.419	1.419
-110	1.241	1.241
-100	2.106	2.106
-90	2.09	2.09
-80	1.462	1.462
-70	0.858	0.858
-60	0.469	0.469
-50	0.252	0.252
-40	0.145	0.145
-30	0.109	0.109
-20	0.122	0.122
-10	0.164	0.164

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Electric Field Data, Cross Section C

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section C1 (kV/m)	Maximum Field With EAEC Cross Section C2 (kV/m)
0	0.236	0.236
10	0.349	0.349
20	0.522	0.522
30	0.789	0.789
40	1.198	1.198
50	1.812	1.812
60	2.693	2.693
70	3.831	3.831
80	4.984	4.984
90	5.551	5.551
100	4.959	4.959
110	3.72	3.72
120	3.925	3.925
130	5.163	5.163
140	5.508	5.508
150	4.76	4.76
160	3.568	3.568
170	2.467	2.467
180	1.636	1.636
190	1.064	1.064
200	0.683	0.683
210	0.434	0.434
220	0.275	0.275
230	0.177	0.177
240	0.123	0.123
250	0.101	0.101
260	0.096	0.096
270	0.097	0.097
280	0.097	0.097
290	0.097	0.097
300	0.095	0.095
310	0.092	0.092
320	0.089	0.089
330	0.085	0.085
340	0.081	0.081
350	0.076	0.076
360	0.072	0.072
370	0.068	0.068
380	0.064	0.064
390	0.06	0.06
400	0.057	0.057
410	0.054	0.054
420	0.05	0.05
430	0.048	0.048
440	0.045	0.045
450	0.042	0.042
460	0.04	0.04
470	0.038	0.038
480	0.036	0.036
490	0.034	0.034
500	0.032	0.032

LATERAL DISTANCE (feet)	Maximum Field Without EAEC Cross Section C1 (kV/m)	Maximum Field With EAEC Cross Section C2 (kV/m)
510	0.031	0.031
520	0.029	0.029
530	0.028	0.028
540	0.026	0.026
550	0.025	0.025
560	0.024	0.024
570	0.023	0.023
580	0.022	0.022
590	0.021	0.021
600	0.02	0.02
610	0.019	0.019
620	0.018	0.018
630	0.018	0.018
640	0.017	0.017
650	0.016	0.016
660	0.016	0.016
670	0.015	0.015
680	0.014	0.014
690	0.014	0.014
700	0.013	0.013
710	0.013	0.013
720	0.012	0.012
730	0.012	0.012
740	0.012	0.012
750	0.011	0.011
760	0.011	0.011
770	0.011	0.011
780	0.01	0.01
790	0.01	0.01
800	0.01	0.01
810	0.009	0.009
820	0.009	0.009
830	0.009	0.009
840	0.008	0.008
850	0.008	0.008
860	0.008	0.008
870	0.008	0.008
880	0.008	0.008
890	0.007	0.007
900	0.007	0.007
910	0.007	0.007
920	0.007	0.007
930	0.007	0.007
940	0.006	0.006
950	0.006	0.006
960	0.006	0.006
970	0.006	0.006
980	0.006	0.006
990	0.006	0.006
1000	0.006	0.006

Appendix 5.5-C

AUDIBLE NOISE DATA SHEETS
CROSS SECTIONS A, B AND C
FOR CALPINE EAEC AFC PROJECT

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section A

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section A1 (dB(A))	L5 Rain With EAEC Cross Section A2 (dB(A))
-500	32.9	32.9
-495	33	33
-490	33.1	33.1
-485	33.2	33.2
-480	33.2	33.2
-475	33.3	33.3
-470	33.4	33.4
-465	33.5	33.5
-460	33.6	33.6
-455	33.6	33.6
-450	33.7	33.7
-445	33.8	33.8
-440	33.9	33.9
-435	33.9	33.9
-430	34	34
-425	34.1	34.1
-420	34.2	34.2
-415	34.3	34.3
-410	34.4	34.4
-405	34.4	34.4
-400	34.5	34.5
-395	34.6	34.6
-390	34.7	34.7
-385	34.8	34.8
-380	34.9	34.9
-375	34.9	34.9
-370	35	35
-365	35.1	35.1
-360	35.2	35.2
-355	35.3	35.3
-350	35.4	35.4
-345	35.5	35.5
-340	35.6	35.6
-335	35.7	35.7
-330	35.8	35.8
-325	35.9	35.9
-320	36	36
-315	36.1	36.1
-310	36.2	36.2
-305	36.3	36.3
-300	36.4	36.4
-295	36.5	36.5
-290	36.6	36.6
-285	36.7	36.7
-280	36.8	36.8
-275	36.9	36.9
-270	37	37
-265	37.1	37.1
-260	37.2	37.2
-255	37.3	37.3

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section A1 (dB(A))	L5 Rain With EAEC Cross Section A2 (dB(A))
-250	37.4	37.4
-245	37.6	37.6
-240	37.7	37.7
-235	37.8	37.8
-230	37.9	37.9
-225	38	38
-220	38.2	38.2
-215	38.3	38.3
-210	38.4	38.4
-205	38.5	38.5
-200	38.7	38.7
-195	38.8	38.8
-190	39	39
-185	39.1	39.1
-180	39.2	39.2
-175	39.4	39.4
-170	39.5	39.5
-165	39.7	39.7
-160	39.8	39.8
-155	40	40
-150	40.2	40.2
-145	40.3	40.3
-140	40.5	40.5
-135	40.7	40.7
-130	40.9	40.9
-125	41	41
-120	41.2	41.2
-115	41.4	41.4
-110	41.6	41.6
-105	41.8	41.8
-100	42.1	42.1
-95	42.3	42.3
-90	42.5	42.5
-85	42.7	42.7
-80	43	43
-75	43.2	43.2
-70	43.5	43.5
-65	43.8	43.8
-60	44	44
-55	44.3	44.3
-50	44.6	44.6
-45	44.9	44.9
-40	45.2	45.2
-35	45.5	45.5
-30	45.8	45.8
-25	46.1	46.1
-20	46.3	46.3
-15	46.5	46.5
-10	46.6	46.6
-5	46.6	46.6

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section A

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section A1 (dB(A))	L5 Rain With EAEC Cross Section A2 (dB(A))
0	46.7	46.7
5	46.7	46.7
10	46.6	46.6
15	46.5	46.5
20	46.3	46.3
25	46.1	46.1
30	45.8	45.8
35	45.5	45.5
40	45.2	45.2
45	44.9	44.9
50	44.6	44.6
55	44.3	44.3
60	44	44
65	43.8	43.8
70	43.5	43.5
75	43.2	43.2
80	43	43
85	42.7	42.7
90	42.5	42.5
95	42.3	42.3
100	42.1	42.1
105	41.8	41.8
110	41.6	41.6
115	41.4	41.4
120	41.2	41.2
125	41	41
130	40.9	40.9
135	40.7	40.7
140	40.5	40.5
145	40.3	40.3
150	40.2	40.2
155	40	40
160	39.8	39.8
165	39.7	39.7
170	39.5	39.5
175	39.4	39.4
180	39.2	39.2
185	39.1	39.1
190	39	39
195	38.8	38.8
200	38.7	38.7
205	38.5	38.5
210	38.4	38.4
215	38.3	38.3
220	38.2	38.2
225	38	38
230	37.9	37.9
235	37.8	37.8
240	37.7	37.7
245	37.6	37.6
250	37.4	37.4

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section A1 (dB(A))	L5 Rain With EAEC Cross Section A2 (dB(A))
255	37.3	37.3
260	37.2	37.2
265	37.1	37.1
270	37	37
275	36.9	36.9
280	36.8	36.8
285	36.7	36.7
290	36.6	36.6
295	36.5	36.5
300	36.4	36.4
305	36.3	36.3
310	36.2	36.2
315	36.1	36.1
320	36	36
325	35.9	35.9
330	35.8	35.8
335	35.7	35.7
340	35.6	35.6
345	35.5	35.5
350	35.4	35.4
355	35.3	35.3
360	35.2	35.2
365	35.1	35.1
370	35	35
375	34.9	34.9
380	34.9	34.9
385	34.8	34.8
390	34.7	34.7
395	34.6	34.6
400	34.5	34.5
405	34.4	34.4
410	34.4	34.4
415	34.3	34.3
420	34.2	34.2
425	34.1	34.1
430	34	34
435	33.9	33.9
440	33.9	33.9
445	33.8	33.8
450	33.7	33.7
455	33.6	33.6
460	33.6	33.6
465	33.5	33.5
470	33.4	33.4
475	33.3	33.3
480	33.2	33.2
485	33.2	33.2
490	33.1	33.1
495	33	33
500	33	33

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section B

LATERAL DISTANCE (feet)	L5 Rain With EAEC Cross Section B (dB(A))
-500	36.5
-495	36.6
-490	36.7
-485	36.8
-480	36.9
-475	37
-470	37
-465	37.1
-460	37.2
-455	37.3
-450	37.4
-445	37.5
-440	37.6
-435	37.7
-430	37.8
-425	37.9
-420	37.9
-415	38
-410	38.1
-405	38.2
-400	38.3
-395	38.4
-390	38.5
-385	38.6
-380	38.7
-375	38.8
-370	38.9
-365	39.1
-360	39.2
-355	39.3
-350	39.4
-345	39.5
-340	39.6
-335	39.7
-330	39.9
-325	40
-320	40.1
-315	40.2
-310	40.4
-305	40.5
-300	40.6
-295	40.8
-290	40.9
-285	41
-280	41.2
-275	41.3
-270	41.5
-265	41.6
-260	41.8
-255	42

LATERAL DISTANCE (feet)	L5 Rain With EAEC Cross Section B (dB(A))
-250	42.1
-245	42.3
-240	42.5
-235	42.7
-230	42.9
-225	43.1
-220	43.3
-215	43.5
-210	43.7
-205	43.9
-200	44.2
-195	44.4
-190	44.7
-185	44.9
-180	45.2
-175	45.5
-170	45.8
-165	46
-160	46.3
-155	46.6
-150	46.8
-145	46.9
-140	47.1
-135	47.1
-130	47.1
-125	47.1
-120	47.1
-115	47
-110	46.9
-105	46.7
-100	46.5
-95	46.3
-90	46
-85	45.8
-80	45.6
-75	45.4
-70	45.2
-65	45
-60	44.8
-55	44.7
-50	44.5
-45	44.4
-40	44.3
-35	44.2
-30	44.1
-25	44.1
-20	44
-15	44
-10	43.9
-5	43.9

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section B

LATERAL DISTANCE (feet)	L5 Rain With EAEC Cross Section B (dB(A))
0	43.9
5	43.9
10	43.9
15	44
20	44
25	44.1
30	44.1
35	44.2
40	44.3
45	44.4
50	44.6
55	44.7
60	44.9
65	45
70	45.2
75	45.4
80	45.6
85	45.8
90	46.1
95	46.3
100	46.5
105	46.8
110	46.9
115	47.1
120	47.2
125	47.2
130	47.2
135	47.2
140	47.1
145	47
150	46.8
155	46.6
160	46.4
165	46.1
170	45.8
175	45.5
180	45.3
185	45
190	44.7
195	44.5
200	44.2
205	44
210	43.8
215	43.5
220	43.3
225	43.1
230	42.9
235	42.7
240	42.6
245	42.4
250	42.2

LATERAL DISTANCE (feet)	L5 Rain With EAEC Cross Section B (dB(A))
255	42
260	41.9
265	41.7
270	41.5
275	41.4
280	41.2
285	41.1
290	40.9
295	40.8
300	40.7
305	40.5
310	40.4
315	40.3
320	40.1
325	40
330	39.9
335	39.8
340	39.7
345	39.5
350	39.4
355	39.3
360	39.2
365	39.1
370	39
375	38.9
380	38.8
385	38.7
390	38.6
395	38.5
400	38.4
405	38.3
410	38.2
415	38.1
420	38
425	37.9
430	37.8
435	37.7
440	37.6
445	37.5
450	37.4
455	37.3
460	37.3
465	37.2
470	37.1
475	37
480	36.9
485	36.8
490	36.7
495	36.7
500	36.6

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section C

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section C1 (dB(A))	L5 Rain With EAEC Cross Section C2 (dB(A))
-1000	46.3	46.3
-990	46.4	46.4
-980	46.5	46.5
-970	46.6	46.6
-960	46.7	46.7
-950	46.8	46.8
-940	47	47
-930	47.1	47.1
-920	47.2	47.2
-910	47.3	47.3
-900	47.4	47.4
-890	47.5	47.5
-880	47.6	47.6
-870	47.7	47.7
-860	47.8	47.8
-850	47.9	47.9
-840	48	48
-830	48.1	48.1
-820	48.2	48.2
-810	48.4	48.4
-800	48.5	48.5
-790	48.6	48.6
-780	48.7	48.7
-770	48.8	48.8
-760	48.9	48.9
-750	49	49
-740	49.1	49.1
-730	49.3	49.3
-720	49.4	49.4
-710	49.5	49.5
-700	49.6	49.6
-690	49.7	49.7
-680	49.9	49.9
-670	50	50
-660	50.1	50.1
-650	50.2	50.2
-640	50.3	50.3
-630	50.5	50.5
-620	50.6	50.6
-610	50.7	50.7
-600	50.9	50.9
-590	51	51
-580	51.1	51.1
-570	51.2	51.2
-560	51.4	51.4
-550	51.5	51.5
-540	51.6	51.6
-530	51.8	51.8
-520	51.9	51.9
-510	52.1	52.1

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section C1 (dB(A))	L5 Rain With EAEC Cross Section C2 (dB(A))
-500	52.2	52.2
-490	52.3	52.3
-480	52.5	52.5
-470	52.6	52.6
-460	52.8	52.8
-450	52.9	52.9
-440	53.1	53.1
-430	53.2	53.2
-420	53.4	53.4
-410	53.6	53.6
-400	53.7	53.7
-390	53.9	53.9
-380	54.1	54.1
-370	54.2	54.2
-360	54.4	54.4
-350	54.6	54.6
-340	54.8	54.8
-330	54.9	54.9
-320	55.1	55.1
-310	55.3	55.3
-300	55.5	55.5
-290	55.7	55.7
-280	56	56
-270	56.2	56.2
-260	56.4	56.4
-250	56.6	56.6
-240	56.9	56.9
-230	57.2	57.2
-220	57.4	57.4
-210	57.7	57.7
-200	58	58
-190	58.4	58.4
-180	58.7	58.7
-170	59.1	59.1
-160	59.5	59.5
-150	59.9	59.9
-140	60.3	60.3
-130	60.7	60.7
-120	60.9	60.9
-110	61	61
-100	61	61
-90	60.9	60.9
-80	60.8	60.8
-70	60.7	60.7
-60	60.6	60.6
-50	60.6	60.6
-40	60.6	60.6
-30	60.7	60.7
-20	60.8	60.8
-10	61	61

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Audible Noise Data, Cross Section C

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section C1 (dB(A))	L5 Rain With EAEC Cross Section C2 (dB(A))
0	61.2	61.2
10	61.4	61.4
20	61.7	61.7
30	62	62
40	62.4	62.4
50	62.7	62.7
60	63.2	63.2
70	63.6	63.6
80	64	64
90	64.3	64.3
100	64.5	64.5
110	64.5	64.5
120	64.5	64.5
130	64.4	64.4
140	64.2	64.2
150	63.8	63.8
160	63.4	63.4
170	62.9	62.9
180	62.5	62.5
190	62.1	62.1
200	61.7	61.7
210	61.3	61.3
220	60.9	60.9
230	60.6	60.6
240	60.2	60.2
250	59.9	59.9
260	59.6	59.6
270	59.3	59.3
280	59	59
290	58.8	58.8
300	58.5	58.5
310	58.3	58.3
320	58	58
330	57.8	57.8
340	57.5	57.5
350	57.3	57.3
360	57.1	57.1
370	56.9	56.9
380	56.7	56.7
390	56.5	56.5
400	56.3	56.3
410	56.1	56.1
420	55.9	55.9
430	55.7	55.7
440	55.5	55.5
450	55.3	55.3
460	55.1	55.1
470	55	55
480	54.8	54.8
490	54.6	54.6
500	54.5	54.5

LATERAL DISTANCE (feet)	L5 Rain Without EAEC Cross Section C1 (dB(A))	L5 Rain With EAEC Cross Section C2 (dB(A))
510	54.3	54.3
520	54.1	54.1
530	54	54
540	53.8	53.8
550	53.7	53.7
560	53.5	53.5
570	53.4	53.4
580	53.2	53.2
590	53.1	53.1
600	52.9	52.9
610	52.8	52.8
620	52.6	52.6
630	52.5	52.5
640	52.3	52.3
650	52.2	52.2
660	52.1	52.1
670	51.9	51.9
680	51.8	51.8
690	51.7	51.7
700	51.5	51.5
710	51.4	51.4
720	51.3	51.3
730	51.1	51.1
740	51	51
750	50.9	50.9
760	50.8	50.8
770	50.6	50.6
780	50.5	50.5
790	50.4	50.4
800	50.3	50.3
810	50.1	50.1
820	50	50
830	49.9	49.9
840	49.8	49.8
850	49.7	49.7
860	49.5	49.5
870	49.4	49.4
880	49.3	49.3
890	49.2	49.2
900	49.1	49.1
910	49	49
920	48.9	48.9
930	48.7	48.7
940	48.6	48.6
950	48.5	48.5
960	48.4	48.4
970	48.3	48.3
980	48.2	48.2
990	48.1	48.1
1000	48	48

Appendix 5.5-D

MAGNETIC FIELD DATA SHEETS
CROSS SECTIONS A, B AND C
FOR CALPINE EAEC AFC PROJECT

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section A

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section A1 (mG)	RMS Resultant With EAEC Cross Section A2 (mG)
-500	0.12	0.18
-495	0.13	0.19
-490	0.13	0.19
-485	0.13	0.19
-480	0.13	0.2
-475	0.14	0.2
-470	0.14	0.21
-465	0.14	0.21
-460	0.14	0.21
-455	0.15	0.22
-450	0.15	0.22
-445	0.15	0.23
-440	0.16	0.23
-435	0.16	0.24
-430	0.16	0.24
-425	0.17	0.25
-420	0.17	0.26
-415	0.18	0.26
-410	0.18	0.27
-405	0.19	0.28
-400	0.19	0.28
-395	0.2	0.29
-390	0.2	0.3
-385	0.21	0.31
-380	0.21	0.32
-375	0.22	0.33
-370	0.23	0.34
-365	0.23	0.35
-360	0.24	0.36
-355	0.25	0.37
-350	0.26	0.38
-345	0.26	0.39
-340	0.27	0.41
-335	0.28	0.42
-330	0.29	0.44
-325	0.3	0.45
-320	0.31	0.47
-315	0.33	0.49
-310	0.34	0.51
-305	0.35	0.53
-300	0.37	0.55
-295	0.38	0.57
-290	0.4	0.6
-285	0.42	0.62
-280	0.44	0.65
-275	0.46	0.68
-270	0.48	0.71
-265	0.5	0.75
-260	0.53	0.78
-255	0.55	0.82

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section A1 (mG)	RMS Resultant With EAEC Cross Section A2 (mG)
-250	0.58	0.87
-245	0.61	0.91
-240	0.65	0.96
-235	0.68	1.02
-230	0.72	1.08
-225	0.77	1.14
-220	0.81	1.21
-215	0.86	1.29
-210	0.92	1.37
-205	0.98	1.46
-200	1.05	1.56
-195	1.12	1.67
-190	1.2	1.79
-185	1.29	1.92
-180	1.39	2.07
-175	1.49	2.23
-170	1.62	2.41
-165	1.75	2.61
-160	1.9	2.83
-155	2.07	3.08
-150	2.26	3.36
-145	2.47	3.68
-140	2.71	4.04
-135	2.98	4.45
-130	3.29	4.91
-125	3.64	5.44
-120	4.05	6.04
-115	4.52	6.74
-110	5.06	7.54
-105	5.69	8.48
-100	6.42	9.57
-95	7.28	10.85
-90	8.29	12.36
-85	9.48	14.14
-80	10.9	16.26
-75	12.6	18.8
-70	14.64	21.84
-65	17.1	25.51
-60	20.08	29.95
-55	23.69	35.33
-50	28.07	41.87
-45	33.37	49.77
-40	39.71	59.23
-35	47.18	70.36
-30	55.65	83
-25	64.74	96.55
-20	73.65	109.85
-15	81.36	121.35
-10	87.03	129.8
-5	90.34	134.73

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section A

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section A1 (mG)	RMS Resultant With EAEC Cross Section A2 (mG)
0	91.41	136.33
5	90.36	134.77
10	87.08	129.87
15	81.43	121.45
20	73.73	109.97
25	64.82	96.68
30	55.74	83.13
35	47.26	70.48
40	39.79	59.34
45	33.44	49.87
50	28.13	41.96
55	23.75	35.41
60	20.13	30.02
65	17.14	25.57
70	14.68	21.89
75	12.63	18.84
80	10.93	16.3
85	9.5	14.17
90	8.3	12.39
95	7.29	10.87
100	6.43	9.59
105	5.69	8.49
110	5.06	7.55
115	4.52	6.74
120	4.05	6.04
125	3.64	5.44
130	3.29	4.91
135	2.98	4.44
140	2.7	4.03
145	2.46	3.67
150	2.25	3.35
155	2.06	3.07
160	1.89	2.82
165	1.74	2.59
170	1.6	2.39
175	1.48	2.21
180	1.37	2.05
185	1.28	1.9
190	1.19	1.77
195	1.11	1.65
200	1.03	1.54
205	0.96	1.44
210	0.9	1.35
215	0.85	1.26
220	0.8	1.19
225	0.75	1.12
230	0.71	1.05
235	0.67	0.99
240	0.63	0.94
245	0.6	0.89
250	0.56	0.84

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section A1 (mG)	RMS Resultant With EAEC Cross Section A2 (mG)
255	0.53	0.8
260	0.51	0.76
265	0.48	0.72
270	0.46	0.69
275	0.44	0.65
280	0.42	0.62
285	0.4	0.59
290	0.38	0.57
295	0.36	0.54
300	0.35	0.52
305	0.33	0.5
310	0.32	0.48
315	0.31	0.46
320	0.3	0.44
325	0.28	0.42
330	0.27	0.41
335	0.26	0.39
340	0.25	0.38
345	0.25	0.37
350	0.24	0.35
355	0.23	0.34
360	0.22	0.33
365	0.21	0.32
370	0.21	0.31
375	0.2	0.3
380	0.19	0.29
385	0.19	0.28
390	0.18	0.27
395	0.18	0.27
400	0.17	0.26
405	0.17	0.25
410	0.16	0.24
415	0.16	0.24
420	0.15	0.23
425	0.15	0.23
430	0.15	0.22
435	0.14	0.21
440	0.14	0.21
445	0.14	0.2
450	0.13	0.2
455	0.13	0.19
460	0.13	0.19
465	0.12	0.19
470	0.12	0.18
475	0.12	0.18
480	0.12	0.17
485	0.11	0.17
490	0.11	0.17
495	0.11	0.16
500	0.11	0.16

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section B

LATERAL DISTANCE (feet)	RMS Resultant With EAEC Cross Section B (mG)
-500	0.2
-495	0.21
-490	0.21
-485	0.22
-480	0.22
-475	0.23
-470	0.24
-465	0.24
-460	0.25
-455	0.26
-450	0.26
-445	0.27
-440	0.28
-435	0.29
-430	0.3
-425	0.31
-420	0.32
-415	0.33
-410	0.35
-405	0.36
-400	0.38
-395	0.39
-390	0.41
-385	0.43
-380	0.45
-375	0.47
-370	0.5
-365	0.53
-360	0.56
-355	0.59
-350	0.62
-345	0.66
-340	0.71
-335	0.75
-330	0.8
-325	0.86
-320	0.92
-315	0.99
-310	1.07
-305	1.16
-300	1.25
-295	1.36
-290	1.48
-285	1.61
-280	1.77
-275	1.94
-270	2.13
-265	2.35
-260	2.61
-255	2.89

LATERAL DISTANCE (feet)	RMS Resultant With EAEC Cross Section B (mG)
-250	3.23
-245	3.61
-240	4.05
-235	4.57
-230	5.17
-225	5.88
-220	6.72
-215	7.71
-210	8.89
-205	10.3
-200	11.99
-195	14.03
-190	16.51
-185	19.51
-180	23.16
-175	27.57
-170	32.85
-165	39.07
-160	46.13
-155	53.69
-150	61.1
-145	67.49
-140	72.13
-135	74.76
-130	75.5
-125	74.44
-120	71.51
-115	66.65
-110	60.13
-105	52.67
-100	45.1
-95	38.07
-90	31.9
-85	26.66
-80	22.3
-75	18.7
-70	15.74
-65	13.32
-60	11.32
-55	9.68
-50	8.34
-45	7.24
-40	6.36
-35	5.66
-30	5.13
-25	4.75
-20	4.51
-15	4.42
-10	4.46
-5	4.63

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section B

LATERAL DISTANCE (feet)	RMS Resultant With EAEC Cross Section B (mG)
0	4.91
5	5.31
10	5.83
15	6.46
20	7.22
25	8.12
30	9.18
35	10.45
40	11.94
45	13.71
50	15.82
55	18.35
60	21.39
65	25.05
70	29.49
75	34.87
80	41.41
85	49.31
90	58.79
95	69.94
100	82.61
105	96.22
110	109.59
115	121.19
120	129.75
125	134.8
130	136.5
135	135
140	130.14
145	121.72
150	110.21
155	96.88
160	83.28
165	70.59
170	59.41
175	49.9
180	41.97
185	35.4
190	29.99
195	25.53
200	21.84
205	18.79
210	16.24
215	14.11
220	12.32
225	10.8
230	9.52
235	8.42
240	7.49
245	6.68
250	5.98

LATERAL DISTANCE (feet)	RMS Resultant With EAEC Cross Section B (mG)
255	5.37
260	4.84
265	4.38
270	3.97
275	3.62
280	3.3
285	3.02
290	2.77
295	2.55
300	2.35
305	2.17
310	2.01
315	1.86
320	1.73
325	1.61
330	1.5
335	1.4
340	1.32
345	1.23
350	1.16
355	1.09
360	1.03
365	0.97
370	0.92
375	0.87
380	0.82
385	0.78
390	0.74
395	0.7
400	0.67
405	0.64
410	0.61
415	0.58
420	0.56
425	0.53
430	0.51
435	0.49
440	0.47
445	0.45
450	0.44
455	0.42
460	0.41
465	0.39
470	0.38
475	0.37
480	0.35
485	0.34
490	0.33
495	0.32
500	0.31

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section C

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section C1 (mG)	RMS Resultant With EAEC Cross Section C2 (mG)
-1000	0.3	0.3
-990	0.3	0.3
-980	0.3	0.31
-970	0.31	0.31
-960	0.31	0.31
-950	0.31	0.32
-940	0.32	0.32
-930	0.32	0.32
-920	0.32	0.33
-910	0.33	0.33
-900	0.33	0.33
-890	0.34	0.34
-880	0.34	0.34
-870	0.34	0.35
-860	0.35	0.35
-850	0.35	0.36
-840	0.36	0.36
-830	0.36	0.37
-820	0.37	0.37
-810	0.38	0.38
-800	0.38	0.38
-790	0.39	0.39
-780	0.4	0.4
-770	0.4	0.4
-760	0.41	0.41
-750	0.42	0.42
-740	0.42	0.42
-730	0.43	0.43
-720	0.44	0.44
-710	0.45	0.45
-700	0.46	0.46
-690	0.47	0.47
-680	0.48	0.48
-670	0.49	0.49
-660	0.5	0.5
-650	0.51	0.51
-640	0.53	0.52
-630	0.54	0.53
-620	0.55	0.55
-610	0.57	0.56
-600	0.58	0.58
-590	0.6	0.59
-580	0.61	0.61
-570	0.63	0.62
-560	0.65	0.64
-550	0.67	0.66
-540	0.69	0.68
-530	0.71	0.7
-520	0.73	0.73
-510	0.75	0.75

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section C1 (mG)	RMS Resultant With EAEC Cross Section C2 (mG)
-500	0.78	0.78
-490	0.81	0.8
-480	0.83	0.83
-470	0.86	0.87
-460	0.89	0.9
-450	0.93	0.94
-440	0.96	0.98
-430	1	1.02
-420	1.04	1.07
-410	1.08	1.12
-400	1.13	1.18
-390	1.18	1.24
-380	1.23	1.3
-370	1.29	1.38
-360	1.35	1.46
-350	1.42	1.56
-340	1.49	1.66
-330	1.57	1.78
-320	1.65	1.91
-310	1.74	2.07
-300	1.85	2.24
-290	1.96	2.45
-280	2.09	2.69
-270	2.23	2.98
-260	2.39	3.33
-250	2.57	3.75
-240	2.78	4.28
-230	3.02	4.93
-220	3.3	5.76
-210	3.63	6.85
-200	4.01	8.28
-190	4.44	10.22
-180	4.93	12.9
-170	5.45	16.68
-160	5.9	22.07
-150	6.08	29.65
-140	5.64	39.34
-130	4.84	48.91
-120	5.92	54.89
-110	9.17	56.67
-100	12.33	54.15
-90	13.85	46.81
-80	13.87	37.69
-70	13.44	29.99
-60	13.26	24.53
-50	13.53	21.04
-40	14.27	19.11
-30	15.46	18.41
-20	17.1	18.74
-10	19.22	19.94

CALPINE #172026, TASK NSEE
EAEC EMF and AUDIBLE NOISE STUDY

Magnetic Field Data, Cross Section C

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section C1 (mG)	RMS Resultant With EAEC Cross Section C2 (mG)
0	21.88	21.98
10	25.18	24.87
20	29.26	28.71
30	34.33	33.71
40	40.61	40.1
50	48.36	48.19
60	57.7	58.24
70	68.37	70.11
80	79	82.62
90	86.62	92.86
100	87.94	97.23
110	82.25	94.43
120	71.8	85.95
130	59.23	73.73
140	46.72	59.63
150	36.08	46.04
160	28.04	34.75
170	22.31	26.17
180	18.22	19.89
190	15.24	15.32
200	13	11.98
210	11.27	9.52
220	9.89	7.7
230	8.77	6.33
240	7.85	5.3
250	7.07	4.52
260	6.41	3.91
270	5.84	3.44
280	5.35	3.07
290	4.92	2.78
300	4.54	2.54
310	4.2	2.34
320	3.9	2.17
330	3.63	2.02
340	3.39	1.9
350	3.17	1.79
360	2.97	1.69
370	2.79	1.61
380	2.63	1.53
390	2.48	1.46
400	2.34	1.39
410	2.21	1.33
420	2.1	1.27
430	1.99	1.22
440	1.89	1.17
450	1.8	1.13
460	1.71	1.09
470	1.63	1.05
480	1.56	1.01
490	1.49	0.97
500	1.43	0.94

LATERAL DISTANCE (feet)	RMS Resultant Without EAEC Cross Section C1 (mG)	RMS Resultant With EAEC Cross Section C2 (mG)
510	1.37	0.91
520	1.31	0.88
530	1.26	0.85
540	1.21	0.83
550	1.16	0.8
560	1.12	0.78
570	1.08	0.76
580	1.04	0.74
590	1	0.72
600	0.97	0.7
610	0.94	0.68
620	0.91	0.66
630	0.88	0.64
640	0.85	0.63
650	0.82	0.61
660	0.8	0.6
670	0.77	0.59
680	0.75	0.57
690	0.73	0.56
700	0.71	0.55
710	0.69	0.54
720	0.67	0.53
730	0.65	0.51
740	0.64	0.5
750	0.62	0.49
760	0.6	0.49
770	0.59	0.48
780	0.58	0.47
790	0.56	0.46
800	0.55	0.45
810	0.54	0.44
820	0.53	0.44
830	0.51	0.43
840	0.5	0.42
850	0.49	0.42
860	0.48	0.41
870	0.47	0.4
880	0.46	0.4
890	0.46	0.39
900	0.45	0.39
910	0.44	0.38
920	0.43	0.38
930	0.42	0.37
940	0.42	0.37
950	0.41	0.36
960	0.4	0.36
970	0.4	0.35
980	0.39	0.35
990	0.38	0.34
1000	0.38	0.34

Appendix 6.1A
Application for Service

Pacific Gas and Electric Company

77 Beale Street
San Francisco, CA 94105

Mailing Address
Mail Code B16A
P.O. Box 770000
San Francisco, CA 94177
415/973-7000

Via Mail & Fax

March 2, 2001

Mr. Chad Driskill
Director-Fuels
Calpine
6700 Knoll Center Parkway
Pleasanton, CA 94566

Subject: Preliminary Application for Service – East Altamont Energy Center

Dear Mr. Driskill:

On January 24, 2001, Calpine Corporation (Applicant) requested from Pacific Gas and Electric Company (PG&E), a Preliminary Application for Service to connect a gas load to Applicant's proposed East Altamont Energy (Facility), located on the corner of Kelso and Mountain House Roads, near Byron, California. PG&E now provides Applicant with results of its Preliminary Application for Service. For the purpose of this study, PG&E based its review upon natural gas service for a maximum load of 7,800 MMBtu/hr at a requested minimum delivery service pressure of 500 psig and current load demands on PG&E's system. It is assumed that the Facility will require natural gas service throughout the year, and that gas will be required by October 1, 2003.

Per Applicant's request, PG&E provides information on Applicant's Alternative #1, "PG&E to construct, own and operate pipeline." PG&E provides two routes for this alternative since either route may prove to be most economical once more detailed engineering and site evaluation studies are completed.

Alternative #1A begins at the intersection of PG&E's Line 401 and Kelso Road, and Alternative #1B begins at the intersection of Line 401 and Mountain House Road. Alternative #2 - PG&E is to install a meter and tap at its existing Bethany Compressor Station discharge side piping on Line 401, and Alternative #3 is to install a meter and tap near the Line 401 and Mountain House Road crossing location. For purposes of this estimate, and because Applicant has not provided exact meter set locations for Alternatives #2 and #3, PG&E will assume an offset of 100-feet from PG&E's Line 401 to the proposed meter set, and a meter set location at any point along L-401 between Alternative #2 and Alternative #3.

Pressures and Routes:

Alternative #1A: PG&E Installs, Owns and Operates Gas Service Pipeline:

The Standard Facilities Design will likely be able to provide a minimum prevailing service to the Facility at an unregulated pressure downstream of the meter set at approximately 310 to 865 psig. This option will require PG&E to install approximately 10,670 feet of 10-inch steel gas service pipeline to PG&E's Line 401.

PG&E would likely be able to provide an elevated gas service delivery pressure of 540 to 975 psig by increasing the diameter of the gas service pipeline from 10-inch to 12-inch. PG&E would likely be able to provide an elevated gas service delivery pressure of 615 to 1020 psig by increasing the diameter of the gas service pipeline from 10-inch to 16-inch.

Route Description: PG&E would tap Line 401 near Kelso Road about 0.1 mile east of Bruns Road intersection, proceed east about 1.4 miles within franchise area along Kelso Road to Mountain House Road intersection, then north about 0.5 mile within franchise area along Mountain House Road, to meter set at fence line of property of proposed power plant site. (Reference attached map)

Alternative #1B: PG&E Installs, Owns and Operates Gas Service Pipeline:

The Standard Facilities Design will likely be able to provide a minimum prevailing service to the Facility at an unregulated pressure downstream of the meter set at approximately 195 to 845 psig. This option will require PG&E to install approximately 11,880 feet of 10-inch steel gas service pipeline to PG&E's Line 401.

PG&E would likely be able to provide an elevated gas service delivery pressure of 520 to 965 psig by increasing the diameter of the gas service pipeline from 10-inch to 12-inch. PG&E would likely be able to provide an elevated gas service delivery pressure of 610 to 1015 psig by increasing the diameter of the gas service pipeline from 10-inch to 16-inch.

Route Description: PG&E would tap Line 401 near its crossing of Mountain House Road just north of the Delta-Mendota Canal, proceed north about 1.75 miles within franchise area on Mountain House Road to the Kelso Road intersection, then continue north about 0.5 mile within franchise area along Mountain House Road to meter set at fence line of property of proposed power plant site. (Reference attached map)

Should Applicant decide to proceed with the elevated pressure option, Applicant would be responsible for the incremental costs under PG&E's Gas Rule 2.

Alternative #2 and #3:

PG&E is likely to be able to serve a meter set at any point along Line 401 between PG&E's Bethany Compressor Station and Mountain House Road as long as a year-round access road can be provided to the meter set. The Standard Facilities Design along this route will likely be able to provide a minimum unregulated prevailing service pressure along this section of Line 401 downstream of the meter set at approximately 645 to 1035 psig.

Alternate Tap Design:

PG&E provides a basic tap design as well as two alternative tap designs for Calpine's consideration, applicable to any of the alternatives, which would significantly enhance service reliability to your facility. The first is to tap both Line 401 and the adjacent Line 2 in a "cross-tie" arrangement such that if one facility was out of operation, feed could be transferred to the other pipeline, although service pressure will be lower and will require further evaluation. The second is to "bridle" the tap such that a mainline valve would be installed in Line 401. This would allow service to be maintained to your facility while a portion of Line 401 upstream or downstream of this new mainline valve is taken out of service. If the portion of Line 401 north of this new mainline valve is out of service, service pressure to your facilities will reduce and will require further evaluation. If the portion of Line 401 south of this new mainline valve is out of service, service pressure to your facilities should remain the same.

Cost:

Please note that these costs are preliminary estimates, i.e., are order-of-magnitude, plus or minus 50% estimates, and are not escalated. PG&E will be able to provide more accurate estimates during final detailed engineering phase of this project. A summary table under the provisions of Rules 15 and 16, excluding allowances, if any, follows:

Alternative 1A. PG&E Installs, Owns, and Operates Gas Service Line. Applicant Costs for Standard Facilities at prevailing service	
a. 10,670' of 10-inch pipeline	$1,604,000
b. Tap	$42,000

c. Meter set	$800,000
d. ITCC (35% of a., b. and c.)	$856,000
Total Applicant cost for prevailing service delivery pressure:	$3,302,000
Applicant Costs for Elevated Service Delivery Pressure:	
12-inch Gas Service Pipeline Option	
a. 10,670' of 12-inch pipeline costs, incremental	$262,000
b. Tap, incremental	$13,000
c. Meter set, incremental	$0
d. ITCC (35% of a., b., and c.)	$96,000
e. Special Facilities (a., b., and c.)	$181,000
Total Special Facilities cost for 12-inch service delivery option	$552,000
Total cost for 12-inch service delivery option	$3,854,000
16-inch Gas Service Pipeline Option	
a. 10,670' of 16-inch pipeline costs, incremental	$835,000
b. Tap, incremental	$22,000
c. Meter set, incremental	$0
d. ITCC (35% of a., b., and c.)	$300,000
e. Special Facilities (a., b., and c.)	$564,000
Total Special Facilities cost for 16-inch service delivery option	$1,721,000
Total cost for 16-inch service delivery option	$5,023,000
Alternative 1B. PG&E Installs, Owns, and Operates Gas Service Line. Applicant Costs for Standard Facilities at prevailing service	
a. 12,514' of 10-inch pipeline	$1,759,000
b. Tap	$42,000
c. Meter set	$800,000
d. ITCC (35% of a., b. and c.)	$910,000
Total Applicant cost for prevailing service delivery pressure:	$3,511,000
Applicant Costs for Elevated Service Delivery Pressure:	
12-inch Gas Service Pipeline Option	
a. 12,514' of 12-inch pipeline costs, incremental	$307,000

b. Tap, incremental	$13,000
c. Meter set, incremental	$0
d. ITCC (35% of a., b., and c.)	$112,000
e. Special Facilities (a., b., and c.)	$210,000
Total Special Facilities cost for 12-inch service delivery option	$642,000
Total cost for 12-inch service delivery option	$4,153,000
16-inch Gas Service Pipeline Option	
a. 12,514' of 16-inch pipeline costs, incremental	$959,000
b. Tap, incremental	$22,000
c. Meter set, incremental	$0
d. ITCC (35% of a., b., and c.)	$343,000
e. Special Facilities (a., b., and c.)	$645,000
Total Special Facilities cost for 16-inch service delivery option	$1,969,000
Total cost for 16-inch service delivery option	$5,480,000
Alternative #2 and #3. Applicant Costs for Installing Meter Set off of PG&E's Line 401:	
a. 100' of 12-inch pipeline	$27,000
b. Tap	$55,000
c. Meter set and site preparation	$876,000
d. ITCC (35% of a., b., and c.)	$335,000
Total Cost for Standard Delivery Service, Meter set off of PG&E's Line 401	$1,293,000
Alternative Tap Options – Incremental Costs:	
Cross tie LINE 401 and Line 2 Incremental costs including ITCC and Special Facilities	
10-inch option	$111,000
12-inch option	$144,000
16-inch option	$165,000
Install Main Line Valve and Bridle off Line 401	
10-inch option	$394,000
12-inch option	$427,000
16-inch option	$448,000

No land rights costs were included in these estimates and will likely be required. Costs allocations of easements and rights-of-way are yet to be determined.

<u>Alternative #1A, PG&E Installs, Owns and Operates Gas Service Pipeline:</u>

PG&E would install, own and operate gas service pipeline from PG&E's Line 401 to the Facility. The total cost for Standard Facilities Design of $3,302,000.

For Special Facilities at Elevated Service Delivery Pressure for a 12-inch gas service, Applicant would be responsible for paying PG&E's incremental costs to provide elevated service delivery pressure as available from PG&E's transmission pipeline, ITCC, and cost-of-ownership charges, plus Standard Facilities Costs for a total of $3,854,000.

For Special Facilities at Elevated Service Delivery Pressure for a 16-inch gas service, Applicant would be responsible for paying PG&E's incremental costs to provide elevated service delivery pressure as available from PG&E's transmission pipeline, ITCC, and cost-of-ownership charges. The total cost to Applicant for this option would be the Special Facilities costs plus the Standard Facilities costs, or $5,023,000.

<u>Alternative #1A, PG&E Installs, Owns and Operates Gas Service Pipeline:</u>

PG&E would install, own and operate gas service pipeline from PG&E's Line 401 to the Facility. The total cost for Standard Facilities Design of $3,511,000.

For Special Facilities at Elevated Service Delivery Pressure for a 12-inch gas service, Applicant would be responsible for paying PG&E's incremental costs to provide elevated service delivery pressure as available from PG&E's transmission pipeline, ITCC, and cost-of-ownership charges, plus Standard Facilities Costs for a total of $4,153,000.

For Special Facilities at Elevated Service Delivery Pressure for a 16-inch gas service, Applicant would be responsible for paying PG&E's incremental costs to provide elevated service delivery pressure as available from PG&E's transmission pipeline, ITCC, and cost-of-ownership charges. The total cost to Applicant for this option would be the Special Facilities costs plus the Standard Facilities costs, or $5,480,000.

<u>Alternatives #2 and #3:</u> The total cost for meter set, tap, and an estimated 100-feet of pipe from PG&E's Line 401 to the meter set is estimated to be $1,293,000.

Service Tap Options: Incremental costs for a bridle valve between Line 401 and Line 2 range between $111,000 and $165,000, depending on the size of tap and pipe. Incremental costs for installing a main line valve on Line 401, and a bridle valve range between $394,000 and $448,000. If Applicant selects one of these options, the cost will be incremental to the service alternative selected, and subject to ITCC and Special Facilities charges.

Next Steps:

PG&E would suggest that Applicant proceed with a Final Application for Gas Service. This will require from the Applicant to:

1. Request gas service from PG&E.
2. Notify PG&E of which option Applicant requests.
3. Provide PG&E with a cash advance to proceed with engineering (PG&E will provide the required amount of the cash advance when Applicant notifies PG&E of its preferred option).
4. Confirm the data provided in the Cogeneration/Power Plant Interconnection Information Sheet, or revise accordingly.
5. Provide a meter set location map, or the meter set location staked in the field.
6. Provide the estimated annual gas consumption for the facility.

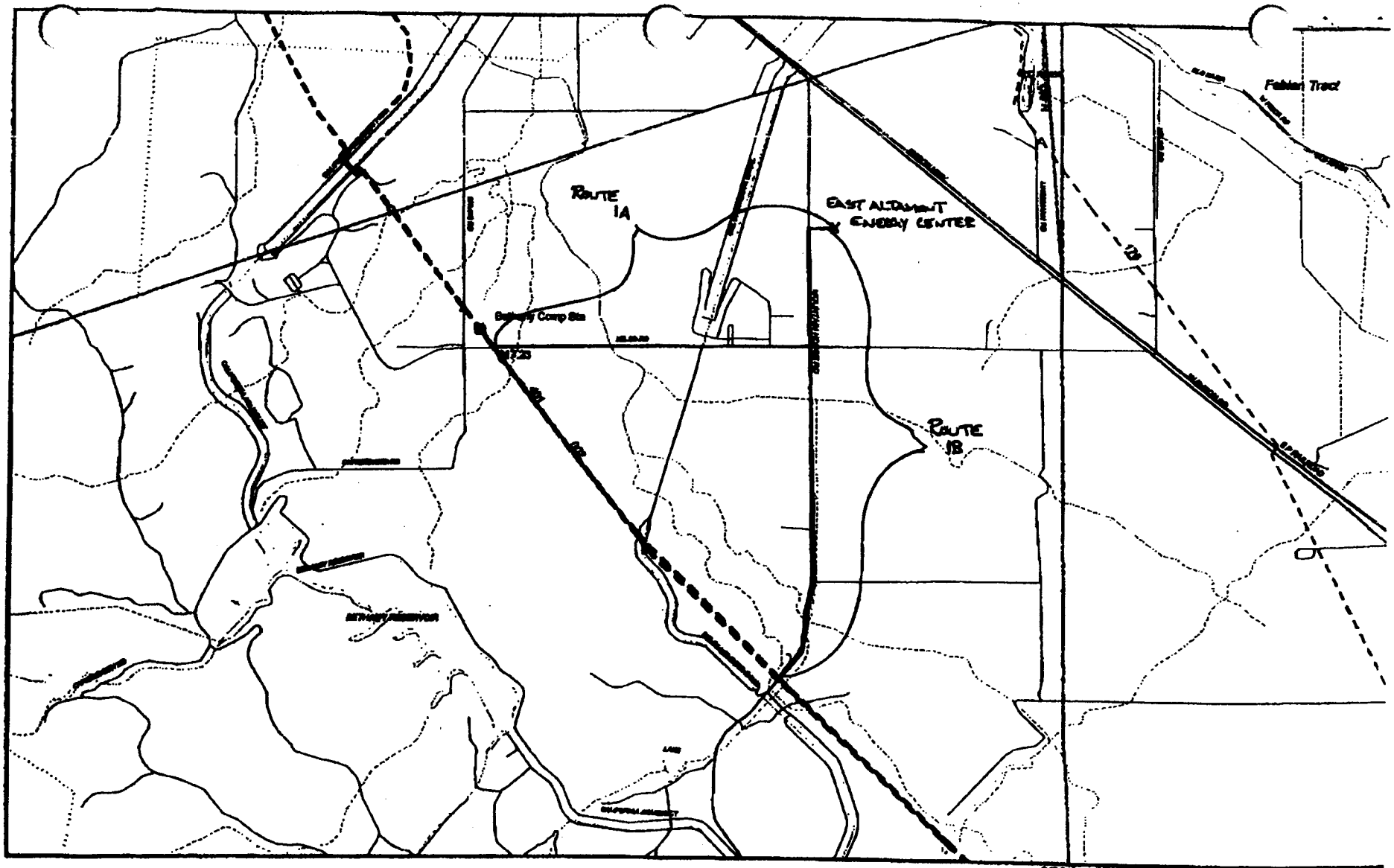
Nonbypassable Local Transmission Rates: Please note that under all of the potential scenarios set forth here, gas to be delivered to the facility would be subject to in-California rates consisting of both backbone transmission charges as well as local transmission charges. If you have questions about our rates, please contact Roger Graham at 415.973.2293, who will be pleased to discuss this with you. In addition, you may wish to visit PG&E's website (www.pge.com/customer_services/business/tariffs/#GR) for rate information.

PG&E suggests that we meet to review these costs to ensure there is clarity. Once you have had an opportunity to review this letter, please contact me at 415.973.2908, or Mike O'Brien at 415.973.5652 to set a meeting time and date.

Sincerely,

Rod Boschee / mdo

Rodney A. Boschee
Manager, Contract Development and Management



This information shall be used only for the expressed purpose of developing a gas service connection to the Calpine Inc. East Altamont Energy Center.

Calpine - East Altamont Energy Center
Proposed Routes 1A & 1B

California Gas Transmission

Gas System Maintenance and Technical Support
Geographic Information Services

2/28/01 - 07:09 AM
City Alameda
Div Stockton
Zone 3
Wallmap# 3-3111

N

Scale: 1:24000 or 1"

APPENDIX 8.1
Air Quality

APPENDIX 8.1A
Detailed Emissions Calculations

Table 8.1A-1
East Altamont Energy Center
Emissions and Operating Parameters for New Turbines

	Case J	Case M	Case K	Case C1	Case C2	Case D
	98 deg Full Load no DB	98 deg Full Load w/ DB	98 deg 70% Load	45 deg Full Load no DB	45 deg Full Load w/ DB	45 deg 70% Load
Ambient Temp, F	98	98	98	45	45	45
GT Load	100	100	70	100	100	700
GT heat input, MMBtu/hr (HHV)	1645.3	1801.8	1302.7	1898.8	1898.8	1479.4
DB heat input, MMBtu/hr (HHV)	0.0	732.0	0.0	0.0	732.0	0.0
Stack flow, lb/hr	3,172,645	3,416,079	2,643,388	3,641,095	3,672,694	2,840,191
Stack flow, acfm	822,838	892,221	680,869	1,015,024	1,030,159	733,094
Stack temp, F	142	142	140	188	188	140
Stack exhaust, vol %						
O2 (dry)	13.42	9.88	13.86	13.4	10.32	13.41
CO2 (dry)	4.27	6.27	4.03	4.29	6.02	4.28
H2O	8.78	11.95	7.71	8.43	11.20	8.42
Emissions						
NOx, ppmvd @ 15% O2	2.5	2.5	2.5	2.5	2.5	2.5
NOx, lb/hr	14.89	22.94	11.8	17.19	23.80	13.41
NOx, lb/MMBtu	0.0091	0.0091	0.0091	0.0091	0.0090	0.0091
SO2, ppmvd @ 15% O2	0.138	0.14	0.139	0.139	0.139	0.139
SO2, lb/hr	1.149	1.786	0.911	1.32	1.84	1.04
SO2, lb/MMBtu	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
CO, ppmvd @ 15% O2	6.00	6.00	6.00	6.00	6.00	6.00
CO, lb/hr	21.78	33.52	17.24	25.12	34.80	19.57
CO, lb/MMBtu	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132
VOC, ppmvd @ 15% O2	1.11	2.00	1.17	1.10	2.00	1.10
VOC, lb/hr	2.3	6.42	1.93	2.65	6.64	2.07
VOC, lb/MMBtu	0.0014	0.0025	0.0015	0.0014	0.0025	0.0014
PM10, lb/hr	11.0	18.32	11.0	11.0	18.3	11.0
PM10, lb/MMBtu	0.0067	0.0072	0.0084	0.0058	0.0070	0.0074
PM10, gr/dscf	0.00198	0.00315	0.00236	0.00172	0.00291	0.00221
NH3, ppmvd@15% O2	10.0	10.0	10.0	10.0	10.0	10.0
NH3, lb/hr	22.07	33.97	17.47	25.47	35.28	19.84

Table 8.1A-2
Auxiliary Boiler Characteristics
East Altamont Energy Center

Boiler Emission Characteristics	
Auxiliary Boiler, MMBtu/hr (HHV)	129
Boiler Rating, lb/hr	100,000
NOx, ppmvd @ 3% O2	9.0
Ammonia Slip, ppmvd @ 3% O2	10.0
CO, ppmvd @ 3% O2	50.0
VOC (as CH4), ppmvd @ 3% O2	10.0
NOx (as NO2), lb/hr	1.5
NOx, lb/MMBtu	0.0114
CO, lb/hr	5.0
CO, lb/MMBtu	0.0386
POC (as CH4), lb/hr	0.6
POC, lb/MMBtu	0.0044
PM10, lb/hr	2.65
PM10, lb/MMBtu	0.0206
SO2, grains/100 scf	0.25
SO2, lb/hr	0.09
SO2, lb/MMBtu	0.0007
NH3, lb/hr	0.61

Table 8.1A-3
Calculation of Cooling Tower Emissions
East Altamont Energy Center

Cooling Tower Design Parameters	
Water Flow Rate, 10E6 lbm/hr	141.09
Water Flow Rate, gal/min	282,300.0
Drift Rate, %	0.0005
Drift, lbm water/hr	705.47
PM10 Emissions based on TDS Level	
TDS level, ppm	3400
PM10, lb/hr	2.40
PM10, tpy	10.51
PM10 Emissions for Modeling (19 cells)	
PM10 Emissions per cell, g/s	1.59E-02

Table 8.1A-4
Emergency Generator Performance and Emissions

Engine		
Manufacturer		Caterpillar
Model		G3516 LE
Capacity (w/o fan)	kW	1,040
Brake Horsepower	bhp	1,467
Speed	rpm	1,800
Fuel		Natural Gas
Fuel Consumption (LHV)	Btu/bhp-hr	7,899
Fuel Consumption	lb/hr	554.66
Combustion Air Flow	scfm	3,041
Combustion Air Flow	lb/hr	13,684.5
Exhaust Temperature	deg. F	886
Exhaust Pipe Diameter	in	9
Number of Exhaust Pipes		1
Exhaust Stack Height	ft	10
Operating Profile		
Annual operation	hrs	200
Stack Velocity	ft/sec	327.63
Emissions		
NOx	g/bhp-hr	2
CO	g/bhp-hr	2.1
VOC (non-methane hydrocart	g/bhp-hr	0.9
PM10	lb/bhp-hr	0.00035
NOx	lb/hr	6.46
CO	lb/hr	6.78
VOC	lb/hr	2.91
PM10	lb/hr	0.52
SO2	lb/hr	0.0090

Table 8.1A-5
Diesel Fire Pump Performance and Emissions

Engine		
Manufacturer		Caterpillar
Model		3406B
Useable Horsepower	hp	370
Speed	rpm	1750
Fuel		No. 2 fuel oil
Specific Gravity		0.825
Fuel Sulfur Content	mass %	0.0005
Fuel Consumption	gph	18.3
Exhaust Flow	cfm	2452
Exhaust Temperature	deg. F	1002
Exhaust Pipe Diameter	in	6
Pump		
Speed	rpm	1750
Capacity	gpm	2500
Discharge Pressure	psig	150
Pump Efficiency	%	0.65
Brake Horsepower	bhp	336.5
Operating Profile		
Annual Operation	hrs	100
Emissions		
Exhaust Velocity	ft/sec	208.1
NOx	g/bhp-hr	5.89
CO	g/bhp-hr	3.55
VOC	g/bhp-hr	0.73
PM10	g/bhp-hr	0.25
NOx	lb/hr	4.36
CO	lb/hr	2.63
VOC	lb/hr	0.54
PM10	lb/hr	0.19
SO2	lb/hr	0.13

Table 8.1A-6
Calculation of Daily and Annual Fuel Use
East Altamont Energy Center

	Operating Hours			Max Hourly Fuel Use, MMBtu
	max. hour	hrs/day	hrs/yr	
Turbine 1, no DB	0	8	3660	1898.8
Turbine 2, no DB	0	8	3660	1898.8
Turbine 3, no DB	0	8	3660	1898.8
Turbine 1, w/ DB	1	16	5100	2630.8
Turbine 2, w/ DB	1	16	5100	2630.8
Turbine 3, w/ DB	1	16	5100	2630.8
Aux Boiler, 100%	1	8	3000	129

	Fuel Use		
	MMBtu/hr	MMBtu/day	MMBtu/yr
Turbine 1, no DB	n/a	15,190.4	6,949,608
Turbine 2, no DB	n/a	15,190.4	6,949,608
Turbine 3, no DB	n/a	15,190.4	6,949,608
Turbine 1, w/ DB	2,630.8	42,092.8	13,417,080
Turbine 2, w/ DB	2,630.8	42,092.8	13,417,080
Turbine 3, w/ DB	2,630.8	42,092.8	13,417,080
Total, Three Trains	**7,892.4**	**171,849.6**	**61,100,064**
Aux Boiler, 100%	129.0	1,032.0	387,000
Total, All Units	**8,021.4**	**172,881.6**	**61,487,064**

TABLE 8.1A-7A
Summary Of Startup Emissions Data - Pounds Per Hour

Project	Notes	POC	CO	NOx	SO_X	PM_{10}
Crockett Cogeneration	Source Tests					
6/96 avg	(Note 1)	54	46	59	-	-
6/97 avg		<1	31	41	-	-
min run		<1	27	9	-	-
max run		59	49	95	-	-
Crockett Cogeneration	FDOC	170	385	160	-	-
	(Note 2)					
SF Energy	FDOC	299	437	77	-	-
Sutter	From					
Cold Start	Westinghouse	-	838	175	-	-
Hot Start		-	902	170	-	-
Sutter	FDOC					
Cold Start	(Note 3)	1.1	838	175	2.7	9.0
Hot Start		1.1	902	170	2.7	9.0
Westinghouse	Note 4					
Cold Start		292	1722	183	3	28
Warm Start		296	1625	221	3	25
Hot Start		442	2142	217	4	33
Bechtel - DEC	From					
Cold Start	Westinghouse	437	3317	168	-	7
Hot Start	Note 5	520	7343	189	-	8
Used in AFC	Note 6	16	902	80	1.32	11.0

Notes:

1. Minimum and maximum values are based on the six individual runs that comprise the two sets of tests.
2. Permit conditions have not been carried forward into the permit to operate, and are no longer in effect.
3. Values shown are from the engineering analysis; there are no proposed permit conditions for startup emissions limits in the proposed FDOC.
4. Westinghouse provided data for the total plant (3 turbines) on a lbs/start basis. The above lbs/hr values were calculated assuming a 3 hour starting period per turbine for a cold start; 2 hours for a warm start; and 1 hour for a hot start. Data do not reflect the performance of oxidation catalysts or CO catalysts.
5. Bechtel estimates are 140 minutes for cold start for first engine; 40 minutes for cold start for second and third engines; and 30 minutes for hot start for each engine.
6. POC values are two times full load emission rates. CO values are equivalent to values proposed for Sutter project. NOx values are 30% higher than the higher of the two Crockett test averages, rounded up to the nearest 5 lbs/hr. SOx and PM10 values are the full load emission rates.

TABLE 8.1A-7B
Summary Of Startup Emissions Data - Pounds Per Start Per Turbine

Project	Notes	POC	CO	NOx	SO_x	PM_{10}
Crockett Cogeneration	Source Tests					
6/96 avg	(Note 1)	71	62	79	-	-
6/97 avg		1	41	54	-	-
min run		<1	36	12	-	-
max run		79	66	127	-	-
Crockett Cogeneration	FDOC (Note 2)	340	770	320	-	-
SF Energy	FDOC (Note 3)	299	437	77	-	-
Sutter	From Westinghouse					
Cold Start		-	611	2932	-	-
Hot Start		-	339	1804	-	-
Sutter	Proposed FDOC (Note 4)					
Cold Start		3	2514	525	8	27
Hot Start		1	902	170	3	9
Westinghouse	Note 5					
Cold Start		875	5167	550	8	83
Warm Start		592	3250	442	5	50
Hot Start		442	2142	217	4	33
Bechtel - DEC	From Westinghouse					
Cold Start		1019	7740	391	-	17
Hot Start		520	3671	189	-	4
Used in AFC	Note 6	48	2,706	240	n/a	n/a

Notes:

1. Data extrapolated from reported hourly values by ratio of 80/60.
2. Values based on maximum 2 hours per startup.
3. Values based on maximum 1 hour per startup.
4. Values based on maximum 3 hours per cold start, 1 hour per hot start.
5. Westinghouse provided data for the total plant (3 turbines). Data do not reflect the performance of oxidation catalysts or CO catalysts.
6. Based on maximum of 3 hours per cold startup.

Table 8.1A-8
Detailed Calculations for Maximum Hourly, Daily and Annual Criteria Pollutant Emissions
East Altamont Energy Center

Maximum Hourly, Daily and Annual Emissions								NOx			SO2	CO			POC			
		Base Load		Cold Start		Hot Start		Base Load	Cold Start	Hot Start		Base Load	Cold Start	Hot Start	Base Load	Cold Start	Hot Start	PM10
	max. hour	hrs/day	hrs/yr	hrs/day	hrs/yr	hrs/day	hrs/yr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Turbine 1, no DB	0	4	3260	3	150	1	250	17.19	80	80	1.32	25.12	838.0	902.0	2.65	16.0	16.0	11.0
Turbine 2, no DB	0	4	3260	3	150	1	250	17.19	80	80	1.32	25.12	838.0	902.0	2.65	16.0	16.0	11.0
Turbine 3, no DB	0	4	3260	3	150	1	250	17.19	80	80	1.32	25.12	838.0	902.0	2.65	16.0	16.0	11.0
Turbine 1, w/ DB&PA	1	16	5100	0	0	0	0	23.80	0	0	1.84	34.80	0	0	6.64	0.0	0.0	18.3
Turbine 2, w/ DB&PA	1	16	5100	0	0	0	0	23.80	0	0	1.84	34.80	0	0	6.64	0.0	0.0	18.3
Turbine 3, w/ DB&PA	1	16	5100	0	0	0	0	23.80	0	0	1.84	34.80	0	0	6.64	0.0	0.0	18.3
Aux Boiler	1	8	0	0	0	0	0	1.47	0	0	0.09	4.98	0	0	0.57	0.0	0.0	2.7
Emergency generator	1	1	200	0	0	0	0	6.46	0	0	0.009	6.78	0	0	2.91	0.0	0.0	0.52
Fire pump engine	1	1	100	0	0	0	0	4.36	0	0	0.126	2.63	0	0	0.54	0.0	0.0	0.19
Cooling tower	1	24	8760	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	2.40

	NOx			SO2			CO			POC			PM10		
	Max	Max	Total	Max	Max	Total	Max	Max	Total	Max	Max	Total	Max	Max	Total
	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy
Turbine 1, no DB	80.0	388.8	38.4	0.0	10.6	2.4	902.0	3,516.5	216.5	16.0	74.6	7.5	0.0	88.0	20.1
Turbine 2, no DB	80.0	388.8	38.4	0.0	10.6	2.4	902.0	3,516.5	216.5	16.0	74.6	7.5	0.0	88.0	20.1
Turbine 3, no DB	80.0	388.8	38.4	0.0	10.6	2.4	902.0	3,516.5	216.5	16.0	74.6	7.5	0.0	88.0	20.1
Turbine 1, w/ DB&PA	0.0	380.8	48.6	1.8	29.4	4.7	0.0	556.8	88.7	0.0	106.2	16.9	18.3	293.1	46.7
Turbine 2, w/ DB&PA	0.0	380.8	48.6	1.8	29.4	4.7	0.0	556.8	88.7	0.0	106.2	16.9	18.3	293.1	46.7
Turbine 3, w/ DB&PA	0.0	380.8	48.6	1.8	29.4	4.7	0.0	556.8	88.7	0.0	106.2	16.9	18.3	293.1	46.7
Turbines/Duct Burners	240.0	2308.7	260.9	5.5	120.0	21.3	2706.0	12219.8	915.9	48.0	542.5	73.4	55.0	1143.4	200.5
Aux Boiler	1.5	11.8	0.0	0.09	0.7	0.00	5.0	39.8	0.0	0.6	4.6	0.0	2.65	21.2	0.0
Emergency generator	6.5	6.5	0.6	0.01	0.0	0.00	6.8	6.8	0.7	2.9	2.9	0.3	0.52	0.5	0.1
Fire pump engine	4.4	4.4	0.22	0.13	0.1	0.01	2.6	2.6	0.1	0.5	0.5	0.0	0.19	0.2	0.0
Cooling tower	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	2.4	57.6	10.5
Permitted Totals			260.90			21.32			915.86			73.35			211.04
Total	247.9	2326.9	261.8	5.7	120.8	21.33	2717.8	12266.4	916.7	51.5	550.0	73.7	60.5	1222.7	211.1
	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy	lb/hr	lb/day	tpy

Assumptions:

Each turbine has one cold start and one hot start on worst case day; startups lag by two hours, but to be conservative, no lag time is assumed.
Boiler operates at full load 8 hrs/ day on worst case day.
Emergency generator and fire pump will not both be tested on the same day. Higher emission rate used for calculating hourly and daily emissions.
Annual NOx emissions will be managed so as to maintain total facility NOx emissions to not more than 263 tons/ year.
Cooling tower has 19 cells.

Notes for Table 8.1A-8 Calculation of Maximum Hourly, Daily and Annual Emissions

Calculation of Maximum Hourly Emissions

Turbines/HRSGs

As hourly NOx, CO and POC emissions from the turbines are higher during startup than during full load operation, highest hourly emissions occur while one turbine is in startup mode. Except for startup, maximum hourly emissions from the turbines occur while operating at full load and 98□F with power augmentation and duct firing. Emissions under this operating mode are higher than under part load or low temperature operations as the duct burner operates only at full load and high temperature conditions. Emissions under full and part load conditions at maximum and minimum site temperature conditions are shown in Table 8.1A-1.

Highest hourly emissions from the turbines would occur if three turbines were starting up during the same hour.

Auxiliary Boiler Maximum hourly emissions from the auxiliary boiler will occur while the boiler is operating at full load.

Emergency Generator and Fire Pump

The emergency generator and the fire pump will not operate simultaneously. Maximum hourly SO_2 emissions will occur while the fire pump is operating; highest hourly emissions of other pollutants will occur when the emergency generator is operating. Emissions from these units are shown in Tables 8.1A-4 and 8.1A-5.

Cooling Tower

Maximum hourly emissions occur while the cooling tower is operating at full capacity.

Calculation of Maximum Daily Emissions

Turbines/HRSGs As discussed above for the hourly emissions calculations, hourly NOx, CO and POC emissions are highest during startup. The operating conditions having the next highest hourly emissions are full load operation at 98EF with power augmentation and duct firing, followed by full load operation at 45EF. Duct burner operation will not exceed 16 hours a day. Therefore maximum daily turbine emissions will occur on a day when each turbine has one hot and one cold start, operates at full load with power augmentation and duct firing for 16 hours, and operates at full load without power augmentation and duct burning for the rest of the day. Again, both turbines will not be in startup mode simultaneously; there will be a two-hour period between starting the first and second turbines.

Auxiliary Boiler

The auxiliary boiler will operate a maximum of 8 hours per day. Maximum emissions occur at full load.

Emergency Generator and Fire Pump

The emergency generator and fire pump will operate a maximum of one hour per day for testing, and the two units will not be tested on the same day. Therefore, maximum daily emissions correspond to one hour of operation of the unit that has the higher emissions.

Cooling Tower

Maximum daily cooling tower emissions will occur while the cooling tower is in operation for 24 hours.

Maximum Annual Emissions

Turbines/HRSGs

Each turbine is assumed to have a maximum of 50 cold starts (150 hours) and 250 hot starts (250 hours) each year. Duct firing will be limited to 5100 hours per year per turbine. Therefore, the calculation of maximum annual emissions from each turbine is based on the following assumptions:

- 150 hours of cold start operation
- 250 hours of hot start operation
- 5100 hours of operation with power augmentation and duct firing
- 3260 hours of operation at full load, 45EF

Auxiliary Boiler

The auxiliary boiler will operate a maximum of 3000 hours per year. Maximum emissions occur at full load.

Emergency Generator and Fire Pump

The emergency generator and fire pump will operate a maximum of 200 hours per year and 100 hours per year, respectively. Annual emissions are based on this yearly operation.

Table 8.1A-9a
Calculation of Noncriteria Pollutant Emissions from Gas Turbines
East Altamont Energy Center

Compound (1)	Emission Factor, lb/MMscf (2)	(each turbine) Maximum Hourly Emissions, lb/hr (3)	Annual Emissions, ton/yr (4)	Emission Rates for Modeling (each turbine) One-hour Impacts, g/s	Annual Impacts, g/s	Total, 3 turbines lb/yr	tpy
Ammonia	(5)	35.28	136.57	4.45E+00	3.93E+00	819,444.6	409.7
Propylene	7.70E-01	1.98	7.68	2.50E-01	2.21E-01	46,079.4	23.0
Hazardous Air Pollutants							
Acetaldehyde	6.86E-02	0.18	0.68	2.23E-02	1.97E-02	4,105.3	2.1
Acrolein	6.43E-03	0.02	0.06	2.09E-03	1.84E-03	384.8	0.2
Benzene	1.36E-02	0.04	0.14	4.42E-03	3.90E-03	813.9	0.4
1,3-Butadiene	1.27E-04	3.27E-04	1.27E-03	4.12E-05	3.64E-05	7.6	0.0
Ethylbenzene	1.79E-02	0.05	0.18	5.81E-03	5.14E-03	1,071.2	0.5
Formaldehyde	1.10E-01	0.28	1.10	3.57E-02	3.16E-02	6,582.8	3.3
Hexane	2.59E-01	0.67	2.58	8.41E-02	7.43E-02	15,499.4	7.7
Naphthalene	1.66E-03	4.28E-03	1.66E-02	5.39E-04	4.76E-04	99.3	0.0
PAHs (6)	6.60E-04	1.70E-03	6.58E-03	2.14E-04	1.89E-04	39.5	0.0
Propylene oxide	4.78E-02	0.12	0.48	1.55E-02	1.37E-02	2,860.5	1.4
Toluene	7.10E-02	0.18	0.71	2.31E-02	2.04E-02	4,248.9	2.1
Xylene	2.61E-02	0.07	0.26	8.47E-03	7.49E-03	1,561.9	0.8
Total HAPs			6.21			37,275.0	18.64

Notes:

(1) Provided by BAAQMD from Ventura County APCD and CATEF databases.
(2) Based on maximum hourly turbine fuel use of 2630.8 MMBtu/hr (with duct burner) and fuel HHV of 1021 Btu/scf. 2.58 MMscf/hr
(3) Based on maximum annual turbine fuel use of 20,366,688 MMBtu/yr (with duct burner) and fuel HHV of 1021 Btu/scf. 19,948 MMscf/yr
(4) Based on 10 ppm ammonia slip from SCR system.
(5) Polycyclic aromatic hydrocarbons, excluding naphthalene (treated separately).

Table 8.1A-9b
Calculation of Noncriteria Pollutant Emissions from Auxiliary Boiler
East Altamont Energy Center

Compound	Emission Factor, lb/MMscf (1)	Maximum Hourly Emissions, lb/hr (2)	Annual Emissions, lb/yr (3)	Annual Emissions, ton/yr (3)	Emission Rates for Modeling: One-hour Impacts, g/s	Emission Rates for Modeling: Annual Impacts, g/s
Ammonia	(4)	0.61	1815.6	9.08E-01	7.625E-02	2.611E-02
Propylene	1.55E-01	1.96E-02	58.9	2.94E-02	2.472E-03	8.467E-04
Hazardous Air Pollutants						
Acetaldehyde	8.9E-03	1.12E-03	3.37	1.69E-03	1.417E-04	4.852E-05
Acrolein	8.00E-04	1.01E-04	0.30	1.52E-04	1.274E-05	4.362E-06
Benzene	4.31E-03	5.45E-04	1.63	8.17E-04	6.861E-05	2.350E-05
Ethylbenzene	2.00E-02	2.53E-03	7.58	3.79E-03	3.184E-04	1.090E-04
Formaldehyde	2.21E-01	2.79E-02	83.8	4.19E-02	3.518E-03	1.205E-03
Hexane	1.3E-03	1.64E-04	0.49	2.46E-04	2.070E-05	7.088E-06
Naphthalene	3.00E-04	3.79E-05	0.11	5.69E-05	4.776E-06	1.636E-06
PAHs (4)	1.00E-04	1.26E-05	0.04	1.90E-05	1.592E-06	5.452E-07
Toluene	7.8E-03	9.86E-04	2.96	1.48E-03	1.242E-04	4.253E-05
Xylene	5.8E-03	7.33E-04	2.20	1.10E-03	9.233E-05	3.162E-05
Total HAPs				5.12E-02		

Notes:

(1) Provided by BAAQMD from Ventura County APCD and CATEF databases.
(2) Based on maximum hourly boiler fuel use of 129 MMBtu/hr and fuel HHV of 1021 Btu/scf. 0.13 MMscf/hr
(3) Based on maximum annual boiler fuel use of 387,000 MMBtu/yr and fuel HHV of 1021 Btu/scf. 379.04 MMscf/yr
(4) Based on 10 pppm ammonia slip.
(5) Polycyclic aromatic hydrocarbons, excluding naphthalene (modeled separately).

Table 8.1A-9c
Calculation of Noncriteria Pollutant Emissions from Cooling Tower (1)
East Altamont Energy Center

Constituent	Concentration in Cooling Tower Return Water	Emissions, lb/hr	Emissions, ton/yr	Emission Rates for Modeling (each cell) One-hour Em Rate, g/s	Annual Em Rate, g/s	Emissions, lbs/year
Ammonia	6 ppm	4.23E-03	1.85E-02	2.81E-05	2.81E-05	37.1
Copper	0.032 ppm	2.26E-05	9.89E-05	1.50E-07	1.50E-07	0.2
Silver	0.08 ppm	5.64E-05	2.47E-04	3.74E-07	3.74E-07	0.5
Zinc	0.056 ppm	3.95E-05	1.73E-04	2.62E-07	2.62E-07	0.3
Hazardous Air Pollutants						
Arsenic	0.016 ppm	1.13E-05	4.94E-05	7.49E-08	7.49E-08	0.099
Cadmium	0.008 ppm	5.64E-06	2.47E-05	3.74E-08	3.74E-08	0.049
Chromium (III)	0.136 ppm	9.59E-05	4.20E-04	6.36E-07	6.36E-07	0.840
Lead	0.0218 ppm	1.54E-05	6.74E-05	1.02E-07	1.02E-07	0.135
Mercury	0.008 ppm	5.64E-06	2.47E-05	3.74E-08	3.74E-08	0.049
Nickel	0.08 ppm	5.64E-05	2.47E-04	3.74E-07	3.74E-07	0.494
Dioxins/furans	-- ppm	--	--	--	--	--
PAHs	--	--	--	--	--	--
Total HAPs			8.34E-04			1.67

Notes: (1) Emissions calculated from maximum drift rate of 705.47 lb/hr.

TABLE 8.1A-10
AMMONIA EMISSION CALCULATIONS

Calculation of ammonia emissions from the gas turbines and the boilers is based on the proposed ammonia slip limit of 10 ppmvd (corrected).

Gas Turbines

Maximum hourly ammonia emissions from the gas turbines occur when the turbines are operating at 100% load with maximum duct firing, at 45° F. Under these conditions, the exhaust flow rate is 734,054 dscfm at 10.32 percent O_2. The 10 ppm ammonia slip rate at 15 percent O_2 is calculated as:

> 10 ppm (@ 15% O_2) * 4.4852×10^{-8} lb/scf per ppm * 734,054 dscf/min * (20.9-10.32)/(20.9-15) * 60 min/hr = 35.3 lb/hr

Maximum hourly emissions without duct burning are 25.5 lb/hr (see Table 8.1A-1). Maximum annual duct burning hours are 5100 per year, so maximum annual ammonia emissions are:

> (5100 hrs/yr * 35.3 lb/hr) + (3660 hrs/yr * 25.5 lb/hr) = 136.6 tons/yr

Auxiliary Boiler

Maximum hourly ammonia emissions from the boilers are based on the ammonia slip limit of 10 ppmvd @ 3 percent O_2 and the maximum exhaust gas flow rate of 23,128 dscfm @ 2.5 percent O_2.

> 10 ppm @ 3 percent O_2 * 4.4852×10^{-8} lb/scf per ppm * 23,128 scf/min * (20.9-2.5)/(20.9-3)
> * 60 min/hr = 0.6 lb/hr

The boiler will operate a maximum of 3000 hrs/yr, so annual ammonia emissions from the boiler can be calculated as: 3000 hrs/yr * 0.6 lb/hr = 1.0 ton/yr

Appendix 8.1B
Modeling Analysis

Attachment 8.1B-1
Modeling Protocol and Related Correspondence

sierra
research

1801 J Street
Sacramento, CA 95814
(916) 444-6666
Fax: (916) 444-8373

December 1, 2000

Mr. Rob DeMandel, Manager
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

Subject: Modeling Protocol
East Altamont Energy Center
Calpine Corporation

Dear Mr. DeMandel:

Early next year, Calpine Corporation will be applying to the BAAQMD for an Authority to Construct and a Determination of Compliance for a power generating facility near the Western Area Power Authority (WAPA) Substation in the southeast corner of Alameda County. The project will be a major new source and will be subject to District requirements for air quality modeling analyses. Attached for your review and approval is a description of the analytical pproach that will be used to comply with District modeling requirements for the project. We ntend to file the application with the District in February 2001 and are requesting approval of the modeling protocol by December 21, 2000.

We would be pleased to meet with you and your staff to discuss this protocol if such a meeting would be useful. We look forward to working with you. If you have any questions, please do not hesitate to call me at (916) 444-6666, or Greg Darvin of RTP Environmental at (805) 569-6555. Thank you for your attention in this matter.

Sincerely,

Gary Rubenstein

Gary Rubenstein by JEG

cc: Glen Long, BAAQMD
Jim Cordova, BAAQMD
Steve Hill, BAAQMD
Keith Golden, CEC
Alicia Torre, Calpine Corporation
Tom Lagerquist, Peregrine Consulting
Neal Pospisil, Calpine Corporation

Calpine Corporation
East Altamont Energy Center
Modeling Protocol

Calpine Corporation, a leading U.S. power company, is planning to construct and operate a merchant power plant near the Western Area Power Authority (WAPA) Substation in northeast Alameda County, near Route J4 (Byron Bethany Highway). The proposed project, called the East Altamont Energy Center, will consist of three gas turbines with heat recovery steam generators and one steam turbine, with a total nominal net generating capacity of 1,100 MW. The turbines are expected to be General Electric 7251 (7FB) units. One nominal 100,000 pound per hour auxiliary boiler will also be included to provide steam as needed for auxiliary purposes. A 19-cell wet cooling tower will also be installed to provide cooling water for the steam turbine condenser. Additional auxiliary equipment will include a 1,000 kW Diesel emergency generator and a 370 hp Diesel fire pump.

The proposed project will be a major new source under Bay Area Air Quality Management District (BAAQMD) regulations.

The applicant will submit air quality impact analyses to both the BAAQMD and the California Energy Commission (CEC). The modeling analysis will include pollutants for which emissions exceed the Prevention of Significant Deterioration (PSD) significant emissions thresholds of BAAQMD Regulations 2-2-304, 305, and 306 (shown in Table1) and the CEC requirements for evaluation of project air quality impacts. The purpose of this document is to establish the procedure for meeting the BAAQMD and CEC air quality modeling requirements for the proposed project.

Table 1
BAAQMD PSD Significant Emissions Thresholds

Pollutant	Cumulative Increase (tons/yr)
NO_x	100
SO_2	100
CO	100
PM_{10}	100

The project is expected to result in emissions that will exceed BAAQMD PSD significance thresholds for oxides of nitrogen (NO_x), carbon monoxide (CO), and fine particulate matter (PM_{10}). Emissions of sulfur dioxide (SO_2) are expected to be below the significance levels. The project will also trigger CEC modeling requirements for cumulative and construction-based impacts.

Emissions from the proposed project are expected to exceed the BAAQMD thresholds defining a major source for purposes of New Source Review (NSR). As part of the major source permit application, an increment analysis and a cumulative impacts analysis will be performed. Modeled ambient impacts are expected to be below the levels at which preconstruction monitoring is required. The results of these analyses will be presented in detail in the AFC and the application for a Determination of Compliance.

As part of a PSD application process and in accordance with the BAAQMD requirements ("*Permit Modeling Guidance,*" April 2, 1996), a modeling protocol is required. This modeling protocol outlines the proposed use of air dispersion modeling techniques that will be used to assess impacts from the proposed source, and has been prepared by Sierra Research on behalf of Calpine. This protocol also follows modeling guidance provided by the U.S. Environmental Protection Agency (USEPA) in its "*Guideline on Air Quality Models*" (including supplements), the National Park Service's "*Permit Application Guidance for New Air Pollution Sources*" (Bunyak, 1993), the Federal Land Managers' "*Air Quality Related Values Workgroup (FLAG) Draft Phase I Report*" (October 1999), and the "*Interagency Workgroup on Air Quality Modeling (IWAQM) Phase II Recommendations*" (1998), as well as BAAQMD modeling guidance.

Impacts from operation of the facility will be compared to the following:

Air Quality Criteria	NO_2	PM_{10}	CO	SO_2
PSD Significant Impact Levels	√	√	√	√[a]
PSD Monitoring Exemption Levels	√	√	√	√[a]
PSD Increments	√[b]	√[b]		√[a,b]
Ambient Air Quality Standards	√[b]	√[b]	√[b]	√[a,b]
Class I and Class II Visibility	√	√		√[a]
Impacts to Soils and Vegetation	√	√		√[a]
Class I Area Acid Deposition	√	√		√[a]

Project Location

The proposed project is located in the far eastern corner of Alameda County. The site lies northeast of the intersection of Mountain House Road and Kelso Road. The UTM coordinates of the site are 4185 kilometers northing, 6254 kilometers easting. The nominal site elevation is 40 feet above mean sea level.

[a]SO_2 air quality modeling will be performed only if facility emission rates exceed PSD significance levels. However, SO_2 impacts will be evaluated for CEC CEQA purposes.
[b]Multisource air quality modeling for AAQS and PSD increments will be performed only if facility impacts exceed significant impact levels.

PROPOSED EMISSION SOURCES

The primary emission sources at the Calpine facility will be three gas turbine electric generators, each equipped with a HRSG that will have the potential to duct fire up to 730 MMBtu/hour/HRSG. The project will also consist of one cooling tower, one Diesel-fueled emergency generator, and one Diesel-fueled emergency fire pump. Low-sulfur #2 distillate fuel will be used for the Diesel engines. The turbines and HRSG duct burners will be fired with natural gas only. The turbines/HRSGs will utilize advanced combustion designs and emission controls to limit emissions of NO_x to 2.5 ppmv, while limiting emissions of CO to 6 ppmv. Emissions of PM_{10} and SO_2 will be kept to a minimum through the exclusive use of natural gas. Additionally, high-efficiency drift eliminators will minimize emissions of PM_{10} from the cooling tower.

EXISTING METEOROLOGICAL AND AIR QUALITY DATA

A first-order National Weather Service (NWS) station is located at the Stockton Airport. Measurements of surface data (e.g., wind speed, direction, cloud cover, ceiling height, and temperature) are recorded by this NWS station on a continual basis. The NWS monitoring location (37 degrees 54 minutes North latitude and 121 degrees 15 minutes West longitude; UTMN 4196, UTME 654) reported by the National Climatic Data Center (NCDC) is about 30 km northeast of the project site. An existing air quality monitoring station, northwest of the town of Tracy (24371 Patterson Road, Tracy) and operated by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) collects hourly wind speed, wind direction, temperature, ozone (O_3), oxides of nitrogen (NO_x), and nitrogen dioxide (NO_2) data. This monitoring station is approximately 9 kilometers southeast of the project site and its UTM coordinates are 629 km easting and 4176 km northing. The project site and the Tracy monitoring station are both situated at or near the western edge of the San Joaquin Valley; the Stockton NWS site is closer to the center of the Valley. Each site is at the same approximate elevation, with similar solar exposures.

Terrain immediately surrounding the facility and Tracy monitoring station is presented in Figure 1. The area in the immediate vicinity of the project site and monitoring station is relatively flat towards the east, with terrain rising into the Altamont Hills towards the west. Both sites are located at the eastern edge of the Altamont Hills. Terrain becomes flat east of these sites. With respect to large-scale features, the project site, the monitoring station, and the NWS station are all located in the San Joaquin Valley. The San Joaquin Valley is quite broad and is generally oriented north to south. Air flow in the valley can be characterized by up-valley and down-valley winds. The down-valley winds are generally a result of airflow into the Valley from the Carquinez Strait and the Altamont Pass that then flow south. However, the local climate of the project area is modified by the Altamont Hills. Strong diurnal wind regimes markedly affect the horizontal transport of air in the project area. This results in a pronounced west-west-southwest component to the windrose, which is attached for the Tracy monitoring station (1997) (Figure 2).

Figure 1
Site Location

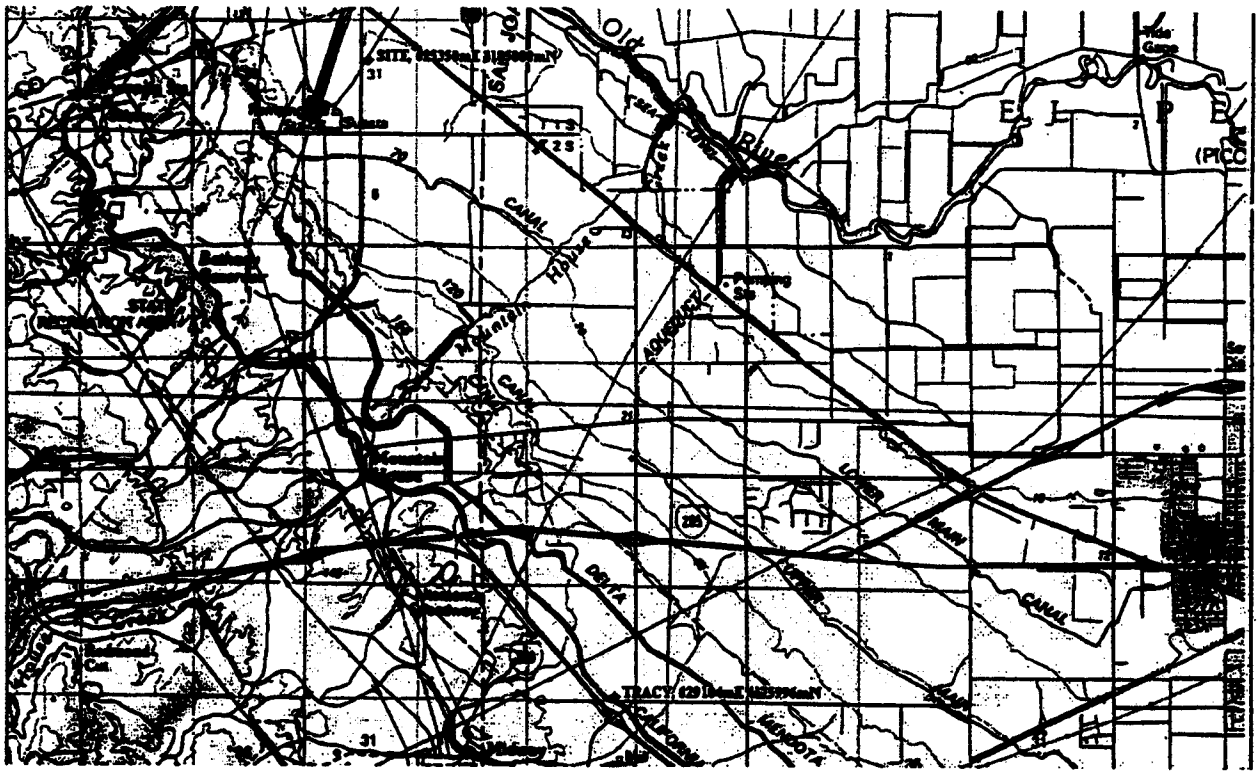
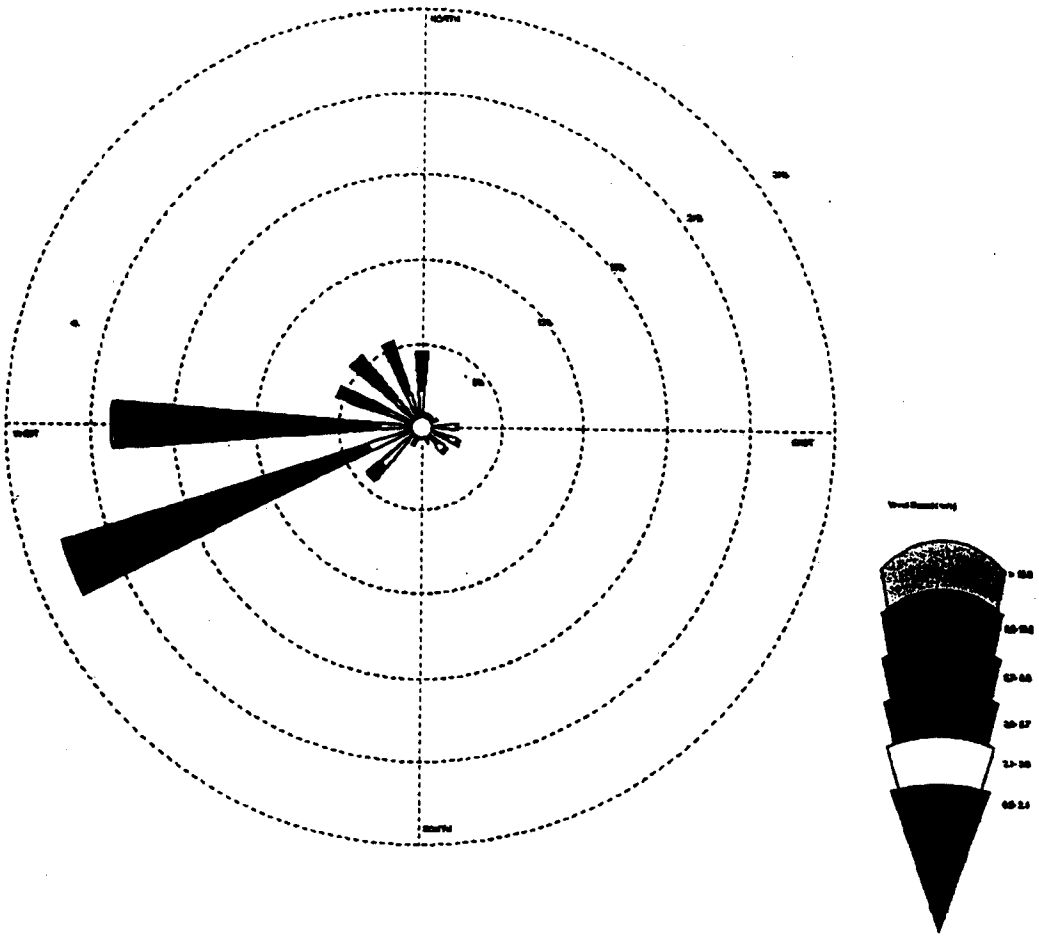


Figure 2
SJVUAPCD TRACY MONITORING STATION WIND ROSE
01/01/97 THROUGH 12/31/97



Background air quality data for NO_2 and ozone are available from the Tracy site; the nearest monitoring site for CO and PM_{10} is in Stockton, and the nearest SO_2 monitor is located in Fresno.

TABLE 2
ESTIMATED BACKGROUND AIR QUALITY VALUES
Summary of Existing Ambient Air Quality for East Altamont Energy Center

	Monitoring Location	State Standard	NAAQS	1997	1998	1999
PM_{10} Annual	Stockton Hazleton St.	30	50	22.5	20.8	21.6
PM_{10} 24-hour[a]	Stockton Hazleton St.	50	150	55-130	61-99	52-118
Fine PM 24-hour	Stockton Hazleton St.	65	65	67	81	56
Fine PM Annual	Stockton Hazleton St.	15	15	12.5	13.5	17.3
NO_X 1-hour	Tracy 24371 Patterson Rd	0.25	NA	0.06	0.079	0.074
NO_X Annual	Tracy 24371 Patterson Rd		0.053	0.012	0.013	0.015
Ozone 1-hour	Tracy 24371 Patterson Rd	.09	0.12	0.119	0.116	0.132
Ozone 8-hour	Tracy 24371 Patterson Rd		0.08	0.099	0.094	0.113
CO 8-hour	Stockton Hazleton St.	9	9	3.60	7.18	5.34
SO_2 24-hour	Fresno [b]	.04	.14	.003	NA	NA

[a] Listed PM_{10} 24-hour concentrations reflect range from 4th-highest to highest concentration.

[b] No ambient SO_2 concentrations in San Joaquin County for last 3 years; Fresno is closest site in San Joaquin Air Basin with SO_2 data in last 3 years.

SITE REPRESENTATION

USEPA defines the term "on-site data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates in the Clean Air Act at section 165(e)(1). Section 165(e)(1) defines on-site meteorology as the collection "of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility."

This definition and USEPA's guidance on the use of on-site monitoring data are also outlined in the "*On-Site Meteorological Program Guidance for Regulatory Modeling Applications*" (1987). The representativeness of the data is dependent upon (a) the proximity of the meteorological

monitoring site to the area under consideration, (b) the complexity of the topography of the area, (c) the exposure of the meteorological sensors, and (d) the period of time during which the data are collected. As discussed below, we believe the meteorological data from the Tracy monitoring station data, coupled with concurrent sky cover and ceiling data from the Stockton Airport, satisfy the definition of on-site data. The use of Stockton Airport NWS data will be limited to sky cover and ceiling height in order to calculate initial stability. Since the project site, the Stockton Airport, and the Tracy monitoring station are all located within the western or central San Joaquin Valley, use of Stockton sky cover and ceiling height to calculate stability is representative of the project (and Tracy) site(s) since the amounts of incoming solar radiation at all sites would be identical. The stability data will then be corrected with wind speed data from Tracy.

The attached windrose for the Tracy Monitoring Station (Figure 2) indicates a consistent high-speed wind pattern (58% of wind speeds are greater than 3.7 m/s), with a predominant wind direction of west-southwest and a secondary maximum at west. Analysis of a stability rose of the Tracy monitoring station demonstrates that D stability occurs up to 38% of the time for the three-year data set. The predominance of D stability is primarily due to the large frequency of high wind-speeds. In general, this flow is indicative of the influence of the Altamont Pass. As the predominant wind direction(s) are towards flat terrain (away from terrain), terrain influences on project impacts would be minimized. In all likelihood, use of this data set would tend to maximize impacts due to building downwash, since downwash is a function of high wind speeds and D stability. Thus, use of the Tracy monitoring station to represent the project site wind speed, wind direction, and temperature would be considered conservative, with respect to the calculation of potential impacts from the project.

The area surrounding the project site can be characterized as rural. Areas within three (3) kilometers of the project site are predominately undeveloped or farmland with small areas of residential development, mostly along secondary roads. In accordance with the Auer land use classification methodology (USEPA's "*Guideline on Air Quality Models*"), land use within the area circumscribed by a three km radius around the modified facility is greater than 50 percent rural. Therefore, in the modeling analyses supporting the permitting of the facility, rural coefficients will be assigned.

Representativeness has also been defined in the "*Workshop on the Representativeness of Meteorological Observations*" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Judgments of representativeness should be made only when sites are climatologically similar, as the project site and NWS station clearly are. Representativeness has also been defined in the PSD Monitoring Guideline as data that characterize the air quality for the general area in which the proposed project would construct and operate. The same large-scale topographic features that influence the Tracy monitoring station also influence the proposed project site in the same manner.

In determining the representativeness of the Tracy monitoring station coupled with the Stockton Airport NWS station data set relative to the project site, the following considerations were addressed.

Aspect ratio of terrain, which is the ratio of height to width of hill at base - The aspect ratios of the terrain near the Tracy monitoring station would be nearly identical to the terrain near the project site. No large differences were discerned. Most of the canyons on the eastern slope of the Altamont Pass are oriented in a similar west west-southwest direction, as is the larger scale Altamont Pass. The strong predominance of west and west-southwest wind direction and speed that is typical of the Altamont Pass area is well represented at both sites.

Slope of terrain - Terrain in the immediate vicinity east of the project site and the Tracy monitoring station is relatively flat. The slopes of the terrain of the Altamont Hills close to these respective locations are similar, as would be the surface roughness and slope terrain angles.

Ratio of terrain height to stack/plume height - Terrain heights of the Altamont Hills range from about 10 to 330 meters above the project site elevation (stack base) within about five (5) kilometers of the site. Terrain heights at further distances (about 10 km to the west, northwest, and southwest) range from 200 to 400 meters above stack base. Final plume height (stack height plus plume rise) was calculated for D stability and a wind speed of 5 meter/second (m/s) to be about 280 meters. Thus, some maximum project impacts may occur in complex terrain, which may be refined with screening meteorology and CTSCREEN as discussed below.

Correlation of terrain features to prevailing meteorological conditions - As discussed in detail earlier, the orientation and aspect of terrain in the project area correlates well with the prevailing wind fields in the Tracy windroses, with little apparent influence by local terrain perturbations (such as small hill outcroppings or canyon orientations). Wind flow at the Tracy monitoring station would therefore be nearly identical to the project site.

Thus, it is our assessment that the wind direction and wind speed data collected at the Tracy monitoring station and coupled with the Stockton sky cover and ceiling data are identical to the dispersion conditions at the project site and to the regional area. The windroses do not indicate any overwhelming effects on the potential dispersion of pollutants from the project site on a regional scale from influences other than the Altamont Hills. Although some short-term maximum impacts from the proposed project may well occur on terrain features in the Altamont Hills area, these impacts would then be addressed using the CTSCREEN model if violations of air quality standards were predicted. Thus, the data set would satisfy the definition of on-site data, as defined in the PSD Monitoring Guidelines (1990) and the On-site Meteorological Program Guidance for Regulatory Modeling Applications (1987).

Meteorological data for the Stockton Airport were obtained from the National Climatic Data Center for the last three available years for surface data (1997-1999). The Stockton Airport observations include all the necessary parameters required for the ISCST3 dispersion modeling

analyses (i.e., wind speed and direction, temperature, sky cover, and ceiling height). However, only sky cover and ceiling height data will be used. Concurrent wind speed, wind direction, and temperature data from the Tracy monitoring station will be used with Stockton sky cover and ceiling data to produce a three-year meteorological data set for use with ISCST3. Any missing data will be filled in by using applicable EPA guidance ("*Procedures for Substituting Values for Missing NWS Meteorological Data for Use in Regulatory Air Quality Models*," Dennis Atkinson and Russell F. Lee, July 7, 1992). These data will be processed by the latest version (99169) of the USEPA program PCRAMMET.

As described above, recent air quality data from the Tracy monitoring station will be used to represent ambient concentrations of O_3, NO_x, and NO_2. Available data from the SJVUAPCD monitoring station in Stockton will be used to represent ambient concentrations of PM_{10} and CO. The closest monitoring station for SO_2 is in Fresno. These data are expected to be conservative for estimating baseline concentrations in the project vicinity, since they are taken from locations closer to emission sources than is the project site. For state and federal attainment pollutants with maximum modeled ground-level impacts greater than USEPA-defined significance levels, modeled concentrations will be added to these representative background concentrations to determine compliance with the CAAQS and NAAQS.

AIR QUALITY DISPERSION MODELS

Overview

Several USEPA dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources operating parameters and their locations. The models proposed for use are Building Profile Input Program (BPIP, current version 95086), Industrial Source Complex - Short Term (ISCST3, current version 00101), CTSCREEN (current version 94111), SCREEN3, and the VISCREEN visibility model (current version 88341). These models, along with options for their use and how they are used, are discussed below. These models will be used for the following:

- comparison of impacts to significant impact levels;
- comparison of impacts to monitoring significance thresholds;
- PSD Class I and Class II increment consumption ;
- compliance with AAQS; and
- impacts to Air Quality Related Values in Class I and Class II areas.

Simple, Complex, and Intermediate Terrain Impacts

For modeling the project in simple, complex, and intermediate terrain, the ISCST3 model will be used with the hourly meteorological data from the Tracy monitoring station for 1997 through 1999. The ISCST3 model is a steady-state, multiple-source, Gaussian dispersion model designed

for use with stack emission sources situated in terrain where ground elevations can exceed the stack heights of the emission sources. The ISCST3 model requires hourly meteorological data consisting of wind vector, wind speed, temperature, stability class, and mixing height. The model assumes that there is no variability in meteorological parameters over a 1-hour time period, hence the term steady-state. The ISCST3 model allows input of multiple sources and source groupings, eliminating the need for multiple model runs. Complex phenomena such as building-induced plume downwash are treated in the ISCST3 model.

The ISCST3 model was selected due in part to the varying terrain surrounding the project site, and is one of several models that are recommended by the USEPA for such evaluations. The ISCST3 model is capable of calculating pollutant concentrations in intermediate terrain. Intermediate terrain is defined as terrain between stack top and final plume height. In calculating pollutant concentrations in intermediate terrain, the model will select the higher of the simple and complex terrain calculations on an hour-by-hour, source-by-source, and receptor-by-receptor basis. In addition, the ISCST3 model is preferred for this application because it incorporates algorithms for the simulation of aerodynamic downwash induced by buildings. These effects are of importance because many of the emission points may be below Good Engineering Practice (GEP) stack height.

Technical options selected for the ISCST3 model are listed below. Use of these options follows the USEPA's (1986, 1987, 1990, and 1994) modeling guidance, BAAQMD guidance, and/or sound scientific practice. An explanation of these options and the rationale for their selection is provided below.

- Default option (includes final plume rise except for building wake downwash, stack-tip downwash except for Schulman-Scire [SS] downwash, buoyancy-induced dispersion except for SS downwash, default wind profile exponents, default temperature gradients, and calm processing per EPA policy);
- Anemometer height = 20 feet (Tracy monitoring station sensor height for 1997-1999);
- Rural dispersion parameters; and
- Elevated receptor terrain heights option.

Final plume rise option does not consider the possible effects of gradual plume rise on ambient concentrations during the rising phase of the plume downwind transport. Gradual plume rise is recommended by USEPA (1986, 1987, 1990, 1994) when there is significant terrain close to the stacks. Significant terrain does not occur until about one km from the source. Buoyancy-induced dispersion, which accounts for the buoyant growth of a plume caused by entrainment of ambient air, will be included because of the relatively warm exit temperature and subsequent buoyant nature of the exhaust plumes. Stack-tip downwash, which adjusts the effective stack height downward following the methods of Briggs (1972) for cases where the stack exit velocity is less than 1.5 times the wind speed at stack top, will be selected per USEPA guidance.

As previously mentioned, based on the land use classification procedure of Auer (1978), land use within the area circumscribed by a three-km radius around the modified facility is greater than 50 percent rural. Therefore, in the modeling analyses supporting the permitting of the facility, rural coefficients will be assigned.

The calm processing option allows the user to direct the program to exclude hours with persistent calm winds in the calculation of concentrations for each averaging period. This option is generally recommended by the USEPA (1986, 1987, 1990, 1994) for regulatory applications. The ISCST3 model recognizes a calm wind condition as a wind speed less than or equal to 1 meter per second and a wind direction equal to that of the previous hour (a wind speed of 0 m/sec is used in the ASCII meteorological data file). The calm processing option in the ISCST3 model will then exclude these hours from the calculation of concentrations.

CTSCREEN Dispersion Model

If the ISCST3 model calculates exceedances of AAQS, increments or significance levels in intermediate or complex terrain, the CTSCREEN model will be used to refine the modeling analysis. The CTSCREEN model, the screening mode of CTDMPLUS, is a refined point source Gaussian air quality model for use in all stability conditions for complex terrain applications. Because the model accounts for the dimensional nature of the plume and terrain interaction, the model requires digitized terrain of the nearby topographical features. The mathematical representation of terrain is accomplished by the terrain preprocessors, FITCON and HCRIT. The wind direction used in CTSCREEN is based on the source-terrain geometry, resulting in computation of the highest impacts likely to occur. Other meteorological variables are chosen from possible combinations from a set of predetermined values. CTSCREEN provides maximum concentration estimates that are similar to, but on the conservative side of, those that would be calculated from the CTDMPLUS model with a full year of on-site meteorological data.

As well as calculating maximum 1-hour concentrations at all receptors, the CTSCREEN model is designed to provide conservative estimates of worst-case 3-hour, 24-hour, and annual impacts. Scaling factors are used to convert calculated 1-hour concentrations to 3-hour, 24-hour, and annual estimates. A workgroup study found the ratios to convert 1-hour concentrations to 3-hour, 24-hour, and annual concentrations to be 0.7, 0.15, and 0.03, respectively.

CTSCREEN is appropriate for the following applications:

- Elevated point sources;
- Terrain elevations above stack top;
- Rural areas; and
- One-hour to annual averaging time periods.

Ambient Ratio Method and Ozone Limiting Method

Annual NO_2 concentrations will be calculated using the Ambient Ratio Method (ARM), adopted in Supplement C to the Guideline on Air Quality Models (USEPA, 1994). The Guideline allows a nationwide default conversion rate of 75% for annual NO_2/NO_x ratios.

Should NO_2 concentrations need to be examined in a more rigorous manner, the Ozone Limiting Method (OLM) will be used. Hourly ozone data collected at the Tracy monitoring station during 1997 through 1999 are proposed for use in the Ozone Limiting Method to calculate hourly NO_2 concentrations from hourly NO_x concentrations. The Ozone Limiting Method involves an initial comparison of the estimated maximum NO_x concentration and the ambient O_3 concentration to determine which is the limiting factor to NO_2 formation. If the O_3 concentration is greater than the maximum NO_x concentration, total conversion is assumed. If the NO_x concentration is greater than the O_3 concentration, the formation of NO_2 is limited by the ambient O_3 concentration. In this case, the NO_2 concentration is set equal to the O_3 concentration plus a correction factor that accounts for in-stack and near-stack thermal conversion.

EPA's ISC-OLM model will be used to calculate the NO_2 concentration based upon the OLM method. ISC-OLM will be implemented on a plume-by-plume basis (i.e., individual plume). However, for some receptors, a demonstration of plume merging may be made to allow use of the combined source analysis. Plume merging will be demonstrated as follows. The horizontal dispersion of each individual plume, as a function of downwind distance, will be identified using EPA's SCREEN3 dispersion model at the distance to the receptor of interest, under the appropriate meteorology. This value will be compared with half the distance between sources proposed for plume merging. If the horizontal dispersion at the distance to the receptor exceeds half the distance between the sources proposed for merging, then the plumes are assumed to have merged by the time they are transported to the receptor of interest.

Fumigation

The SCREEN3 model will be used to evaluate fumigation impacts for all short-term averaging periods (24 hours or less). The methodology in EPA 454/R-92-019 (Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised) will be followed for this analysis. Combined impacts for all sources under fumigation conditions will be evaluated, based on BAAQMD modeling guidelines.

GOOD ENGINEERING PRACTICE STACK HEIGHT AND DOWNWASH

ISCST3 can account for building downwash effects. Stack locations and heights and building locations and dimensions will be input to BPIP. The first part of BPIP determines and reports on whether a stack is being subjected to wake effects from a structure or structures. The second part calculates direction-dependent "equivalent building dimensions" if a stack is being influenced by structure wake effects. The BPIP output is formatted for use in ISCST3 input files.

RECEPTOR SELECTION

Receptor and source base elevations will be determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (i.e., 30-meter spacing between grid nodes). All coordinates will be referenced to UTM North American Datum 1927 (NAD27), zone 10. The ISC receptors from the DEM files will be placed exactly on the DEM nodes. Every effort will be made to maintain receptor spacing across DEM file boundaries.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. A 250-meter resolution coarse receptor grid will be developed and will extend outwards at least 10 km (or more as necessary to calculate the significant impact area). The maximum extent of the significant impact isopleth for any pollutant that triggers PSD review will be used to represent the impact radius.

For the full impact analyses, a nested grid will be developed to fully represent the significance area(s) and maximum impact area(s). This grid will have 30-meter resolution along the facility fenceline and out to 0.4 km from the fenceline, 60-meter spacing from 0.4 km to 1 km, and 250-meter spacing out to 10 km from the site. When maximum or maximum second-highest impacts occur in the 250 meter spaced area, additional refined receptor grids with 30-meter resolution will be placed around the maximum coarse grid impacts and extended out 1,000 meters in all directions. Concentrations within the facility fenceline will not be calculated.

MODELING SCENARIOS

Pollutant emissions to the atmosphere from the proposed facility will occur from combustion of natural gas in each of three identical combustion turbines. In addition, the HRSGs have the capacity to fire natural gas. Emission rates will be provided by Calpine and are based on vendor data and additional conservative assumptions of turbine and HRSG performance. Turbine/HRSG emissions and stack parameters, such as flow rate and exit temperature, exhibit some variation with ambient temperature and operating load. In order to calculate the worst-case air quality impacts, a screening analysis will be performed to evaluate each operating scenario (based on operating load with and without HRSG firing and atmospheric conditions) to predict the worst-case facility configuration on a pollutant-specific basis.

In the modeling analysis, maximum impacts will be predicted for maximum (100%) and reduced load conditions. In addition, different ambient temperatures will be evaluated for each load condition. Each of these conditions has unique performance characteristics that affect plume dispersion and thus predicted impacts. This analysis is most relevant to analyses for short-term impacts. Annual impacts will be evaluated based on expected turbine performance at an ambient temperature representative of the project site. The temperatures and humidity levels selected for the short-term screening analyses will closely reflect the range of possible site. The results of this screening analysis will be used to select the worst-case operational scenarios for the

modeling analyses in order to provide maximum operating flexibility. Refined modeling for the permit application will be based on these worst-case scenarios.

The screening modeling will use one complete year of meteorological data and the nested receptor grid described above to determine the worst-case source configuration (i.e., configuration that produces maximum facility impacts). This worst-case source configuration will then be executed with all three years of meteorological data and, if necessary, coarse grid impacts will be refined with fine grid receptors spaced 30 meters apart.

Ambient Air Quality Impact Analyses

In evaluating the impacts of the proposed project on ambient air quality, we will model the ambient impacts of the project, add those impacts to background concentrations, and compare the results to the state and federal ambient standards for SO_2, NO_2, PM_{10}, and CO.

In accordance with EPA guidance (40 CFR part 51, Appendix W, Sections 11.2.3.2 and 11.2.3.3), the highest modeled concentration will be used to demonstrate compliance with annual standards, while the highest second-highest modeled concentrations will be used to demonstrate compliance with standards based on averaging periods of 24 hours or less.

Increments Analysis

Increments are the maximum allowable increases in concentration that are allowed to occur above baseline concentrations for each pollutant for which an increment has been established: currently NO_2, SO_2, and PM_{10}. The baseline concentrations are defined for each pollutant and averaging time, and are the ambient concentrations of each pollutant existing at the time that the first complete PSD application affecting the area is submitted. Applicable ambient significance levels and increments for SO_2, NO_2, and PM_{10} are shown in Table 3.

Federal and BAAQMD regulations require increments analyses to be performed only for pollutants with ambient impacts exceeding these significance levels. If preliminary modeling shows that one or more significance levels are exceeded, a supplemental protocol will be provided for any required increments analyses.

Preconstruction Monitoring Requirements

Section 2-2-414.3 of the BAAQMD rules requires an applicant's air quality analysis to contain preconstruction ambient air quality monitoring data for purposes of establishing background pollutant concentrations in the impact area of the proposed facility. However, according to Rule 2-2-111, an applicant may be exempted from the requirement for preconstruction monitoring if the predicted air quality impacts of the facility do not exceed the specified *de minimis* levels listed in Table 4. An applicant may also, at the APCO's discretion, rely on

Table 3 PSD Ambient Significance Levels			
Pollutant/ Avg. Period	Significance Level ($\mu g/m^3$)	Class I Increment ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)
SO_2 - Annual	1	2	20
SO_2 - 24-hour	5	5	91
SO_2 - 3-hour	25	25	512
PM_{10} - Annual	1	4	17
PM_{10} - 24-hour	5	8	30
NO_2 - Annual	1	–	–
NO_2 - 1-hour	19	2.5	25

Table 4 Preconstruction Monitoring Thresholds	
CO: 8-hr average	575 $\mu g/m^3$
PM_{10}: 24-hr average	10 $\mu g/m^3$
NO_2: annual average	14 $\mu g/m^3$
SO_2: 24-hr average	13 $\mu g/m^3$

existing continuous air quality monitoring data collected at District-approved monitoring stations to satisfy the requirement for preconstruction monitoring.

Additional Impacts Analysis

For those pollutants emitted in significant amounts, the applicant will prepare additional impacts analysis for growth, soils and vegetation, and visibility. Visibility impacts will be evaluated using VISCREEN.

Impacts on Class I Areas

As required by Regulation 2-2-308, the applicant will prepare an analysis to determine whether the proposed project will result in emissions that would have an adverse impact on air quality related values, including visibility, acidic deposition, and regional haze, in Class I areas. An analysis will be conducted to determine the proposed project impact on visibility (extinction) at Point Reyes National Seashore and Pinnacles National Monument, the nearest Class I areas. The appropriate Federal Land Managers will be contacted with regards to preparing a Class I impact analysis.

Regulation 2-2-308 also requires a demonstration that emissions from a project located within 10 km (6.2 miles) of a Class I area will not cause or contribute to the exceedance of any national ambient air quality standard or any PSD increment there. Because the nearest Class I area, Point Reyes National Seashore, is greater than 10 km from the project site, this requirement is not applicable to the proposed project.

Additional Analyses Required by the CEC

Additional analyses that may be required by the CEC are a cumulative air quality impacts analysis and an analysis of construction impacts. The procedures to be used in evaluating construction impacts are discussed below. A separate protocol will be prepared for the cumulative impacts analysis.

Construction Impacts Analysis - The potential ambient impacts from air pollutant emissions during the construction of the East Altamont Energy Center project will be evaluated by air quality modeling that will account for the construction site location and the surrounding topography; the sources of emissions during construction, including vehicle and equipment exhaust emissions; and fugitive dust.

Site Description - The dispersion modeling analyses will include a description of the physical setting of the facility and surrounding terrain. A map showing the plant location, fence lines, and model receptors will be included, as well as a plot plan of the plant site indicating heights of nearby structures above a common reference point.

Types of Emission Sources - Construction of the proposed East Altamont Energy Center project will be divided into three main construction phases: (1) site preparation; (2) construction of foundations; and (3) installation and assembly of mechanical and electrical equipment. The construction impacts analysis will include a schedule for construction operation activities. Site preparation is expected to include site excavation, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations will begin. Once the foundations are finished, the installation and assembly of the mechanical and electrical equipment will begin.

Fugitive dust emissions from the construction of the project result from (1) dust entrained during excavation and grading at the construction site; (2) dust entrained during onsite travel on paved and unpaved roads and across the unpaved construction site; (3) dust entrained during aggregate and soil loading and unloading operations; (4) dust entrained from raw material transfer to and from material stockpiles; and (5) wind erosion of areas disturbed during construction activities. Heavy equipment exhaust emissions result from (1) exhaust from the heavy equipment used for excavation, grading, and construction of onsite structures; (2) exhaust from a water truck used to control construction dust emissions; (3) exhaust from Diesel welding machines, gasoline-powered generators, air compressors, and water pumps; and (4) exhaust from gasoline-powered pickup trucks and Diesel flatbed trucks used onsite to transport workers and materials around the construction site. Diesel and gasoline truck exhaust emissions will result from transport of mechanical and electrical equipment to the project site and transport of rubble and debris from the site to an appropriate landfill. Diesel exhaust emissions may also result from transport of raw materials to and from stockpiles.

Emissions from a worst-case day will be calculated for each of the three main construction phases and only the phase with the highest emissions will be modeled. As the construction impacts are expected to occur for a relatively short time compared with the lifetime of the project, only short-term averaging periods (24 hours or less) will be included in the construction modeling analysis.

Existing Ambient Levels - Ambient NO_2, SO_2, CO, and PM_{10} concentrations are monitored at three locations in the vicinity of the proposed site: Tracy, Stockton, and Fresno. These sites are believed to be representative of the site and are being proposed for use in the analysis.

Model Type - The EPA-approved ISCST3 model will be used to estimate ambient impacts from construction emissions. The modeling options and meteorological data described above will be used for the modeling analysis.

The construction site will be represented as an area source in the modeling analysis. Emissions will be divided into two categories: exhaust emissions and dust emissions. For exhaust emissions, a plume height of 4.6 meters (15 feet) will be used. Plume height refers to the distance measured from ground level to the centerline of the emissions plume. For dust emissions, a release height of two meters will be used due to the ambient plume temperatures and negligible plume velocities.

For the construction modeling analysis, the receptor grid will begin at the property boundary and will extend approximately one kilometer in all directions. Receptor spacing will be 60 meters.

FINAL MODELING SUBMITTAL

In accordance with BAAQMD modeling guidance, the final modeling analyses will also include the following materials:

- US Geological Survey (USGS) 7½-minute (1:24,000) map(s) showing the facility
- Completed "*Air Quality Modeling Checklist*";
- Modeling summaries of maximum impacts for each air quality model showing meteorological conditions and receptor location and elevation;
- All modeling outputs (including BPIP and meteorological files) on diskette, together with a description of all filenames;
- Plot plan showing emission points, nearby buildings (including dimensions), cross-section lines, property lines, fencelines, roads, and UTM coordinates; and
- Table showing the building identifiers in the BPIP run(s) and plot plan.

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February 1, 2001

sierra research

1801 J Street
Sacramento, CA 95814
(916) 444-6666
Fax: (916) 444-8373

Robin DeMandel
Research and Modeling Manager
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

Re: Response to District Comments
Modeling Protocol for the East Altamont Energy Center

Dear Mr. DeMandel:

Thank you for your letter of January 10, 2001, in which you provided comments on your preliminary review of our modeling protocol for Calpine's East Altamont Energy Center. In an effort to avoid any misunderstanding or confusion on our part as we prepare the formal application, we have provided responses to your comments below. For convenience in reading, your comments are shown in italics.

(1) *The source characteristics and the physical characteristics of the facility have not been provided. Stack height, containment buildings, source characteristics and pollution abatement devices are all unknown. These characteristics are needed in order to thoroughly review the potential impact from a facility.*

The application will contain all of the requested information in tabular and graphical forms. GEP input and output files will also be provided.

(2) *Under existing guidance, the air quality models proposed would be acceptable. A determination of acceptable models, though, is not made until a permit application is actually filed. The most current version of the models, at the time of the permit application, would be required. EPA is also expected to make changes to the Guideline on Air Quality Models in the near future. Depending on the release of this Guidance and the submittal of the permit application, different or additional models may be required.*

Comment noted. We intend to file the application within the next few weeks, prior to issuance of the revised Guideline. However, we will incorporate any revised EPA guidance that is issued prior to filing the application.

(3) *The ozone limiting method can only be used for predicting hourly averaged NO_2 concentrations. The Ambient Ratio Method can only be used for determining annual NO_2 concentrations.*

In accordance with District guidance, the ozone limiting method will be used only for predicting hourly average NO_2 concentrations. The Ambient Ratio method, with the default value of 0.75, will be used for determining annual NO_2 concentrations.

(4) *EPA requires a Class I increment analysis of any PSD source within 100 km of a Class I area which increases NO_2 or PM_{10} concentrations by 1 ug/m^3 or more (24-hour average) inside the Class I area. Therefore, the applicant should show that the 24-hour impacts of NO_2 and PM_{10} are below 1 ug/m^3.*

The applicant will coordinate with the appropriate Federal Land Managers in providing the required analysis of the impacts of the project on air quality-related values in the Class I areas. As part of this analysis, we will evaluate the 24-hour impacts of NO_2 and PM_{10} on Point Reyes National Seashore to demonstrate that these impacts are below the 1 ug/m^3 significance threshold.

(5) *In accordance with District Regulation 2-2-111, the applicant must provide at least one year of continuous ambient air quality monitoring data, unless the air quality impacts of the proposed new source or existing air pollutant levels are less than the PSD monitoring exemption levels. These levels are given in District Regulation 2-2-111. The applicant has proposed to use the air monitoring data from Tracy, Stockton and Fresno. Section 2.4 of Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD) (EPA-450/4-87-007) states that existing monitoring data must be representative of the proposed facility impact area (see section 2.4.1 of the Guidelines). The applicant therefore must show that the monitoring data is representative of the following three areas: (1) the location of maximum concentration increase from the proposed source, (2) the location of the maximum air pollutant concentration from existing sources, and (3) the location of the maximum impact area, i.e. where the maximum pollutant concentration would hypothetically occur based on the combined effect of existing sources and the proposed new source. If the applicant can show that the existing monitoring data from Tracy, Stockton and Fresno meet these criteria, then Section 2.4.3 states that the latest 3 years of monitoring data may be used. Otherwise, the applicant may need to model other sources to add to the monitoring data. A monitoring protocol should be submitted to the District if the applicant chooses to perform on-site monitoring.*

The air quality impacts of the proposed new source will be below the PSD monitoring exemption levels as shown in District regulation 2-2-111. The application will include a demonstration that the air monitoring data proposed for use meets the criteria set forth by EPA.

(6) *Application should include a table detailing emissions calculated and modeled for each source and each scenario: commissioning, start-up, 1-hour, 3-hour, 8-hour, 24-hour and annual average. The assumptions used in calculating the emission rates used in the modeling should be clearly identified (load level, ambient temperature, power augmentation, exhaust temperature and exit velocity).*

The requested information will be provided in the application.

(7) *Additional analyses must be carried out before a meteorological data set can be approved for modeling the facility. While the information provided on the data sets available were informative and illustrative, the analysis was incomplete. The following issues must be resolved before a decision can be made on approving a meteorological data set for the modeling analysis:*

(a) *The wind rose shows that winds at the SJVUAPCD monitoring site are probably more influenced by flow through the Patterson Pass, rather than the Altamont Pass. How similar or different do you expect wind speeds and directions to be in an area more influenced by flow through the Altamont Pass?*

Wind speeds and prevailing wind directions are expected to be very similar throughout the area immediately east of the passes. To verify this, wind speed and direction data have been obtained from some of the wind turbine operators. Data from two stations in the eastern end of the Altamont Pass were analyzed. The first station, Jensen-1, is a 13-meter tower on a hill just north of the I-580 and two km west of the I-580/I-205 intersection. Wind direction and wind speed data were collected in 1988 and from 1997 through 2000.

The second station, Martin-1, is a 12-meter tower atop a hill about two km south of the I-580/I-205 intersection. Hourly wind speed and wind direction data was recorded there from January 1986 through March 1988. Figures 1 and 2 show the location of each monitoring station relative to terrain.

Both stations have good local exposures on hilltops, with minimal local topographic influence on wind direction. Surface roughness is very low as well, with all stations surrounded by grass.

Wind roses for each of the two sites are also attached. There are two tabular roses (hours of occurrence and percent frequency; Tables 1 and 2) followed by graphical plots of the joint frequency distribution (Figures 3 and 4). The standard 16-point compass directions are used, and there are seven wind speed categories (including calms at less than 0.5 m/s). The wind roses are virtually identical, with between 55 and 60 percent of winds from the west through the southwest sectors. The mean wind speeds are also significantly higher in those sectors than in the other sectors.

If Patterson Pass affected the winds differently than Altamont Pass, then one would expect to see a significant difference between the winds at these stations and the winds from the Tracy monitoring station. However, comparison of Jensen-1 and Martin-1 to the Tracy site shows an almost identical pattern of wind direction and a similar pattern with regard to wind speed. We believe this demonstrates that the wind rose from the Tracy monitoring site does not show any significant influence from Patterson Pass. Thus, the proposed monitoring site at Tracy is representative of the wind field generated and enhanced by Altamont Pass.

(b) *The statement "incoming solar radiation at all sites would be identical" is probably only accurate for completely clear days. Solar data from at least two locations are not available to verify this statement. A separation of 30+ km is certainly large enough to produce a variation in incoming solar for even partly cloudy days. Treatment of cloudy days needs to be explicitly addressed.*

A variation in incoming solar radiation on cloudy days would be significant if this variation affected the determination of Pasquill-Gifford (P-G) stability class for the project site. However, in the Altamont Pass area the wind speeds are generally so high that stability class determination is driven by wind speed rather than degree of cloud cover.

The Altamont Pass area is characterized by high wind speeds. The average wind speed at the Tracy Monitoring Station (1997-1999) is 4.7 m/s and over 40 percent of all hours have wind speeds above 3.4 m/s. On days with cloudy to partly cloudy conditions, these high wind speeds would modify the P-G stability category towards C or D stability since the high wind speeds tend to cause the boundary layer to become well mixed with regards to both mechanical and thermal turbulent forces. Thus, in the area, one would expect, given the high wind speeds, that C and D stability would predominate. Analyzing a stability rose (see Figure 5) based on Stockton ceiling and sky cover and Tracy wind speed and wind direction, the predominant wind direction (west-west southwest) is most often characterized by D stability. Thus, the high wind speeds that are characteristic of the area would tend to shift the stability categories towards neutral conditions regardless of cloud cover.

(c) *Since it is known that meteorological data have been collected by the owners of the wind mills (and their subcontractors) in the hills and passes north and south of the Altamont Pass, an effort should be made to obtain and analyze these data west of both the air monitoring station and the project site. Results that show similar flow west of each location would certainly help support the claim that the SJVUAPCD met. data are representative of the project site.*

In addition to the two data sets discussed under response 7a above, an additional data set was obtained from the Muller-7 monitoring station. The data were collected with a 12-meter tower on a small knoll about five km north-northwest of the I-580/I-205 intersection. The Muller-7 station was located less than 1 km from the edge of the San Joaquin Valley floor and 2.5 km southwest of the proposed project location. Hourly wind speed and wind direction data were recorded from February 1987 through January 1988. A map showing the location is attached as Figure 6, along with wind rose plots and frequency distributions (Figure 7 and Table 3, respectively).

The Muller-7 site has prevailing winds from the southwest with over 40 percent of the wind speeds in excess of 3.4 m/s. As with the Tracy, Jensen, and Martin monitoring locations, the highest wind speeds are associated with west-southwest and southwest wind directions. The Muller-7 site exhibits a one-point compass shift in predominant wind direction such that the majority of the winds are from the southwest followed by the west-southwest and west directions. The other stations show a majority in the west-southwest direction followed by southwest and west directions. However, all four stations show a similar pattern of westerly winds in terms of both magnitude and direction such that almost 50 percent of the total frequency contains a westerly or southwesterly component.

Because the terrain surrounding the project site is relatively flat, maximum project impacts are being driven by generally high, unidirectional wind speeds and neutral stability. This feature is seen in all four meteorological data sets and is clearly typical of the area. Figure 8 presents all four wind roses for comparison.

Thus, the proposed monitoring site at Tracy is representative of the wind field generated and enhanced by Altamont Pass.

(d) *Since June 2000, SJVUAPCD has been operating a Radar Profiler with RASS at the Tracy Sewage Treatment Plant as part of the CCOS and CRPAQS Field Studies. A surface station was operating concurrently through the end of October 2000. The surface station data from the Sewage Treatment station should be compared with the proposed Tracy monitoring Station meteorological data set. Once the surface stations have been correlated, the upper air data should be analyzed to verify that the air monitoring surface station data will accurately reflect the wind magnitude and the wind direction at the expected plume heights. (As stated above, the stack height and plume characteristics have not been provided to the District).*

We requested the Radar Profiler data from the SJVUAPCD but were unable to obtain it. Therefore, we are unable to provide the requested analysis. However, we do not believe that this type of analysis is necessary to assess whether the Tracy meteorological data are representative of conditions at the project site.

Gaussian models extrapolate wind speeds to stack top elevation based upon stability and the starting elevation of the monitoring station. Wind speed is used to dilute the plume at stack top, as well as being used in the calculation of final plume rise. Wind speed data are not used for any other purpose, either at stack top or at the elevation of final plume rise. Correlating wind data from a surface station to wind data at the height of final rise does not produce meaningful data if the application requires the use of a Gaussian plume model, such as ISCST3.

EPA modeling guidance suggests that in simple terrain, wind speed data should be representative of wind speeds at stack height. The use of surface-based data in simple terrain can approximate wind speed data at stack top once the logarithmic wind profile correction is made. However, the high wind speeds experienced at the project site tend to minimize plume rise, so wind speeds and directions at higher elevations are not expected to have a significant impact on the modeling results. We believe that the comparison of the Tracy monitoring station data with meteorological data from wind turbine stations in the Altamont Pass area demonstrates that the Tracy data are representative of meteorological conditions at the project site.

The additional information requested in your letter will be included in the permit application, along with the information provided above in response to question (7). If you require

additional information regarding meteorological data beyond what is provided in response to question (7) above, please do not hesitate to call.

Sincerely,

Gary Rubenstein

Gary Rubenstein

attachments

cc: Glen Long, BAAQMD
Jim Cordova, BAAQMD
Alicia Torre, Calpine
Neal Pospisil, Calpine
Joe Loyer, CEC

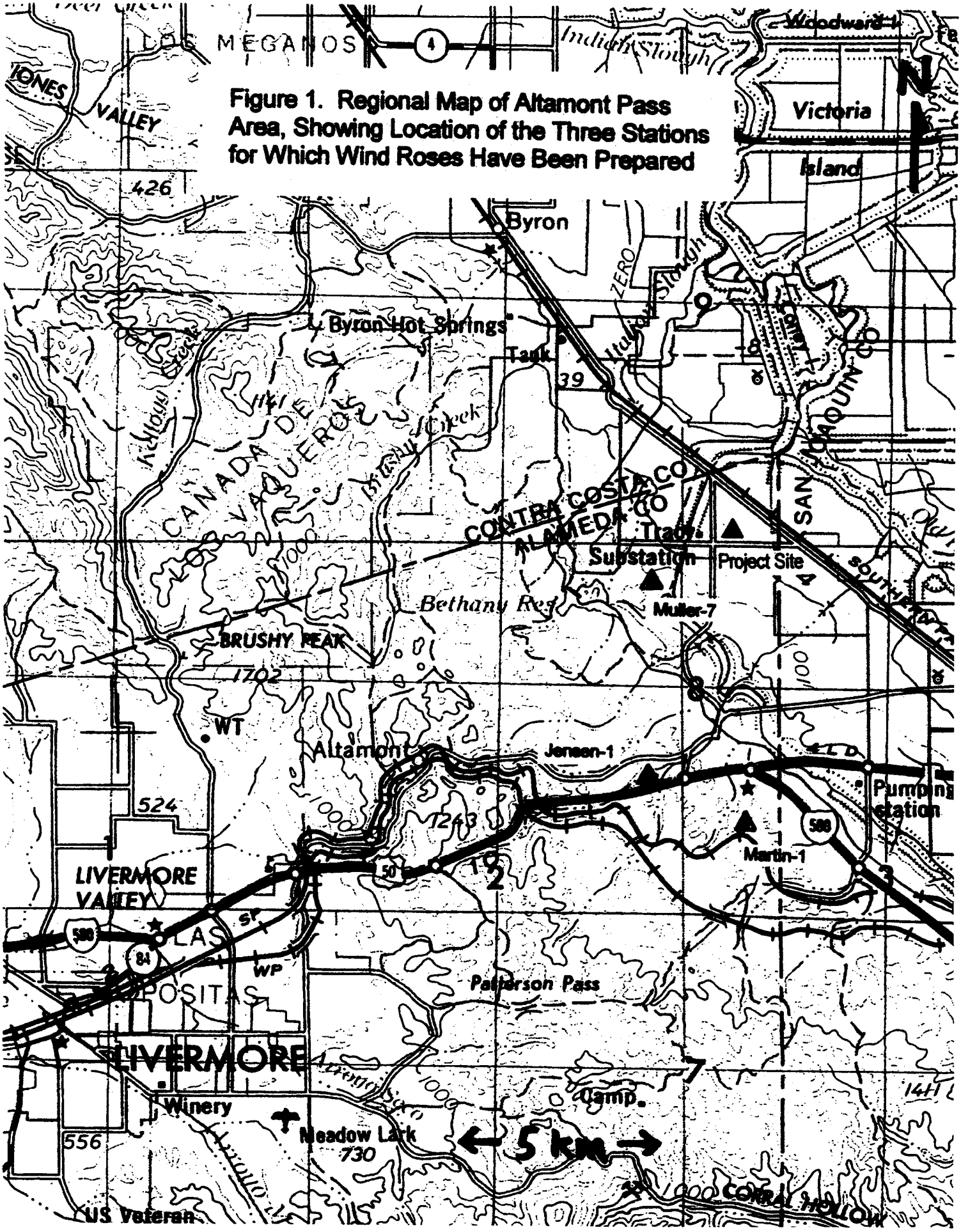

Figure 1. Regional Map of Altamont Pass Area, Showing Location of the Three Stations for Which Wind Roses Have Been Prepared

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STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

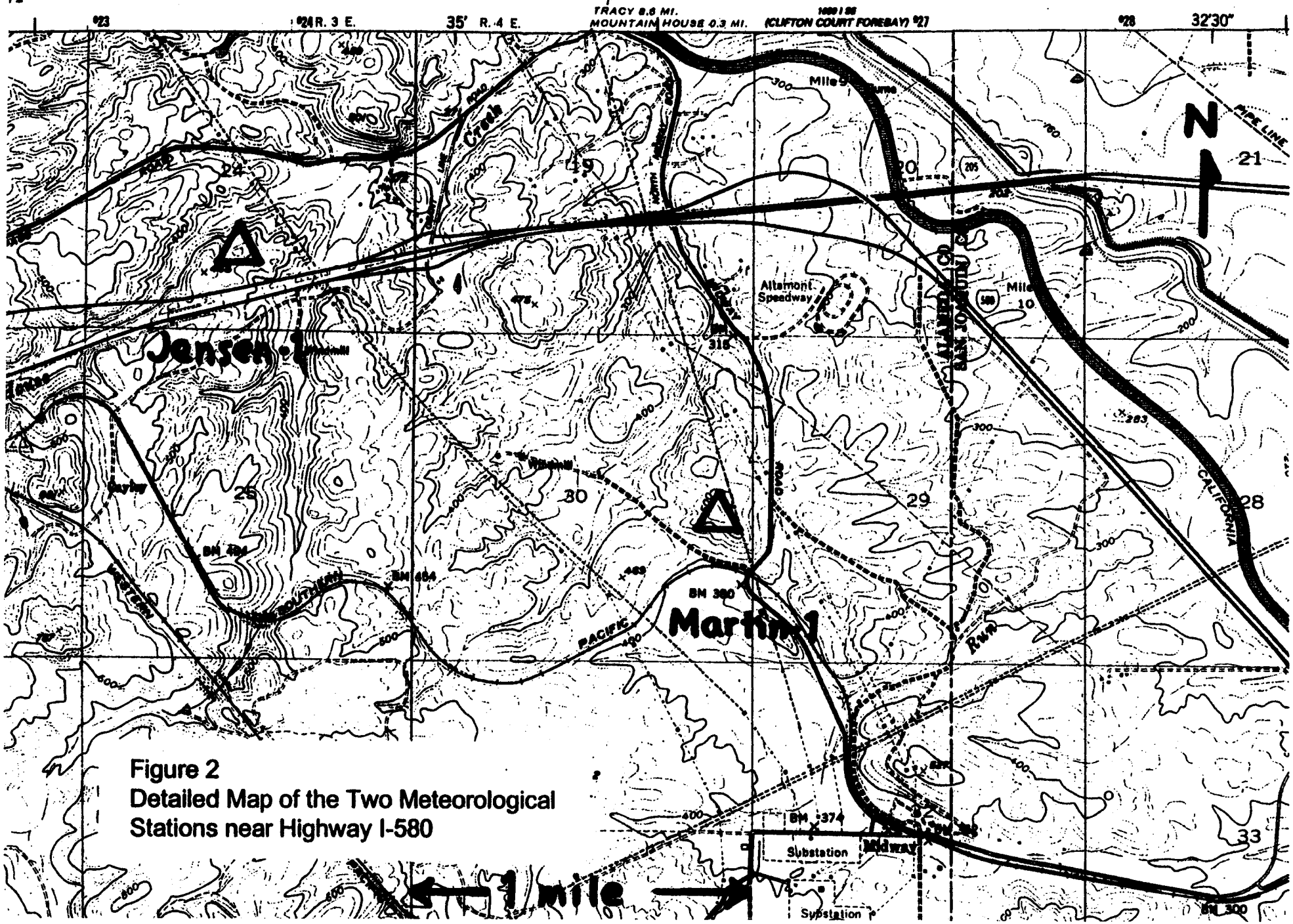


Figure 2
Detailed Map of the Two Meteorological Stations near Highway I-580

Table 1

Eastern Altamont Pass
Jensen-1, 43-ft Level
Wind Rose*
1 Mar 1988 - 2 Oct 2000

	Wind Speed (m/s)							
	0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
Direction**								
N	285	378	324	71	4	6	1068	3.3
NNE	294	310	124	5	.	.	733	2.5
NE	344	129	18	37	30	25	583	3.0
ENE	314	126	20	15	4	6	485	2.2
E	192	124	61	26	3	.	406	2.6
ESE	351	199	130	132	63	32	907	3.9
SE	311	112	66	36	13	19	557	2.9
SSE	186	72	37	30	5	2	332	2.6
S	168	73	55	44	8	3	351	3.1
SSW	334	196	268	253	138	67	1256	4.9
SW	348	218	384	927	741	1274	3892	8.7
WSW	528	658	1048	2856	1751	3158	9999	8.8
W	335	497	1150	1360	402	315	4059	6.1
WNW	247	294	211	63	19	13	847	3.4
NW	276	289	369	351	114	72	1471	5.0
NNW	310	423	526	347	83	66	1755	4.6
Calms	811						811	
Column Count	5634	4098	4791	6553	3378	5058	Total 29512	6.4

96.8% Data Recovery. (976 Hours Missing)
*Entries represent the number of hours in the joint frequency distribution.

	Wind Speed (m/s)							
	0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
Direction**								
N	0.97	1.28	1.10	0.24	0.01	0.02	3.62	3.3
NNE	1.00	1.05	0.42	0.02	.	.	2.48	2.5
NE	1.17	0.44	0.06	0.13	0.10	0.08	1.98	3.0
ENE	1.06	0.43	0.07	0.05	0.01	0.02	1.64	2.2
E	0.65	0.42	0.21	0.09	0.01	.	1.38	2.6
ESE	1.19	0.67	0.44	0.45	0.21	0.11	3.07	3.9
SE	1.05	0.38	0.22	0.12	0.04	0.06	1.89	2.9
SSE	0.63	0.24	0.13	0.10	0.02	0.01	1.12	2.6
S	0.57	0.25	0.19	0.15	0.03	0.01	1.19	3.1
SSW	1.13	0.66	0.91	0.86	0.47	0.23	4.26	4.9
SW	1.18	0.74	1.30	3.14	2.51	4.32	13.19	8.7
WSW	1.79	2.23	3.55	9.68	5.93	10.70	33.88	8.8
W	1.14	1.68	3.90	4.61	1.36	1.07	13.75	6.1
WNW	0.84	1.00	0.71	0.21	0.06	0.04	2.87	3.4
NW	0.94	0.98	1.25	1.19	0.39	0.24	4.98	5.0
NNW	1.05	1.43	1.78	1.18	0.28	0.22	5.95	4.6
Calms	2.75						2.75	
Column Count	19.09	13.89	16.23	22.20	11.45	17.14	Total 100.00	6.4

96.8% Data Recovery. (976 Hours Missing)
*Entries represent the percentage of hours in the joint frequency distribution.
**wind direction refers to the direction from which the wind is blowing.
For example, SSE refers to a wind blowing from the south-southeast.

Table 2

Eastern Altamont Pass
Martin-1
Wind Rose*
1 Jan 1986 - 1 Mar 1988

	Wind Speed (m/s)							
	0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
Direction**								
N	271	199	74	6	.	3	553	2.4
NNE	210	180	59	1	.	.	450	2.3
NE	167	91	9	.	.	.	267	1.9
ENE	255	131	23	6	.	.	415	2.0
E	232	240	79	33	5	3	592	2.7
ESE	172	143	121	96	27	35	594	4.3
SE	124	57	29	30	7	32	279	4.2
SSE	160	32	16	6	2	3	219	2.1
S	178	44	14	16	4	1	257	2.2
SSW	151	64	40	26	12	16	309	3.4
SW	199	179	208	292	187	550	1615	8.3
WSW	333	354	608	1627	1149	1711	5782	8.7
W	407	461	558	720	246	174	2566	5.5
WNW	318	283	299	101	14	2	1017	3.3
NW	372	381	341	238	74	68	1474	4.3
NNW	174	157	190	169	63	92	845	5.4
Calms	582						582	
Column Count	4305	2996	2668	3367	1790	2690	Total 17816	5.8

93.9% Data Recovery. (1159 Hours Missing)
*Entries represent the number of hours in the joint frequency distribution.

	Wind Speed (m/s)							
	0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
Direction**								
N	1.52	1.12	0.42	0.03	.	0.02	3.10	2.4
NNE	1.18	1.01	0.33	0.01	.	.	2.53	2.3
NE	0.94	0.51	0.05	.	.	.	1.50	1.9
ENE	1.43	0.74	0.13	0.03	.	.	2.33	2.0
E	1.30	1.35	0.44	0.19	0.03	0.02	3.32	2.7
ESE	0.97	0.80	0.68	0.54	0.15	0.20	3.33	4.3
SE	0.70	0.32	0.16	0.17	0.04	0.18	1.57	4.2
SSE	0.90	0.18	0.09	0.03	0.01	0.02	1.23	2.1
S	1.00	0.25	0.08	0.09	0.02	0.01	1.44	2.2
SSW	0.85	0.36	0.22	0.15	0.07	0.09	1.73	3.4
SW	1.12	1.00	1.17	1.64	1.05	3.09	9.06	8.3
WSW	1.87	1.99	3.41	9.13	6.45	9.60	32.45	8.7
W	2.28	2.59	3.13	4.04	1.38	0.98	14.40	5.5
WNW	1.78	1.59	1.68	0.57	0.08	0.01	5.71	3.3
NW	2.09	2.14	1.91	1.34	0.42	0.38	8.27	4.3
NNW	0.98	0.88	1.07	0.95	0.35	0.52	4.74	5.4
Calms	3.27						3.27	
Column Count	24.16	16.82	14.98	18.90	10.05	15.10	Total 100.00	5.8

93.9% Data Recovery. (1159 Hours Missing)
*Entries represent the percentage of hours in the joint frequency distribution.
**wind direction refers to the direction from which the wind is blowing.
For example, SSE refers to a wind blowing from the south-southeast.

Table 3

Eastern Altamont Pass
Muller-7
Wind Rose*
18 Feb 1987 - 1 Jan 1988

Direction**	Wind Speed (m/s) 0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
N	141	83	39	5	1	3	272	2.4
NNE	90	86	25	.	.	.	201	2.3
NE	61	20	5	.	.	.	86	1.7
ENE	64	28	4	.	.	.	96	1.8
E	49	35	10	.	3	.	97	2.4
ESE	50	55	38	35	13	14	205	4.6
SE	38	30	20	18	8	3	117	3.9
SSE	46	23	3	2	.	.	74	2.0
S	65	31	22	14	2	1	135	2.9
SSW	66	68	99	182	104	107	626	7.0
SW	83	115	327	879	569	592	2565	8.4
WSW	72	98	198	370	155	51	944	6.4
W	71	64	51	30	1	.	217	3.3
WNW	73	62	75	89	12	2	313	4.4
NW	91	111	134	108	52	27	523	5.0
NNW	63	74	59	34	23	51	304	5.6
Calms	338						338	
Column Count	1461	983	1109	1766	943	851	Total 7113	5.9

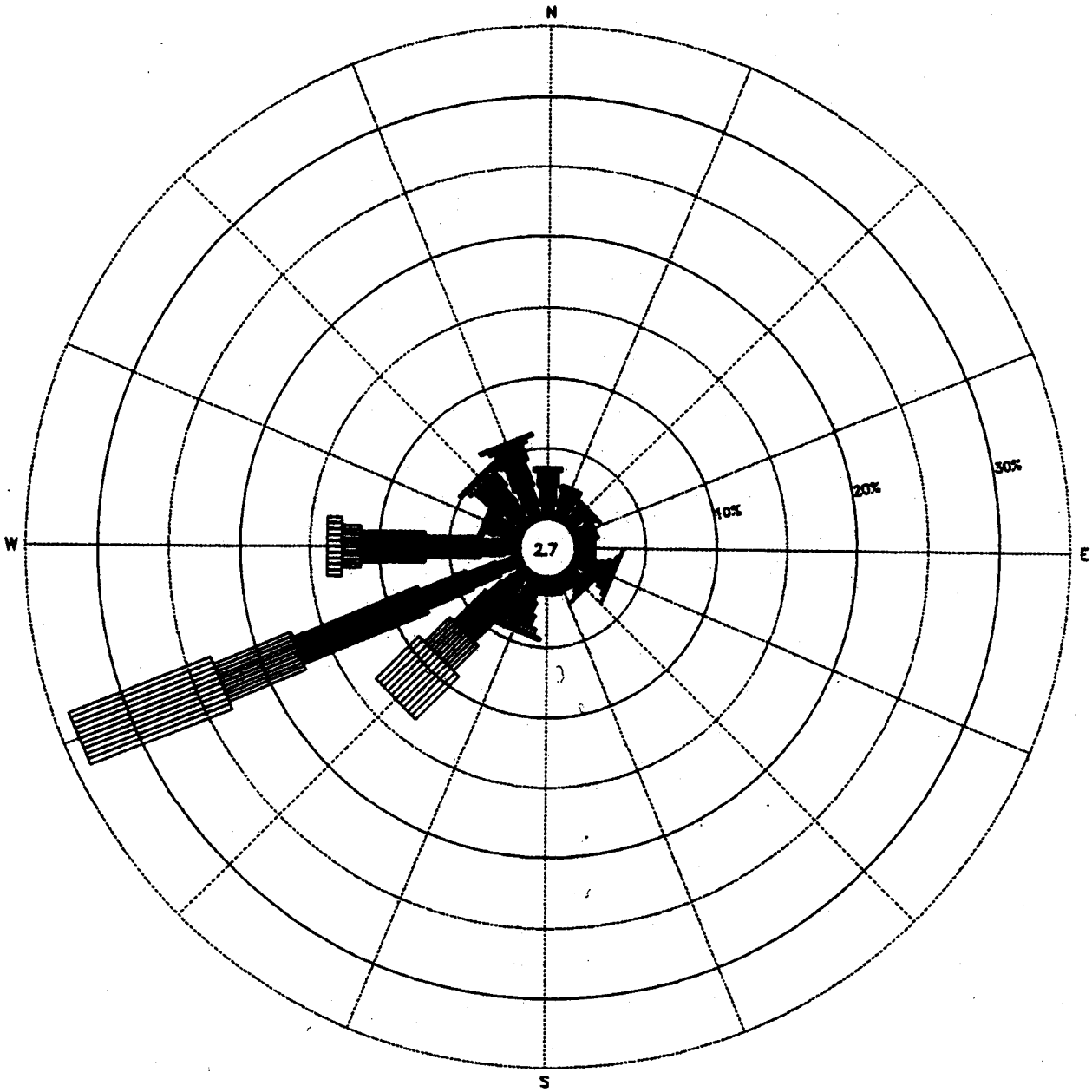
93.5% Data Recovery. (497 Hours Missing)
*Entries represent the number of hours in the joint frequency distribution.

Wind Speed (m/s)

Direction**	0.5-2.1	2.1-3.6	3.6-5.7	5.7-8.8	8.8-10.8	10.8-99	Row Count	Mean Speed
N	1.98	1.17	0.55	0.07	0.01	0.04	3.82	2.4
NNE	1.27	1.21	0.35	.	.	.	2.83	2.3
NE	0.86	0.28	0.07	.	.	.	1.21	1.7
ENE	0.90	0.39	0.06	.	.	.	1.35	1.8
E	0.69	0.49	0.14	.	0.04	.	1.36	2.4
ESE	0.70	0.77	0.53	0.49	0.18	0.20	2.88	4.6
SE	0.53	0.42	0.28	0.25	0.11	0.04	1.64	3.9
SSE	0.65	0.32	0.04	0.03	.	.	1.04	2.0
S	0.91	0.44	0.31	0.20	0.03	0.01	1.90	2.9
SSW	0.93	0.96	1.39	2.56	1.46	1.50	8.80	7.0
SW	1.17	1.62	4.60	12.36	8.00	8.32	36.06	8.4
WSW	1.01	1.38	2.78	5.20	2.18	0.72	13.27	6.4
W	1.00	0.90	0.72	0.42	0.01	.	3.05	3.3
WNW	1.03	0.87	1.05	1.25	0.17	0.03	4.40	4.4
NW	1.28	1.56	1.88	1.52	0.73	0.38	7.35	5.0
NNW	0.89	1.04	0.83	0.48	0.32	0.72	4.27	5.6
Calms	4.75						4.75	
Column Count	20.54	13.82	15.59	24.83	13.26	11.96	Total 100.00	5.9

93.5% Data Recovery. (497 Hours Missing)
*Entries represent the percentage of hours in the joint frequency distribution.
**wind direction refers to the direction from which the wind is blowing.
For example, SSE refers to a wind blowing from the south-southeast.

Figure 3
Eastern Altamont Pass
1 Mar 1988 – 2 Oct 2000
Jensen–1, 43–ft Level
Wind Rose



29513 hours of valid data; 96.8 % Data Recovery

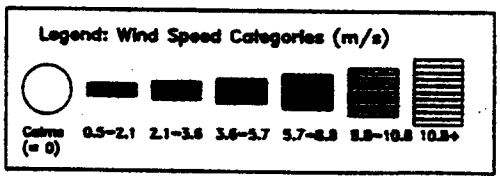
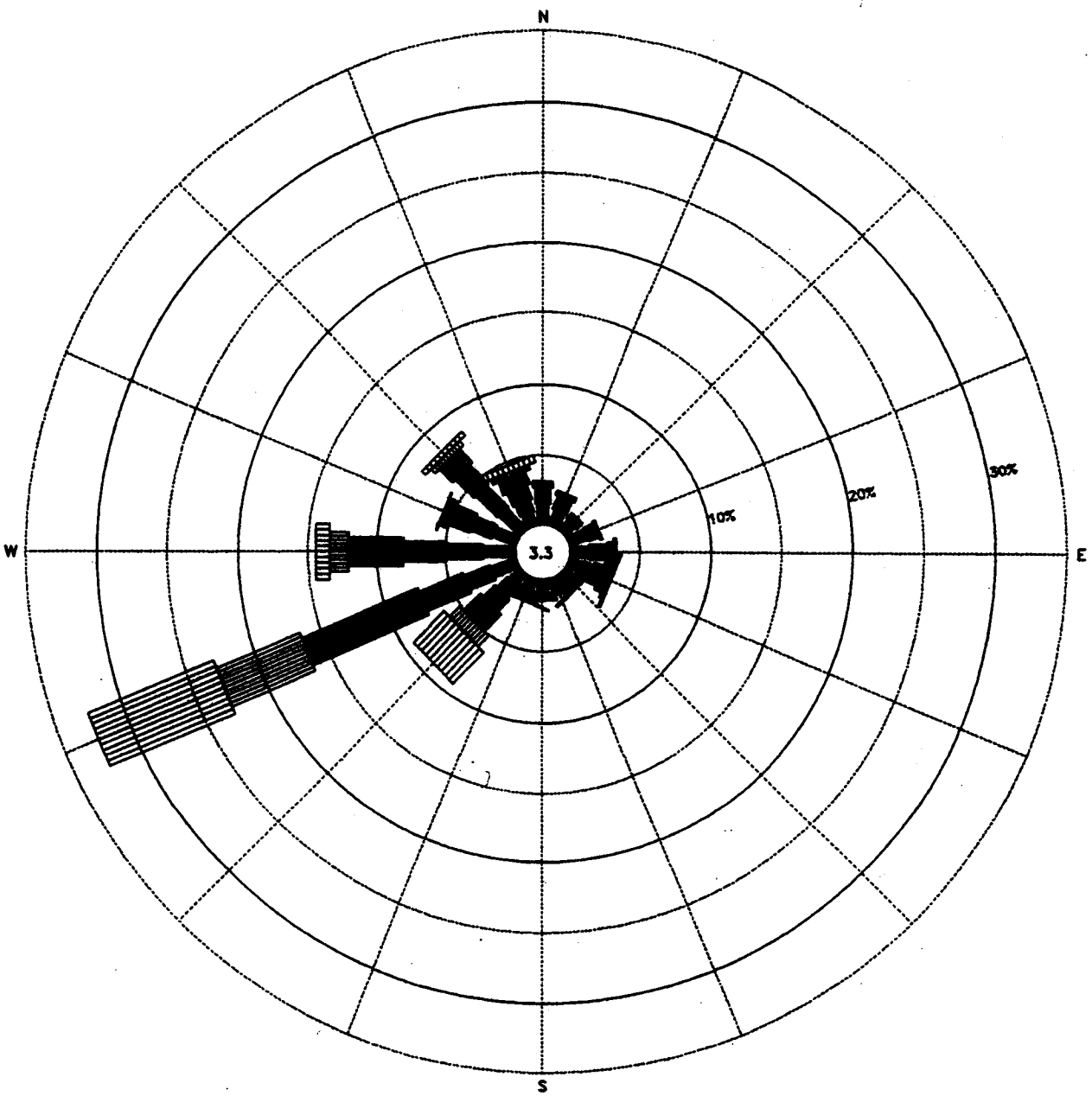


Figure 4

Eastern Altamont Pass
1 Jan 1986 – 1 Mar 1988
Martin–1
Wind Rose



17816 hours of valid data; 93.9 % Data Recovery

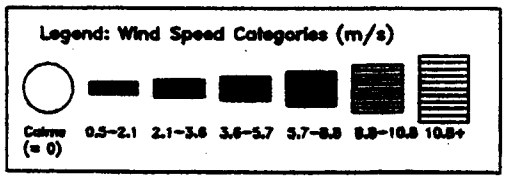
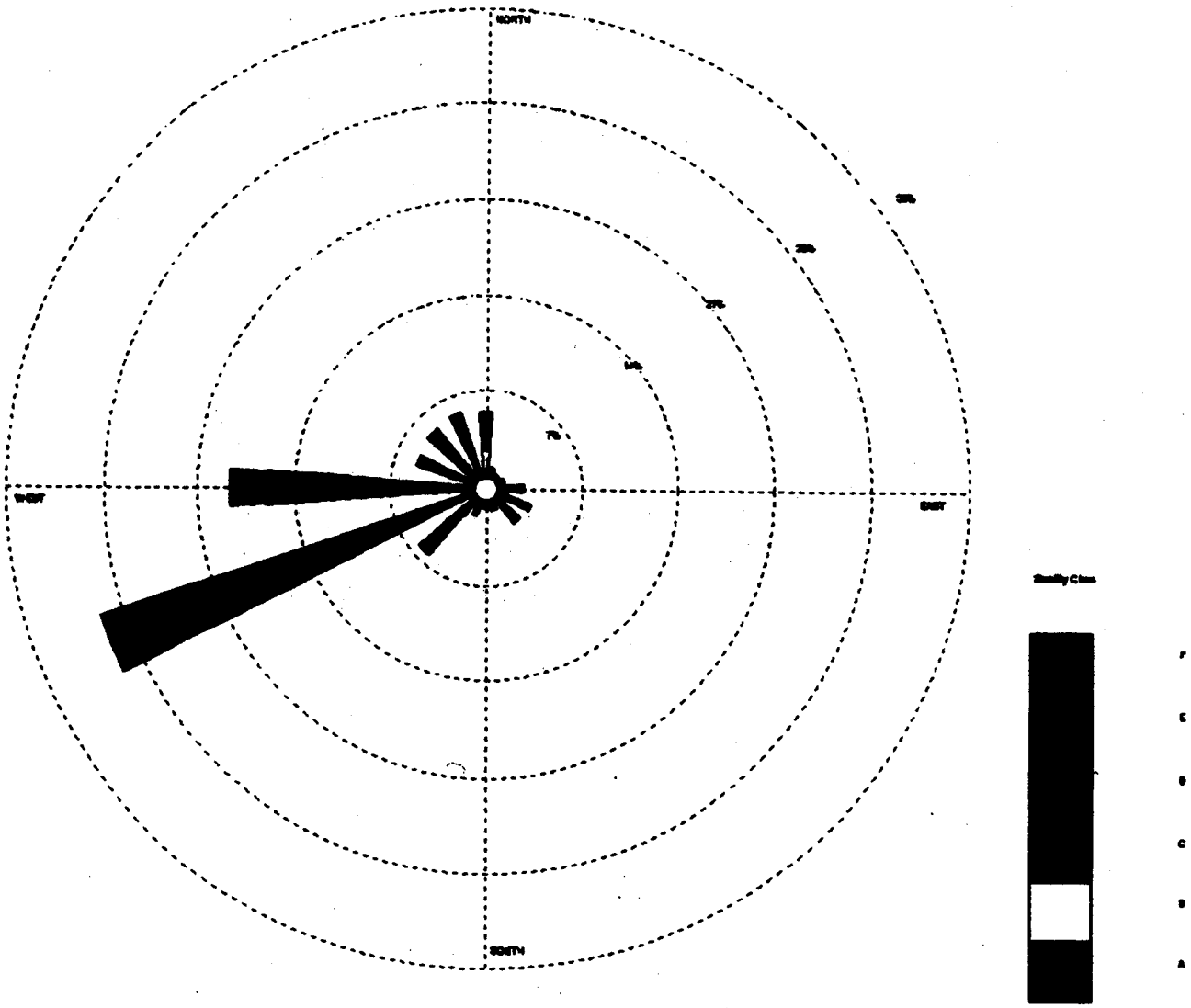


Figure 5

TRACY PATTERSON PASS MONITORING STATION STABILITY ROSE 1997-1999
STABILITY CALCULATION BASED UPON CONCURRENT STOCKTON AIR PORT DATA



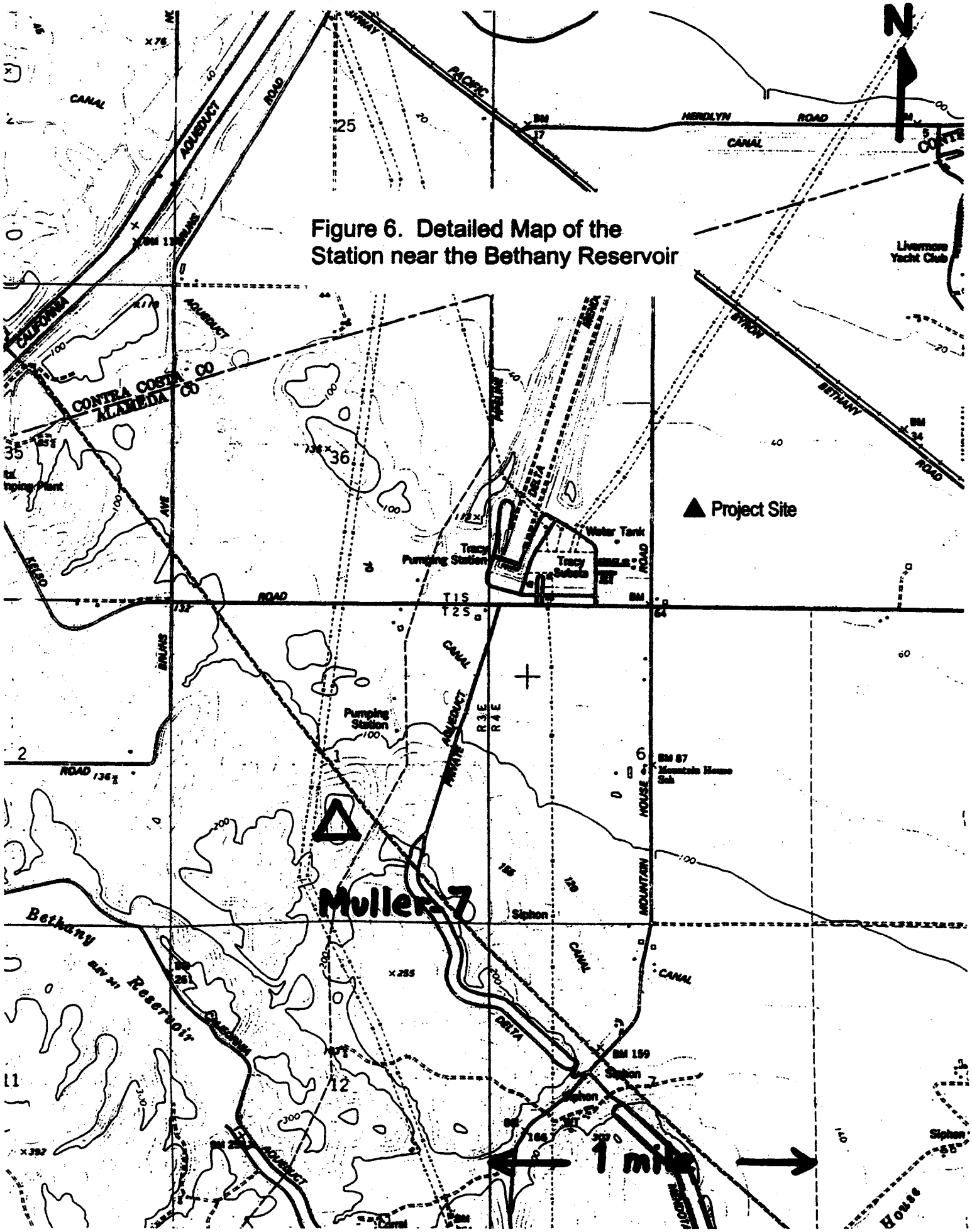
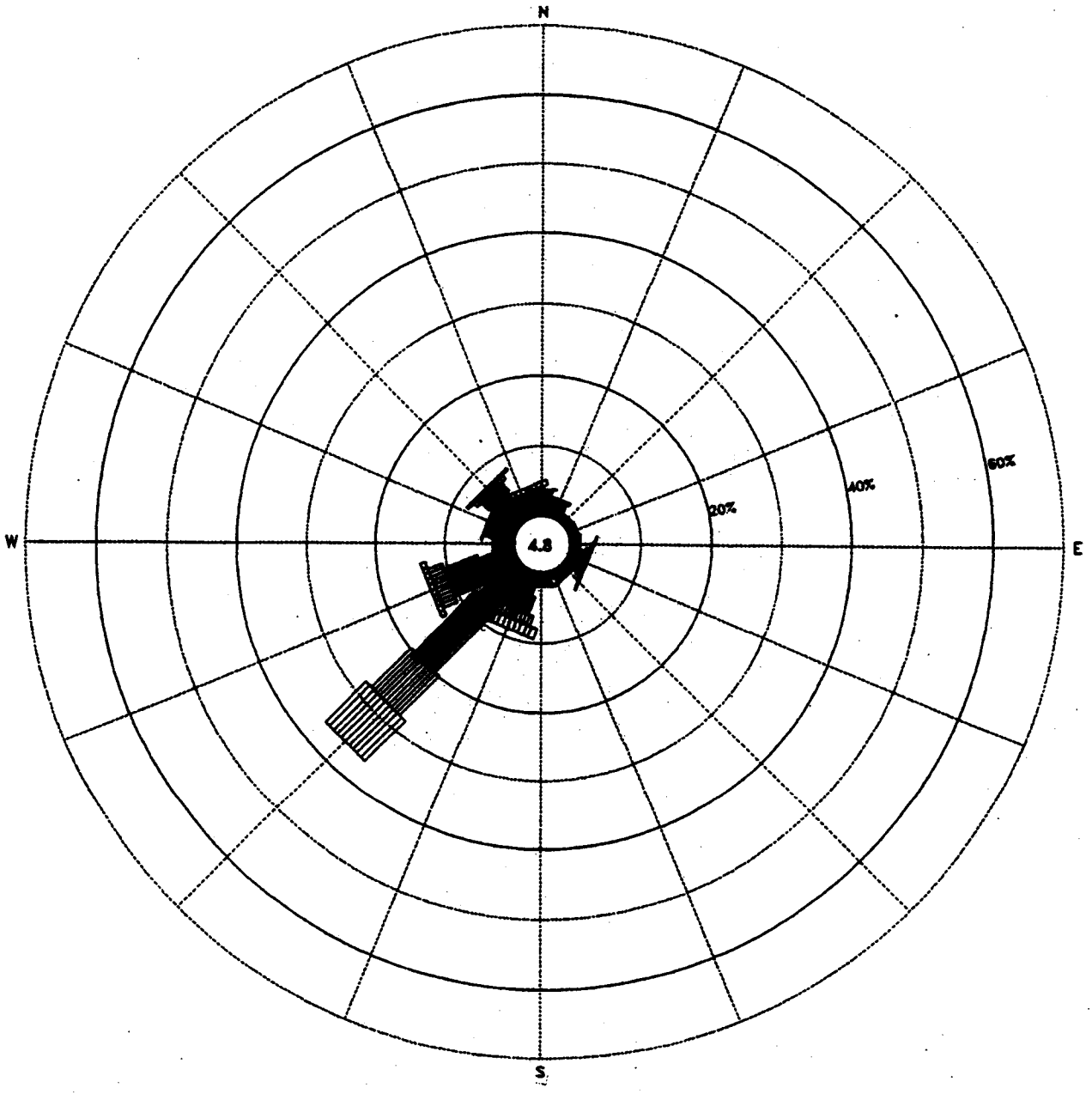


Figure 6. Detailed Map of the Station near the Bethany Reservoir

Figure 7

Eastern Altamont Pass
18 Feb 1987 – 1 Jan 1988
Muller–7
Wind Rose



7113 hours of valid data; 93.5 % Data Recovery

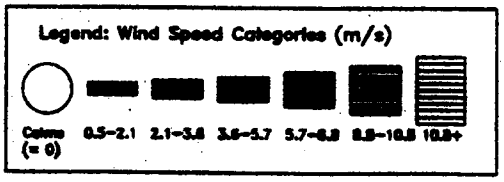
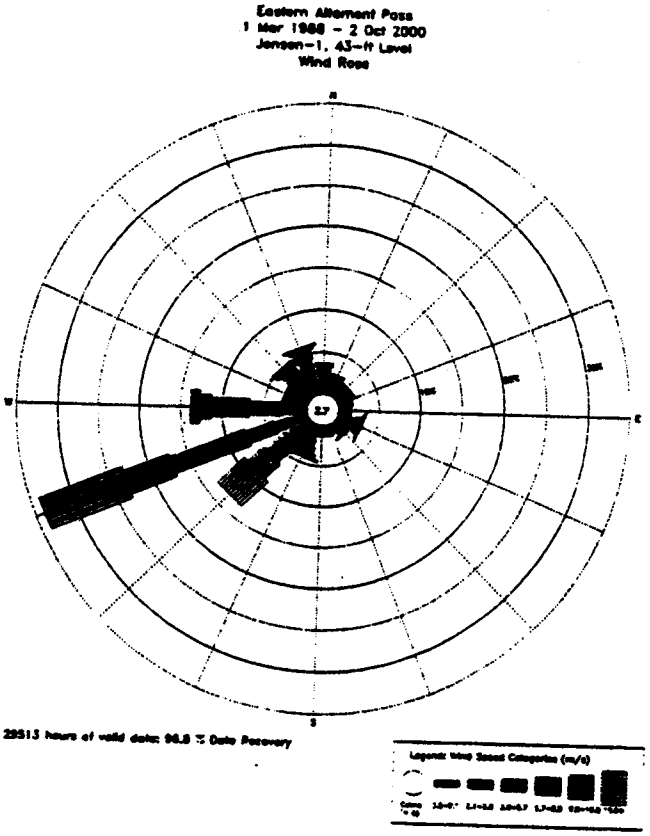
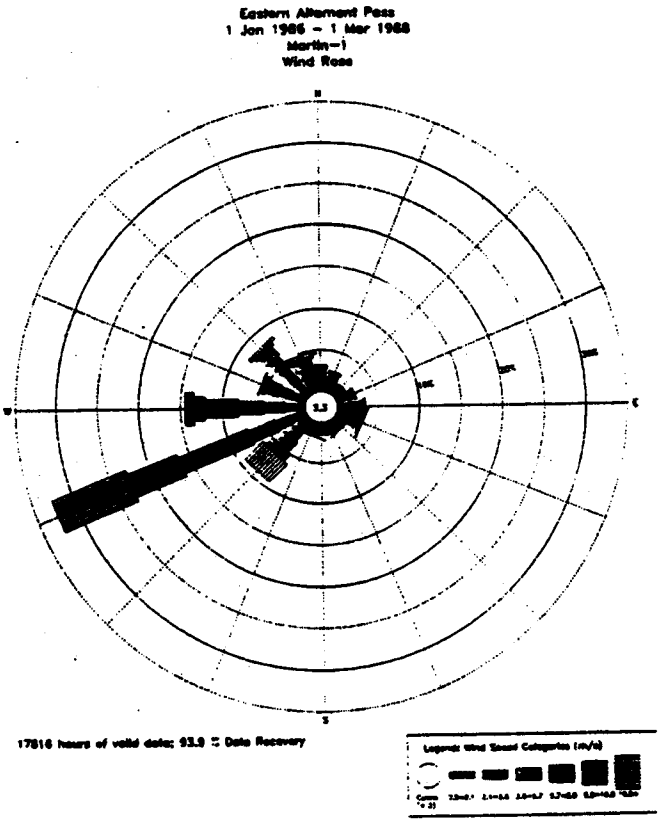
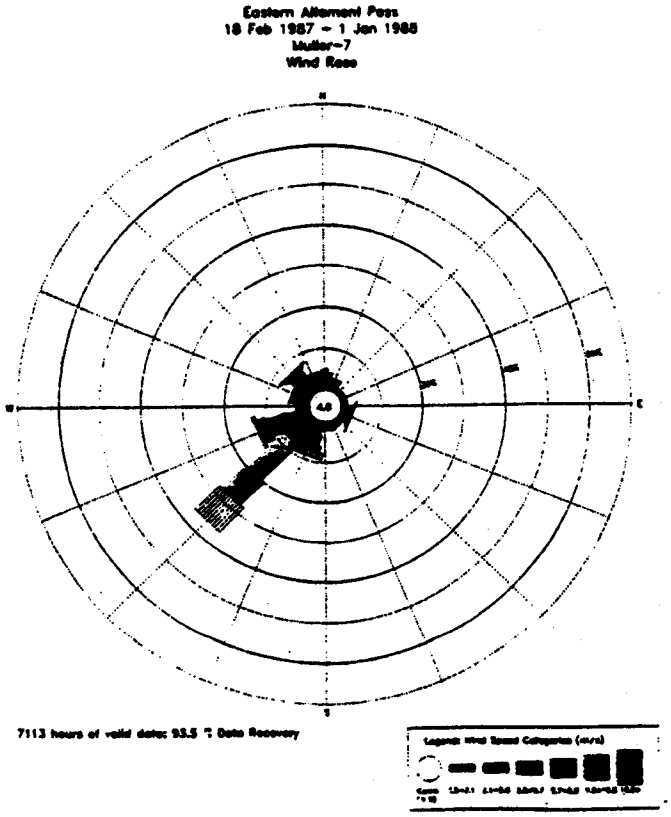


Figure 8

Wind Roses from All Sites







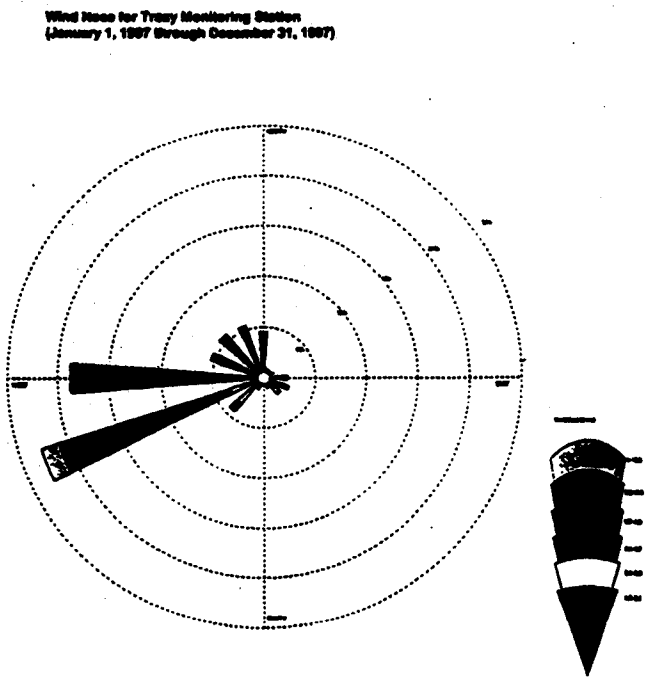


Table 8.1B-1
Building Dimensions Used in GEP Analysis

Building/Structure	Height, meters	Length, meters	Width, meters
HRSG 1	24.4	30.0	19.0
HRSG 2	24.4	30.0	19.0
HRSG 3	24.4	30.0	19.0
Inlet Air Filter 1	19.8	20.0	8.0
Inlet Air Filter 2	19.8	20.0	8.0
Inlet Air Filter 3	19.8	20.0	8.0
Cooling Tower	13.1	313.0	10.0
Administration Bldg	9.14	20.0	46.0
Maintenance Bldg	9.14	90.0	62.5
Raw Water Tanks	12.2	45.0	45.0
Demineralized Water Tanks	12.2	15.0	15.0
Fire Water Tanks	10.36	10.0	10.0

FIGURE 8.1B-1

BUILDING DIMENSIONS USED IN GEP ANALYSIS

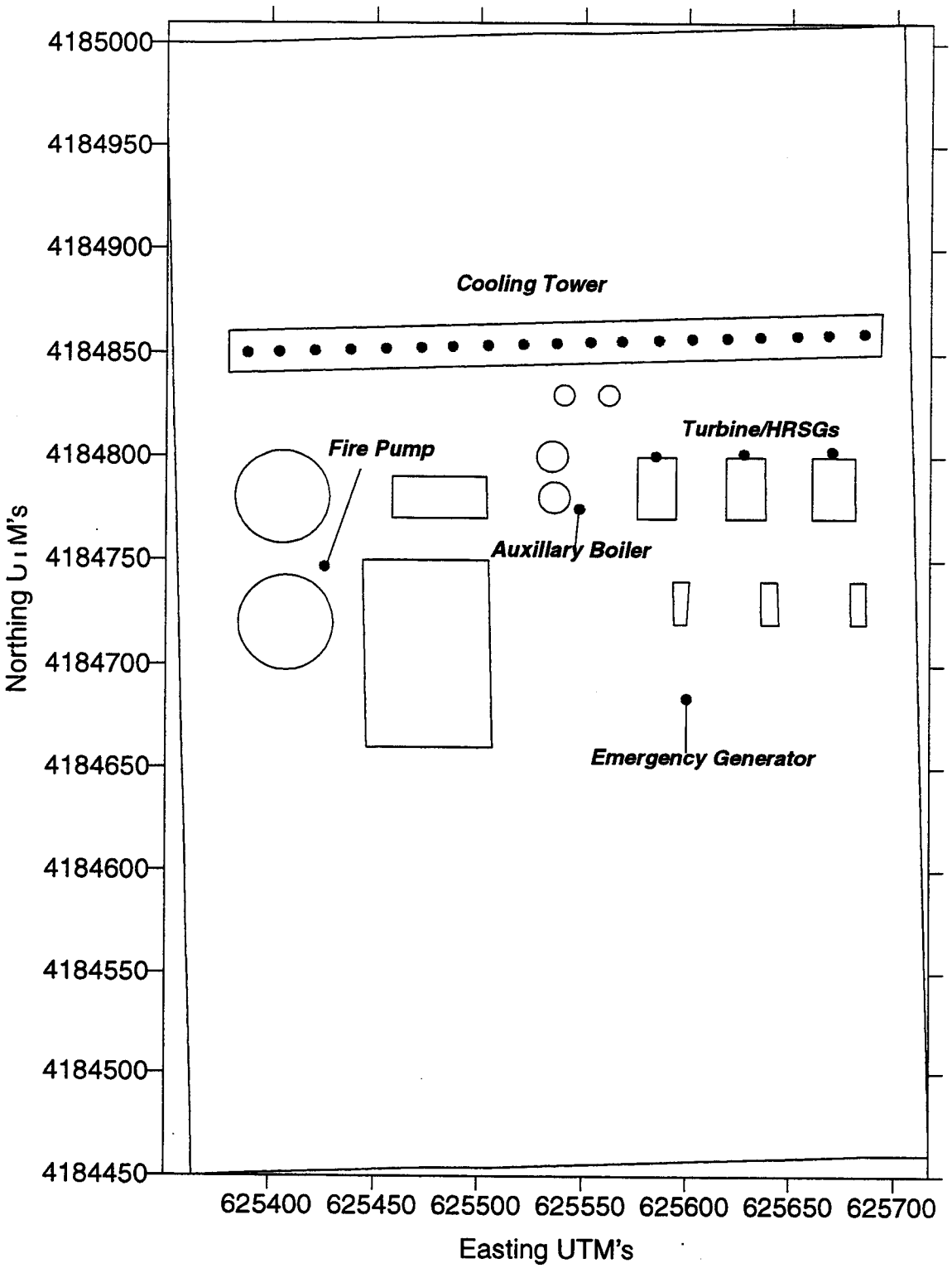


Table 8.1B-2
Emissions and Stack Parameters for Screening Modeling
East Altamont Energy Center

Turbine Case	Load/ Ambient Temp	Duct Firing?	Stack Diam (m)	Stack Height (m)	Exhaust Temp (deg K)	Exhaust Velocity (m/s)	NOx, g/s	SO2, g/s	CO, g/s	PM10, g/s
J	100/98F	no	5.639	53.340	334.111	15.551	1.876	0.145	2.744	1.386
M	100/98F	yes	5.639	53.340	334.111	16.862	2.890	0.225	4.224	2.308
K	70/98F	no	5.639	53.340	333.000	12.867	1.487	0.115	2.172	1.386
C1	100/45F	no	5.639	53.340	359.667	19.183	2.166	0.166	3.165	1.386
C2	100/45F	yes	5.639	53.340	359.667	19.469	2.999	0.232	4.385	2.308
D	70/45F	no	5.639	53.340	333.000	13.854	1.690	0.131	2.466	1.386

Note: Parameters are for each turbine.

Table 8.1B-3
Results of the Turbine Screening Analysis
East Altamont Energy Center

Case	Temp/ Load	Duct Firing?	Modeled Impacts, ug/m3, by Pollutant and Averaging Period									
			NOx		SO2				CO		PM10	
			1-hr	Annual	1-hr	3-hr	24-hr	Annual	1-hr	8-hr	24-hr	Annual
J	100/98F	no	18.68	0.29	1.44	0.95	0.35	0.023	27.3	13.4	3.33	0.22
M	100/98F	yes	29.13	0.42	2.20	1.46	0.40	0.032	41.3	17.5	4.09	0.33
K	70/98F	no	18.42	0.29	1.42	0.78	0.42	0.023	26.9	14.7	5.03	0.27
C1	100/45F	no	19.57	0.20	1.49	0.99	0.23	0.015	28.6	10.6	1.89	0.13
C2	100/45F	yes	26.92	0.28	2.08	1.37	0.32	0.021	39.4	14.6	3.14	0.21
D	70/45F	no	19.01	0.30	1.47	0.92	0.44	0.023	27.8	13.7	4.66	0.25

Table 8.1B-4
Calpine East Altamont Energy Center
Emergency Generator and Fire Pump Screening Analysis

Emission Rates (lb/hr)

	NOx	SO2			CO		PM10	
	1-hr	1-hr	3-hr	24-hr	1-hr	8-hr	24-hr	annual
Fire pump	4.36	0.126	0.042	5.25E-03	2.63	0.329	0.0077	2.11E-03
Generator	6.458	8.97E-03	0.003	3.74E-04	6.78	0.848	0.0216	1.18E-02

Modeled Unit Impacts (ug/m3 per g/s) (highest result from 3 yrs of met data)

	all receptors				
	1-hr	3-hr	8-hr	24-hr	annual
Fire Pump	1255.71	560.24	409.43	208.61	17.05
Generator	680.99	288.18	200.01	176.21	37.52

Max. Modeled Concentrations

	NOx		SO2			CO		PM10	
	1-hr	1-hr w/ OLM	1-hr	3-hr	24-hr	1-hr	8-hr	24-hr	annual
Fire pump	690.0	181.0	**19.9**	**2.96**	**1.38E-01**	415.9	17.0	0.20	4.54E-03
Generator	554.1	**236.2**	0.8	0.11	8.29E-03	**581.8**	**21.4**	**0.48**	5.59E-02

Table 8.1B-5
Emission Rates and Stack Parameters for Modeling
East Altamont Gas Turbines and Other Equipment

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rate, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour									
Turbine 1/HRSG	5.639	53.34	334.1	421.1	16.86	2.890	0.225	4.224	n/a
Turbine 2/HRSG	5.639	53.34	334.1	421.1	16.86	2.890	0.225	4.224	n/a
Turbine 3/HRSG	5.639	53.34	334.1	421.1	16.86	2.890	0.225	4.224	n/a
Aux Boiler	1.067	30.48	435.8	19.20	21.48	0.185	1.138E-02	0.627	n/a
Em Generator	0.229	3.048	747.4	1.435	34.97	0.8136	n/a	0.8543	n/a
Fire Pump	0.152	3.048	811.9	1.157	63.44	n/a	1.587E-02	n/a	n/a
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	n/a
Averaging Period: Three hours									
Turbine 1/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	0.225	n/a	n/a
Turbine 2/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	0.225	n/a	n/a
Turbine 3/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	0.225	n/a	n/a
Aux Boiler	1.067	30.48	435.8	19.2	21.48	n/a	1.138E-02	n/a	n/a
Em Generator	0.229	3.05	747.4	1.4	34.97	n/a	n/a	n/a	n/a
Fire Pump	0.15	3.05	811.9	1.2	63.44	n/a	5.288E-03	n/a	n/a
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	n/a
Averaging Period: Eight hours									
Turbine 1/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	n/a	42.24	n/a
Turbine 2/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	n/a	42.24	n/a
Turbine 3/HRSG	5.639	53.34	334.1	421.1	16.86	n/a	n/a	42.24	n/a
Aux Boiler	1.067	30.48	435.8	19.2	21.48	n/a	n/a	0.627	n/a
Em Generator	0.229	3.05	747.4	1.4	34.97	n/a	n/a	0.1068	n/a
Fire Pump	0.152	3.05	811.9	1.2	63.44	n/a	n/a	n/a	n/a
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	n/a
Averaging Period: 24 hours, SO2									
Turbine 1/HRSG	5.639	53.34	333.0	346.0	13.85	n/a	0.131	n/a	n/a
Turbine 2/HRSG	5.639	53.34	333.0	346.0	13.85	n/a	0.131	n/a	n/a
Turbine 3/HRSG	5.639	53.34	333.0	346.0	13.85	n/a	0.131	n/a	n/a
Aux Boiler (3)	1.067	30.48	435.8	19.2	21.48	n/a	3.793E-03	n/a	n/a
Em Generator	0.229	3.048	747.4	1.4	34.97	n/a	n/a	n/a	n/a
Fire Pump	0.152	3.048	811.9	1.2	63.44	n/a	6.610E-04	n/a	n/a
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	n/a
Averaging Period: 24 hours, PM10									
Turbine 1/HRSG	5.639	53.34	333.0	321.3	12.87	n/a	n/a	n/a	1.386
Turbine 2/HRSG	5.639	53.34	333.0	321.3	12.87	n/a	n/a	n/a	1.386
Turbine 3/HRSG	5.639	53.34	333.0	321.3	12.87	n/a	n/a	n/a	1.386
Aux Boiler (3)	1.067	30.48	435.8	19.2	21.48	n/a	n/a	n/a	1.114E-01
Em Generator	0.229	3.048	747.4	1.4	34.97	n/a	n/a	n/a	2.720E-03
Fire Pump	0.152	3.048	811.9	1.2	63.44	n/a	n/a	n/a	n/a
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	1.591E-02
Averaging Period: Annual									
Turbine 1/HRSG	5.639	53.34	334.1	421.1	16.86	2.502	0.204	n/a	1.923
Turbine 2/HRSG	5.639	53.34	334.1	421.1	16.86	2.502	0.204	n/a	1.923
Turbine 3/HRSG	5.639	53.34	334.1	421.1	16.86	2.502	0.204	n/a	1.923
Aux Boiler (3)	1.067	30.48	435.8	19.2	21.48	6.349E-02	3.897E-03	n/a	0.115
Em Generator	0.229	3.048	747.4	1.4	34.97	1.858E-02	2.579E-05	n/a	1.490E-03
Fire Pump	0.152	3.048	811.9	1.2	63.44	6.273E-03	1.811E-04	n/a	2.663E-04
Cooling Tower (2)	10.26	17.37	294.1	828.8	10.02	n/a	n/a	n/a	1.591E-02

NOTE:
1. Emergency generator and fire pump will not operate during the same 24-hr period. Higher emission rate used for each pollutant and averaging period.
2. Cooling tower parameters based on each cell; total of 19 cells.
3. Auxiliary boiler operates at full load 8 hrs/day on worst case day; 3000 hrs/yr.

Table 8.1B-6
Fumigation Screening Analysis

Emission Rates for Unit Impacts Analysis (g/sec per stack)				
	TURBINES	BOILER	FIREPUMP	EMER.GEN
NOx	2.890	0.185	0.5495	0.8136
SO2	0.225	0.01138	0.01587	0.00113
CO	4.224	0.627	0.3312	0.8543

Modeled Maximum 1-Hr Avg Cavity Concs (ug/m3)				
	TURBINES	BOILER	FIREPUMP	EMER.GEN
ug/m3 for 1 g/s/stack	N/A	258.7	1462	1215
NOx (ug/m3)	N/A	48	803	989
SO2 (ug/m3)	N/A	3	23	1
CO (ug/m3)	N/A	162	484	1038
Max. Cavity Length (m)	N/A	50	50	41
Min. Prop.Boundary (m)	N/A	160	70	110
		(a)	(a)	(a)

(a) Building Cavity does not extend to the property boundary so ambient concentrations are not affected.

Modeled Simple Terrain 1-Hr Avg. Concs (ug/m3)				
	TURBINES	BOILER	FIREPUMP	EMER.GEN
ug/m3 for 1 g/s/stack	3.391	57.56	1720	969
NOx (ug/m3)	29	11	945	788
SO2 (ug/m3)	2	1	27	1
CO (ug/m3)	43	36	570	828
Max.Impact Dist (m)	244	163	74	110
	(b)	(b)		

(b) Maximum simple terrain impacts exceed fumigation impacts so ISCST3 concentrations are conservative and controlling.

Max. Modeled Fumigation 1-Hr Avg. Concs (ug/m3)				
	3 TURBINES	BOILER	FIREPUMP	EMER.GEN
ug/m3 for 1 g/s/stack	1.586	8.606	N/A	N/A
NOx (ug/m3)	14	1.6	N/A	N/A
SO2 (ug/m3)	1.1	0.1	N/A	N/A
CO (ug/m3)	20	5.4	N/A	N/A
Fumigation Dist (m)	13,364	3,876	N/A	N/A

Max. Simple Terrain Concs at Turbine Fumigation Dist (13364 m)						
					---TOTALs w/---	
	3 TURBINES	BOILER	FIREPUMP	EMER.GEN	FIREPUMP	EMER.GEN
ug/m3 for 1 g/s/stack	N/A	3.766	14.83	15.75		
1-hr average						
NOx (ug/m3)	N/A	0.7	8.1	12.8	23	27
SO2 (ug/m3)	N/A	0.04	0.2	0.02	1.3	1.1
CO (ug/m3)	N/A	2.4	4.9	13.5	27	36
3-hr average						
SO2 (ug/m3)	N/A	0.04	0.2	0.02	1.2	1.02

Max. Simple Terrain Concs at Aux.Blr Fumigation Dist (3876 m)						
					---TOTALs w/---	
	3 TURBINES	BOILER	FIREPUMP	EMER.GEN	FIREPUMP	EMER.GEN
ug/m3 for 1 g/s/stack	0.802	N/A	55.95	67.64		
NOx (ug/m3)	7	N/A	31	55	39	64
SO2 (ug/m3)	0.5	N/A	0.9	0.1	1.5	0.7
CO (ug/m3)	10	N/A	19	58	34	73
3-hr average						
SO2 (ug/m3)	0.49	N/A	0.8	0.07	1.4	0.64

Table 8.1B-7
Modeled Impacts During Turbine Startup
Assume one turbine in startup, two turbines at peak load.

	Stack Diam, m	Stack Height, m	Exh Temp, Deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rate, g/s			
						NOx	SO2	CO	PM10
Averaging Period: One hour									
Turbine 1/HRSG	5.64	53.34	333.0	321.3	12.87	30.240	0.115	113.652	n/a
Turbine 2/HRSG	5.64	53.34	334.1	421.1	16.86	2.890	0.225	4.224	n/a
Turbine 3/HRSG	5.64	53.34	334.1	421.1	16.86	2.890	0.225	4.224	n/a

Averaging Period	Pollutant	Modeled Impact, ug/m3
1 hour	NOx (1)	104.7
	SO2	1.9
	CO	689.8

Notes: (1) With ozone limiting.

Appendix 8.1C
Protocol for Increments Analysis

APPENDIX 8.1C

Protocol for Increments Analysis

8.1C.1 Overview of Requirements for Increments Analysis

The federal Prevention of Significant Deterioration (PSD) program is intended to ensure that economic growth in areas with good air quality occurs without causing the deterioration of that air quality to unhealthful levels. The PSD program contains a number of requirements that apply to new or modified sources of air pollution that are located in clean air areas. In the Bay Area, the Bay Area Air Quality Management District (BAAQMD) has been delegated authority by the USEPA to administer the PSD program for NO_2, SO_2 and PM_{10}, the pollutants for which federal ambient standards are currently being attained. These PSD program requirements, applied on a pollutant-specific basis, include conducting an increments analysis to demonstrate that no increments will be exceeded as a result of the proposed new or modified source.

Increments are the maximum increases in concentration that are allowed to occur above baseline concentrations for each pollutant for which an increment has been established. Currently, increments have been established for NO_2, SO_2 and PM_{10}. These allowable increments are shown in the table below.

Class II Increments

Pollutant/ Averaging Time	Allowable Class II Increments (ug/m3)
NO2	
Annual	25
SO2	
3-Hour	512
24-Hour	91
Annual	20
PM10	
24-Hour	30
Annual	17

The baseline concentrations are defined for each pollutant and averaging time, and are the ambient concentrations of each pollutant existing at the time that the first complete PSD application affecting the area is submitted. Federal regulations establish the dates after which major and minor source impacts on increment consumption need to be considered in an increments analysis, as follows:

Major source baseline date: The date after which actual emissions associated with modifications at a major stationary source affect the available increment.

Trigger date: The date after which the minor source baseline date may be established.

Minor source baseline date: The earliest date after the trigger date on which a complete PSD application is received by the reviewing agency. After this date, actual emission changes (including increases in throughput or production that do not require permit changes) from all sources (major and minor stationary sources, area sources and mobile sources) affect the available increment.

BAAQMD regulations require that before an Authority to Construct can be issued for a facility projecting significant increases in NO_2, SO_2 and PM_{10}, the applicant must perform an increments analysis to demonstrate that the project will not cause an exceedance of the applicable increment. The ambient impacts from EAEC for NO_2, SO_2 and annual PM_{10} have been shown to be below significance levels; therefore, increments analyses are not required for these pollutants and averaging periods. However, the 24-hour ambient PM_{10} impacts were shown to be 6.6 $\mu g/m^3$, above the 5 $\mu g/m^3$ significant impact threshold. Therefore, an increments analysis is required for this pollutant and averaging period.

For PM_{10} in the BAAQMD, the baseline and trigger dates are as follows:

	PM_{10}
Major Source Baseline Date	January 6, 1975
Trigger Date	August 7, 1977
Minor Source Baseline Date[1]	not yet set

Therefore, the ambient impact of all changes in PM_{10} emissions since January 6, 1975 (for major modifications to major sources) that affect the applicable impact area must be considered in the PM_{10} increments analysis.

8.1C.2 Methodology

Establishing the Impact Area- The first step in the increments analysis is the establishment of the impact area for each pollutant and averaging period. The impact area includes the area where the emissions from the new source will cause a significant ambient impact. As indicated above, the significant ambient impact level for 24-hour PM_{10} is defined in BAAQMD regulations as 5 ug/m^3. The impact area is a circular area with a radius extending from the source to the most distant point where modeling indicates that the ambient impact will be significant.

As described in the air quality modeling analyses contained in Section 8.1 of the AFC, PM_{10} emissions from EAEC were modeled using the appropriate 24-hour emission rates, the ISCST3 model and the Tracy 1997, 1998 and 1999 meteorological data sets. Based on these modeling analyses, a region of approximately 800 meters in radius surrounding the project site was identified as the area in which EAEC could have a "significant" air quality impact on ambient PM_{10} levels.

[1]For PM_{10}, baseline dates are established on a county-specific basis and has not yet been set for Alameda County. The date the EAEC application is deemed complete will establish the PM_{10} baseline date for Alameda County.

8.1C.2.1 Identifying Sources Affecting the Impact Area

Once the impact area is established, sources consuming increment within the impact area must be identified and emission inventories developed for those sources. The sources include not only those located within the impact area, but also those located outside the impact area whose emissions could contribute to ambient impacts there. These inventories must account for the change in emissions between the pollutant-specific baseline date and the date of the permit application for the new source or modification. Based on these inventories, the changes in emissions are modeled to determine the amount of increment consumed for each pollutant.

In order to ensure that other emission sources that might have significant impacts on the PM_{10} impact area in conjunction with EAEC are identified, we will request from Bay Area and San Joaquin Valley District staff a list of facilities that meet the following criteria:

- Major PM_{10} Sources: All sources within 50 kilometers of the PM_{10} impact area (51 km of the project) that have had significant permitted increases in PM_{10} (greater than 15 tons per year) since the PM_{10} major source baseline date (January 6, 1975).

Because the increments analysis is intended to evaluate changes in ambient impacts since the baseline date due to increment-consuming sources, the analysis should compare impacts from emissions during the appropriate baseline period (two years prior to the baseline date) and from current emissions. However, the Bay Area District staff indicates that actual PM_{10} emissions data are not available from the BAAQMD's inventory system for the appropriate baseline periods. Only the most current year of actual emissions data are available. Therefore, it is not possible to determine the changes in actual PM_{10} emissions from the identified point sources. Based on consultations with BAAQMD staff, it has been suggested that permitted changes in PM_{10} emissions from the identified point sources be modeled instead.

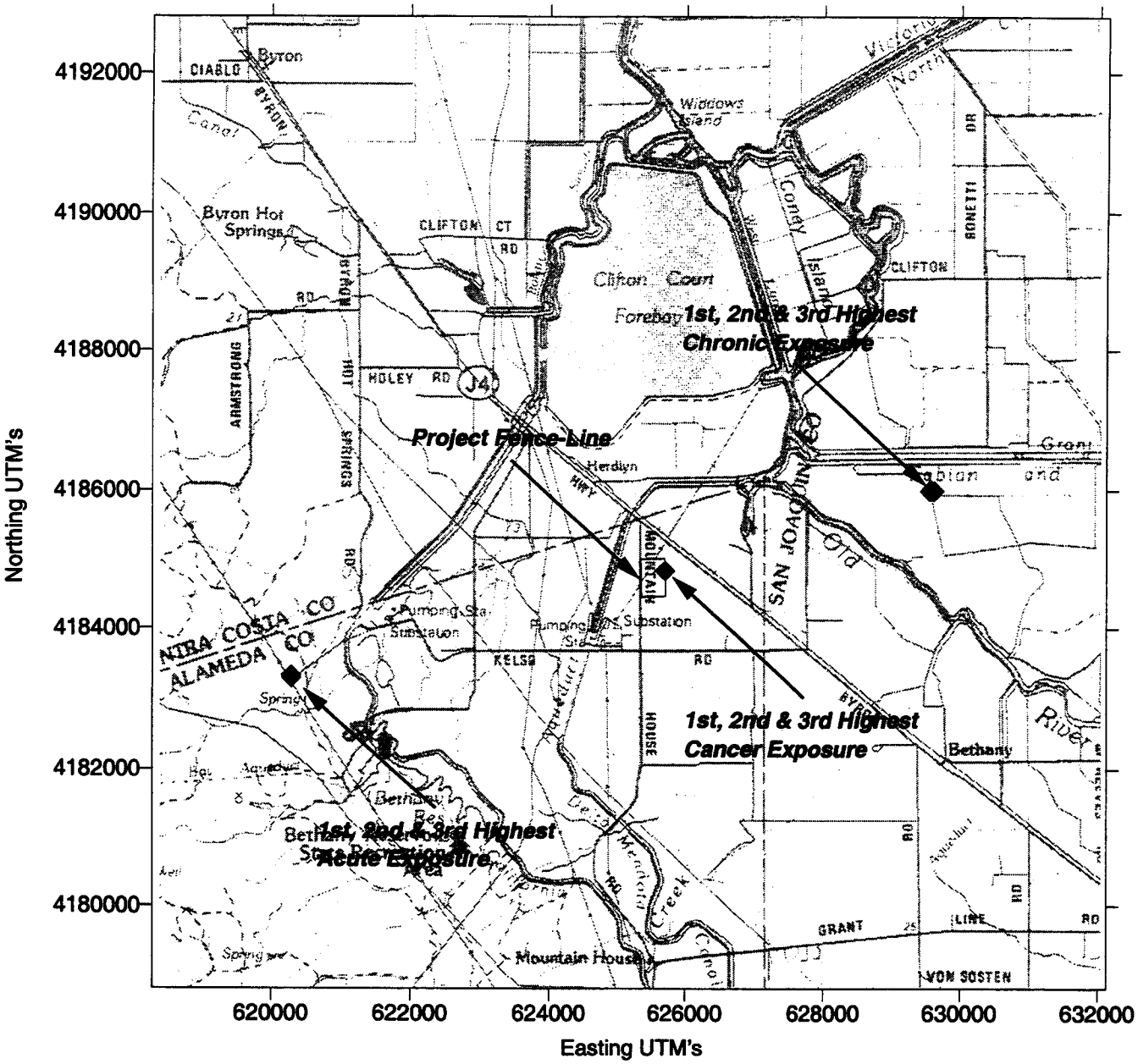
8.1C.2.2 Data Used in the Increments Analysis

Stack Parameters for PM_{10} Sources. For the permitted changes in PM_{10} emissions, we anticipate that the computer printout will provide no stack data, especially when the emissions are fugitive in nature. The following default stack parameters will be used for sources identified as "fugitive" on the computer printout:

- Release height: 1 meter
- Temperature: ambient (70EF)
- Stack cross-sectional area: 1 ft2
- Flow rate: 3000 ACFM

Appendix 8.1D
Screening Health Risk Assessment

Figure 8.1D-1
Locations of Maximum Acute, Chronic and Carcinogenic Risks



Summary of HRA Modeling Results
East Altamont Energy Center

Acute Inhalation Hazard Index

Pollutant Name	Max. Modeled 1-hr Conc, Combustion Sources	Max. Modeled 1-hr Conc, Cooling Tower	Acute REL, ug/m3 (1)	Toxicological Endpoints	Acute Inhalation Hazard Index Combustion Sources	Acute Inhalation Hazard Index Cooling Tower
Acrolein	2.15E-02		1.90E-01	Eye irritation	1.13E-01	
Ammonia	4.60E+01		3.20E+03	Eye and respiratory irritation	1.44E-02	
Arsenic		2.52E-05	1.90E-01	Reproductive/ Developmental		1.33E-04
Benzene	4.56E-02		1.30E+03	Reproductive/ Developmental	3.51E-05	
Copper		5.04E-05	1.00E+02	Respiratory Irritation		5.04E-07
Formaldehyde	9.23E-01		9.40E+01	Eye irritation	9.82E-03	
Mercury		1.26E-05	1.80E+00	Reproductive/ Developmental		7.00E-06
Nickel		1.26E-04	6.00E+00	Respiratory Irritation/Immune Response		2.10E-05
Propylene oxide	4.01E-01		3.10E+03	Eye and respiratory irritation	1.29E-04	
Toluene	2.37E-01		3.70E+04	CNS (mild); Eye and respiratory irritation	6.41E-06	
Xylenes	2.19E-01		2.20E+04	Eye and respiratory irritation	9.95E-06	
Total Acute Hazard Index					**0.138**	

Summary of HRA Modeling Results
East Altamont Energy Center

Chronic Inhalation Hazard Index

	Pathway (1)							
	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
Cooling Tower	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	--
Gas Turbines/Aux. Boiler	0.019	<.0001	<.0001	0.0156	<.0001	<.0001	<.0001	--
Total Chronic	0.0190	0.0001	<.0001	0.0156	<.0001	<.0001	<.0001	--
Total, All Pathways	**0.0347**							

Notes:
(1) Resp: respiratory; CV/BL: cardiovascular/blood; CNS: central nervous system; Repro: reproductive system; Kidn: renal system; GI/LV: gastrointestinal/liver; Immun: immunological system

Summary of HRA Modeling Results
East Altamont Energy Center

Chronic Noninhalation Exposure

	Cooling Tower	Combustion Sources	REL (mg/kg-d)	Avg Dose/REL (total)
Arsenic and compounds	2.54E-09	--	3.00E-04	8.47E-06
Cadmium and compounds	1.29E-09	--	1.00E-03	1.29E-06
Lead and compounds	3.45E-09	--	--	--
Mercury and compounds	1.50E-09	--	3.00E-04	5.00E-06
Naphthalene	--	2.99E-08	--	--
PAH	--	6.23E-09	--	--

Summary of HRA Modeling Results
East Altamont Energy Center

Individual Cancer Risk

	Air	Soil	Skin	Garden	Mmilk	Other
Cooling Tower	6.41E-09	3.76E-09	7.95E-11	0.00E+00	0.00E+00	0.00E+00
Gas Turbines/Aux. Boiler	1.00E-07	4.57E-08	2.90E-08	0.00E+00	0.00E+00	0.00E+00
Route Total	1.07E-07	4.95E-08	2.91E-08	0.00E+00	0.00E+00	0.00E+00
TOTAL RISK	**0.19 in one million**					

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

ACUTE INHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : East Altamont Energy Center

Feb. 25, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

MAX. 1-HR EMISSION RATE INFORMATION

File: ONEHR.M96

Pollutant Name	Emission Rate (g/s)
ACROLEIN	2.149E-02
AMMONIA	4.597E+01
ARSENIC AND COMPOUNDS (INOR	2.520E-05
BENZENE	4.563E-02
COPPER AND COMPOUNDS	5.040E-05
FORMALDEHYDE	3.830E-01
MERCURY AND COMPOUNDS (INOR	1.260E-05
NICKEL AND COMPOUNDS	1.260E-04
PROPYLENE OXIDE	1.592E-01
TOLUENE	2.371E-01
XYLENES	8.739E-02

ACUTE INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Eye	Repro	Kidn	GI/LV	Immun
ACROLEIN	0.1131	–	–	0.1131	–	–	–	–
AMMONIA	0.0144	–	–	0.0144	–	–	–	–
ARSENIC AND COM	–	–	–	–	0.0001	–	–	–
BENZENE	–	<.0001	–	–	<.0001	–	–	<.0001
COPPER AND COMP	<.0001	–	–	–	–	–	–	–
FORMALDEHYDE	0.0041	–	–	0.0041	–	–	–	0.0041
MERCURY AND COM	–	–	–	–	<.0001	–	–	–
NICKEL AND COMP	<.0001	–	–	–	–	–	–	<.0001
PROPYLENE OXIDE	<.0001	–	–	<.0001	<.0001	–	–	–
TOLUENE	<.0001	–	<.0001	<.0001	<.0001	–	–	–
XYLENES	<.0001	–	–	<.0001	–	–	–	–
Total Acute	0.1316	<.0001	<.0001	0.1316	0.0002	–	–	0.0041

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

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CHRONIC INHALATION EXPOSURE REPORT

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Sierra Research

Project : East Altamont Energy Cente

Mar. 5, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	5.315E-06
ACETALDEHYDE	2.882E-03
ACROLEIN	2.702E-04
AMMONIA	5.795E-01
ARSENIC AND COMPOUNDS (INOR	9.550E-07
BENZENE	5.749E-04
CADMIUM AND COMPOUNDS	4.770E-07
COPPER AND COMPOUNDS	1.910E-06
ETHYL BENZENE	7.759E-04
FORMALDEHYDE	6.247E-03
LEAD AND COMPOUNDS	1.300E-06
MERCURY AND COMPOUNDS (INOR	4.770E-07
N-HEXANE	1.084E-02
NAPHTHALENE	6.987E-05
NICKEL AND COMPOUNDS	4.770E-06
PAH:BENZO(A)PYRENE	2.776E-05
PROPYLENE (PROPENE)	3.243E-02
PROPYLENE OXIDE	2.001E-03
TOLUENE	2.982E-03
XYLENES	1.100E-03
ZINC COMPOUNDS	3.340E-06

CHRONIC INHALATION HAZARD INDEX

Pollutant	Resp	CV/BL	CNS	Skin	Repro	Kidn	GI/LV	Immun
ACETALDEHYDE	0.0003	–	–	–	–	–	–	–
ACROLEIN	0.0135	–	–	0.0135	–	–	–	–
AMMONIA	0.0029	–	–	–	–	–	–	–

ARSENIC AND COM	<.0001	–	<.0001	<.0001	–	–	–	–
BENZENE	–	<.0001	<.0001	–	<.0001	–	–	–
CADMIUM AND COM	<.0001	–	–	–	–	<.0001	–	–
COPPER AND COMP	<.0001	–	–	–	–	–	–	–
ETHYL BENZENE	–	–	–	–	<.0001	<.0001	<.0001	–
FORMALDEHYDE	0.0021	–	–	0.0021	–	–	–	–
MERCURY AND COM	–	–	<.0001	–	–	–	–	–
N-HEXANE	–	–	<.0001	–	–	–	–	–
NAPHTHALENE	<.0001	–	–	–	–	–	–	–
NICKEL AND COMP	<.0001	<.0001	–	–	–	–	–	–
PROPYLENE (PROP	<.0001	–	–	–	–	–	–	–
PROPYLENE OXIDE	<.0001	–	–	–	–	–	–	–
TOLUENE	<.0001	–	<.0001	–	<.0001	–	–	–
XYLENES	<.0001	–	<.0001	–	–	–	–	–
ZINC COMPOUNDS	<.0001	<.0001	–	–	–	–	–	–
Total Chronic	0.0190	0.0001	<.0001	0.0156	<.0001	<.0001	<.0001	–

A Zero Background Concentration file was used to perform this analysis, therefore, there is no contribution from background pollutants.

California Air Resources Board

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Office of Environmental Health Hazard Assessment

Health Risk Assessment Program

Version 2.0e

CHRONIC NONINHALATION EXPOSURE REPORT

Run Made By

nlm

Sierra Research

Project : East Altamont Energy Cente

Feb. 25, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	5.315E-06
ACETALDEHYDE	2.882E-03
ACROLEIN	2.702E-04
AMMONIA	1.076E+01
ARSENIC AND COMPOUNDS (INOR	9.550E-07
BENZENE	5.749E-04
CADMIUM AND COMPOUNDS	4.770E-07
COPPER AND COMPOUNDS	1.910E-06
ETHYL BENZENE	7.759E-04
FORMALDEHYDE	6.247E-03
LEAD AND COMPOUNDS	1.300E-06
MERCURY AND COMPOUNDS (INOR	4.770E-07
N-HEXANE	1.084E-02
NAPHTHALENE	6.987E-05
NICKEL AND COMPOUNDS	4.770E-06
PAH:BENZO(A)PYRENE	2.776E-05
PROPYLENE (PROPENE)	3.243E-02
PROPYLENE OXIDE	2.001E-03
TOLUENE	2.982E-03
XYLENES	1.100E-03
ZINC COMPOUNDS	3.340E-06

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

CHRONIC NONINHALATION EXPOSURE

Pollutant	Avg. Dose (mg/kg-d)	REL (mg/kg-d)	Avg Dose/REL
1,3-BUTADIENE	—	—	—
ACETALDEHYDE	—	—	—
ACROLEIN	—	—	—
AMMONIA	—	—	—
ARSENIC AND COMPOUNDS (I	2.54E-09	3.00E-04	8.46E-06
BENZENE	—	—	—
CADMIUM AND COMPOUNDS	1.29E-09	1.00E-03	1.29E-06
COPPER AND COMPOUNDS	—	—	—
ETHYL BENZENE	—	—	—
FORMALDEHYDE	—	—	—
LEAD AND COMPOUNDS	3.45E-09	—	—
MERCURY AND COMPOUNDS (I	1.50E-09	3.00E-04	5.01E-06
N-HEXANE	—	—	—
NAPHTHALENE	2.99E-08	—	—
NICKEL AND COMPOUNDS	—	5.00E-02	—
PAH:BENZO(A)PYRENE	6.23E-09	—	—
PROPYLENE (PROPENE)	—	—	—
PROPYLENE OXIDE	—	—	—
TOLUENE	—	—	—
XYLENES	—	—	—
ZINC COMPOUNDS	—	—	—

California Air Resources Board

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Health Risk Assessment Program

Version 2.0e

INDIVIDUAL CANCER RISK REPORT

Run Made By

nlm

Sierra Research

Project : East Altamont Energy Cente

Feb. 25, 2001

Pollutant Database Date : Oct. 5, 2000
Database Reference..... : CAPCOA Risk Assessment Guidelines

DILUTION FACTOR FOR POINT UNDER EVALUATION

X/Q (ug/m3)/(g/s) : 1.00E+00

ANNUAL AVERAGE EMISSION RATE INFORMATION

File: ANNAVG.E96

Pollutant Name	Emission Rate (g/s)
1,3-BUTADIENE	5.315E-06
ACETALDEHYDE	2.882E-03
ACROLEIN	2.702E-04
AMMONIA	1.076E+01
ARSENIC AND COMPOUNDS (INOR	9.550E-07
BENZENE	5.749E-04
CADMIUM AND COMPOUNDS	4.770E-07
COPPER AND COMPOUNDS	1.910E-06
ETHYL BENZENE	7.759E-04
FORMALDEHYDE	6.247E-03
LEAD AND COMPOUNDS	1.300E-06
MERCURY AND COMPOUNDS (INOR	4.770E-07
N-HEXANE	1.084E-02
NAPHTHALENE	6.987E-05
NICKEL AND COMPOUNDS	4.770E-06
PAH:BENZO(A)PYRENE	2.776E-05
PROPYLENE (PROPENE)	3.243E-02
PROPYLENE OXIDE	2.001E-03
TOLUENE	2.982E-03
XYLENES	1.100E-03
ZINC COMPOUNDS	3.340E-06

EXPOSURE ROUTE INFORMATION

File: EXPOSURE.I96

Deposition Velocity (m/s) .....: 0.020

Fraction of Homegrown Produce .: 0.000

Dilution Factor for Farm/Ranch X/Q (ug/m3)/(g/s) ....: 0.0000
Fraction of Animals' Diet From Grazing .....: 0.0000
Fraction of Animals' Diet From Impacted Feed .....: 0.0000

Fraction of Animals' Water Impacted by Deposition ...: 0.0000

Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume Changes .....: 0.000E+00

Fraction of Meat in Diet Impacted ..: 0.0000

Beef .....: 0.0000
Pork .....: 0.0000
Lamb/Goat .....: 0.0000
Chicken .....: 0.0000

Fraction of Milk in Diet Impacted ..: 0.0000

Goat Milk Fraction ..: 0.0000

Fraction of Eggs in Diet Impacted ..: 0.0000

Fraction of Impacted Drinking Water : 0.0000

X/Q at water source ..: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

Fraction of Fish from Impacted Water: 0.0000

X/Q at Fish Source ...: 0.0000
Surface Area (m2) ....: 0.000E+00
Volume (liters) .....: 0.000E+00
Volume changes .....: 0.000E+00

---

44 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	5.68E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	4.89E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ARSENIC AND COM	1.98E-09	3.21E-09	6.80E-11	0.00E+00	0.00E+00	0.00E+00
BENZENE	1.05E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CADMIUM AND COM	1.26E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	2.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LEAD AND COMPOU	9.81E-12	2.48E-11	5.25E-13	0.00E+00	0.00E+00	0.00E+00
NICKEL AND COMP	7.80E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	1.92E-08	2.95E-08	1.88E-08	0.00E+00	7.57E-08	0.00E+00
PROPYLENE OXIDE	4.65E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	6.74E-08	3.28E-08	1.88E-08	0.00E+00	7.57E-08	0.00E+00

TOTAL RISK: 1.95E-07

70 YEAR
INDIVIDUAL CANCER RISK BY POLLUTANT AND ROUTE

Pollutant	Air	Soil	Skin	Garden	MMilk	Other
1,3-BUTADIENE	9.04E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ACETALDEHYDE	7.78E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ARSENIC AND COM	3.15E-09	3.73E-09	7.89E-11	0.00E+00	0.00E+00	0.00E+00
BENZENE	1.67E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CADMIUM AND COM	2.00E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FORMALDEHYDE	3.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LEAD AND COMPOU	1.56E-11	2.88E-11	6.09E-13	0.00E+00	0.00E+00	0.00E+00
NICKEL AND COMP	1.24E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PAH:BENZO(A)PYR	3.05E-08	4.57E-08	2.90E-08	0.00E+00	0.00E+00	0.00E+00
PROPYLENE OXIDE	7.40E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Route Total	1.07E-07	4.95E-08	2.91E-08	0.00E+00	0.00E+00	0.00E+00

TOTAL RISK: 1.86E-07

Appendix 8.1E
Construction Emissions and Impact Analysis

APPENDIX 8.1E

CONSTRUCTION EMISSIONS AND IMPACT ANALYSIS

8.1E.1 Onsite Construction

Construction of the project is expected to last approximately 24 months, with the construction occurring in the following four main phases:

- Site preparation;
- Foundation work;
- Installation of major equipment; and
- Construction/installation of major structures.

Site preparation includes clearing, grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of the Project will result from:

- Dust entrained during site preparation and grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site;
- Exhaust from locomotives used to deliver mechanical equipment to the project area; and
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Worst-case daily dust emissions are expected to occur during the early months of construction when site preparation occurs (i.e., month 7 of the construction schedule). The worst-case daily exhaust emissions are expected to occur in the middle of the construction schedule during the installation of the major mechanical equipment (i.e., month 16 of the construction schedule). Annual emissions are based on the average equipment mix during the 24-month construction period.

8.1E.2 Linear Facilities

The installation of the raw and recycled water pipelines and the gas pipeline will generate short-term construction impacts including fugitive dust and construction equipment combustion emissions. The proposed pipeline routes require a total of approximately 10 miles of trenching. The three pipeline projects may take place simultaneously. The excavation, installation of pipe, backfilling and site cleanup is expected to be performed in sections to minimize fugitive dust and construction equipment combustion emissions.

8.1E.3 Available Mitigation Measures

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of the Project:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- Use of low-emitting Diesel engines meeting federal emissions standards for construction equipment.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from unpaved road travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard;
- Limit traffic speeds on unpaved roads to 15 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;

- Replant vegetation in disturbed areas as quickly as possible;
- Use wheel washers or wash off tires of all trucks exiting construction site that carry track-out dirt from unpaved roads; and
- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant.

8.1E.4 Estimation of Emissions with Mitigation Measures

8.1E.4.1 Onsite Construction

Tables 8.1E-1 through 8.1E-3 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures for onsite construction activities. Detailed emission calculations are included as Attachment 8.1E-1.

TABLE 8.1E-1

Maximum Daily Emissions During Onsite Construction (Month 7; Maximum Dust Emissions)
Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	154.7	39.5	11.0	4.4	64.2
Offsite					
Worker Travel, Truck/Rail Deliveries	47.3	342.8	28.2	0.8	1.7
Total Emissions					
Total =	**202.0**	**382.3**	**39.2**	**5.2**	**65.9**

TABLE 8.1E-2

Maximum Daily Emissions During Onsite Construction (Month 16; Maximum Exhaust Emissions), Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	201.0	60.6	16.6	5.6	34.4
Offsite					
Worker Travel, Truck/Rail Deliveries	178.1	1,052.4	87.6	4.3	6.7
Total Emissions					
Total =	**379.1**	**1,113.0**	**104.2**	**9.9**	**41.1**

TABLE 8.1E-3
Annual Emissions During Construction, Tons Per Year

	NOx	CO	VOC	SOx	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	18.1	6.6	1.7	0.5	5.5
Offsite					
Worker Travel, Truck/Rail Deliveries	6.9	51.6	4.2	0.12	0.23
Total Emissions					
Total =	**25.0**	**58.23**	**5.9**	**0.6**	**6.9**

8.1E.4.2 Pipeline Construction

Table 8.1E.4.4 shows the estimated maximum daily heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures for the raw water, reclaim water and natural gas pipeline construction activities (assuming all three pipelines are under construction simultaneously). Because it is expected that the pipeline construction projects will take six months or less to complete, annual emissions are not shown in the following emission summary tables for these construction activities. Detailed emission calculations are shown in Attachment 8.1E-1.

TABLE 8.1E-4
Maximum Daily Emissions During Pipeline Construction, Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}
Onsite					
Construction Equipment, Fugitive Dust	321.3	100.8	23.4	10.5	44.7

8.1E.5 Analysis of Ambient Impacts from Onsite Construction

Ambient air quality impacts from emissions during construction of the Project were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

8.1E.5.1 Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1.2), the Tracy, Livermore and Fresno monitoring stations were used to establish the ambient background levels for the construction impact modeling analysis. Table 8.1E-5 shows the maximum concentrations of NOx, SO_2, CO, and PM_{10} recorded for 1997 through 1999 at those monitoring stations.

8.1E.5.2 Dispersion Model

As in the analysis of project operating impacts, the EPA-approved Industrial Source Complex Short Term (ISCST3) model was used to estimate ambient impacts from construction activities. A detailed discussion of the ISCST3 dispersion model is included in Section 8.1.5.1.2.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. An effective emission plume height of 2.0 meters was used for all exhaust emissions. For construction dust emissions, an effective plume height of 0.5 meters was used in the modeling analysis. The exhaust and dust emissions were modeled as a single area source that covered the total area of the construction site. The construction impacts modeling analysis used the same receptor locations as used for the project operating impact analysis. A detailed discussion of the receptor locations is included in Section 8.1.5.1.2.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Tables 8.1E-1 and 8.1E-2 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1E-3 were used. As with the project operating impact analysis, the meteorological data set used for the construction emission impacts analysis is data collected at Tracy Patterson Pass during 1997-1999.

8.1E.5.3 Modeling Results

Based on the emission rates of NOx, SO_2, CO, and PM_{10} and the meteorological data, the ISCST3 model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, three-hour 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of NOx, SO_2, CO, and PM_{10}. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of NO_2 were computed following the revised EPA guidance for computing these concentrations (August 9, 1995 *Federal Register*, 60 FR 40465). The one-hour average was adjusted using the Ozone Limiting Method. The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NOx ratio.

The modeling analysis results are shown in Table 8.1E-5. Also included in the table are the maximum background levels that have occurred in the last 3 years and the resulting total ambient impacts. With the exception of 24-hour PM_{10} impacts, construction impacts alone for all modeled pollutants are expected to be below the most stringent state and national standards. However, the state 24-hour average PM_{10} standard is exceeded in the absence of the construction emissions for the Project.

The ISCST3 model overpredicts PM_{10} construction emission impacts due to the cold plume (i.e., ambient temperature) effect of dust emissions. Most of the plume dispersion characteristics in the ISCST3 model are derived from observations of hot plumes associated with typical smoke stacks. The ISCST3 model does compensate for plume temperature; however, for ambient temperature plumes the model assumes negligible buoyancy and dispersion. Consequently, the ambient concentrations in cold plumes remain high even at significant distances from a source. The Project construction site impacts are not unusual in

comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

TABLE 8.1E-5

Modeled Maximum Onsite Construction Impacts

POLLUTANT	AVERAGING TIME	MAXIMUM CONSTRUCTION IMPACTS ($\mu g/m^3$)	BACK-GROUND ($\mu g/m^3$)	TOTAL IMPACT ($\mu g/m^3$)	STANDARD ($\mu g/m^3$)	FEDERAL STANDARD ($\mu g/m^3$)
NO_2[1]	1-hour	355.9[4]	149	504.9	470	--
	Annual	15.3	28	43	--	100
SO_2	1-hour	30.1[4]	40	70	650	--
	24-hour	4.8[4]	27	32	109	365
	Annual	0.4	11	11	--	80
CO	1-hour	324.8[4]	5,943	6,268	23,000	40,000
	8-hour	151.6[4]	3,233	3,385	10,000	10,000
PM_{10}	24-hour	78.2[5]	86.6	165	50	150
	Annual[2]	12.8	22.6	35	30	--
	Annual[3]	12.8	25.6	38	--	50

Notes:

1. Ozone limiting method applied for 1-hour average, using concurrent O_3 data (1997 to 1999). ARM applied for annual average, using national default 0.75 ratio.
2. Annual Geometric Mean.
3. Annual Arithmetic Mean.
4. Based on maximum daily emissions during Month 16.
5. Based on maximum daily emissions during Month 7.

ATTACHMENT 8.1E-1
DETAILED CONSTRUCTION EMISSIONS CALCULATIONS

Construction Equipment Daily Exhaust Emissions (Month 7)
East Altamont Energy Center

Equipment	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Total Fuel Use (Gals/day)	Emission Factors (lbs/1000 gals)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
Crawler Crane- Greater than 300 ton														
Crawler Crane- Greater than 200 ton														
Crane - Mobile 65 ton														
Cranes -Mobile 45 ton														
Cranes - Mobile 35 ton														
Bulldozer D6H	1	8	5.50	44.00	270.01	39.13	15.65	7.10	15.65	11.88	1.72	0.69	0.31	0.69
Bulldozer D4C	1	8	3.00	24.00	270.01	39.13	15.65	7.10	15.65	6.48	0.94	0.38	0.17	0.38
Excavator- Trencher														
Excavator- Earth Scraper	3	8	9.00	216.00	270.01	39.13	15.65	7.10	15.65	58.32	8.45	3.38	1.53	3.38
Excavator-Motor Grader	1	8	5.00	40.00	270.01	39.13	15.65	7.10	15.65	10.80	1.57	0.63	0.28	0.63
Excavator- Backhoe/loader														
Excavator - loader	1	8	2.50	20.00	270.01	39.13	15.65	7.10	15.65	5.40	0.78	0.31	0.14	0.31
Vibratory Roller	1	8	10.00	80.00	270.01	39.13	15.65	7.10	15.65	21.60	3.13	1.25	0.57	1.25
Portable Compaction roller														
Truck- Water	1	8	3.13	25.04	170.68	106.79	15.33	7.10	9.59	4.27	2.67	0.38	0.18	0.24
Forklift	1	8	2.50	20.00	270.01	39.13	15.65	7.10	15.65	5.40	0.78	0.31	0.14	0.31
Dump Truck	2	8	3.13	50.08	170.68	106.79	15.33	7.10	9.59	8.55	5.35	0.77	0.36	0.48
Service Truck- 1 ton														
Truck- Fuel/Lube	1	8	3.13	25.04	170.68	106.79	15.33	7.10	9.59	4.27	2.67	0.38	0.18	0.24
Concrete Pumper Truck														
Tractor Truck 5th Wheel														
Trucks- Pickup 3/4 ton	2	8	0.78	12.48	74.40	59.47	5.57	7.10	4.83	0.93	0.74	0.07	0.09	0.06
Trucks- 3 ton	1	8	1.56	12.48	74.40	59.47	5.57	7.10	4.83	0.93	0.74	0.07	0.09	0.06
Diesel Powered Welder														
Light Plants	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Portable Compaction- Vibratory Plate														
Portable Compaction- Vibratory Ram														
Articulating Boom Platforms														
Pumps														
Air Compressor 185 CFM	1	8	1.27	10.16	313.05	195.66	46.96	7.10	39.13	3.18	1.99	0.48	0.07	0.40
Air Compressor 750 CFM														
Concrete Vibrators														
Concrete Trowel Machine														
Fusion Welder														
Portable Power Generators	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Total =										154.74	39.49	11.01	4.40	10.02

Notes:
(1) See notes for combustion emissions.

Construction Equipment Daily Exhaust Emissions (Month 16)
East Altamont Energy Center

Equipment	Number of Units	Hrs/Day Per Unit	Gals/Hr Per Unit	Total Fuel Use (Gals/day)	Emission Factors (lbs/1000 gals)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
Crawler Crane- Greater than 300 ton	1	8	7.50	60.00	270.01	39.13	15.65	7.10	15.65	16.20	2.35	0.94	0.43	0.94
Crawler Crane- Greater than 200 ton	2	8	5.00	80.00	270.01	39.13	15.65	7.10	15.65	21.60	3.13	1.25	0.57	1.25
Crane - Mobile 65 ton	1	8	4.00	32.00	270.01	39.13	15.65	7.10	15.65	8.64	1.25	0.50	0.23	0.50
Cranes - Mobile 45 ton	1	8	4.00	32.00	270.01	39.13	15.65	7.10	15.65	8.64	1.25	0.50	0.23	0.50
Cranes - Mobile 35 ton	2	8	4.00	64.00	270.01	39.13	15.65	7.10	15.65	17.28	2.50	1.00	0.45	1.00
Bulldozer D6H														
Bulldozer D4C														
Excavator- Trencher	1	8	2.00	16.00	270.01	39.13	15.65	7.10	15.65	4.32	0.63	0.25	0.11	0.25
Excavator- Earth Scraper														
Excavator-Motor Grader														
Excavator- Backhoe/loader	1	8	2.50	20.00	270.01	39.13	15.65	7.10	15.65	5.40	0.78	0.31	0.14	0.31
Excavator - loader														
Vibratory Roller	1	8	10.00	80.00	270.01	39.13	15.65	7.10	15.65	21.60	3.13	1.25	0.57	1.25
Portable Compaction roller	1	8	10.00	80.00	270.01	39.13	15.65	7.10	15.65	21.60	3.13	1.25	0.57	1.25
Truck- Water	1	8	3.13	25.04	170.68	106.79	15.33	7.10	9.59	4.27	2.67	0.38	0.18	0.24
Forklift	1	8	2.50	20.00	270.01	39.13	15.65	7.10	15.65	5.40	0.78	0.31	0.14	0.31
Dump Truck														
Service Truck- 1 ton	1	8	1.56	12.48	74.40	59.47	5.57	7.10	4.83	0.93	0.74	0.07	0.09	0.06
Truck- Fuel/Lube	1	8	3.13	25.04	170.68	106.79	15.33	7.10	9.59	4.27	2.67	0.38	0.18	0.24
Concrete Pumper Truck														
Tractor Truck 5th Wheel	1	8	3.13	25.04	270.01	39.13	15.65	7.10	15.65	6.76	0.98	0.39	0.18	0.39
Trucks- Pickup 3/4 ton	6	8	0.78	37.44	74.40	59.47	5.57	7.10	4.83	2.79	2.23	0.21	0.27	0.18
Trucks- 3 ton	2	8	1.56	24.96	74.40	59.47	5.57	7.10	4.83	1.86	1.48	0.14	0.18	0.12
Diesel Powered Welder	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Light Plants	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Portable Compaction- Vibratory Plate	2	8	0.25	4.00	313.05	195.66	46.96	7.10	39.13	1.25	0.78	0.19	0.03	0.16
Portable Compaction- Vibratory Ram	2	8	0.25	4.00	313.05	195.66	46.96	7.10	39.13	1.25	0.78	0.19	0.03	0.16
Articulating Boom Platforms	6	8	0.25	12.00	313.05	195.66	46.96	7.10	39.13	3.76	2.35	0.56	0.09	0.47
Pumps	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Air Compressor 185 CFM	1	8	1.27	10.16	313.05	195.66	46.96	7.10	39.13	3.18	1.99	0.48	0.07	0.40
Air Compressor 750 CFM	2	8	1.27	20.32	313.05	195.66	46.96	7.10	39.13	6.36	3.98	0.95	0.14	0.80
Concrete Vibrators	8	8	0.25	16.00	313.05	195.66	46.96	7.10	39.13	5.01	3.13	0.75	0.11	0.63
Concrete Trowel Machine	1	8	1.27	10.16	313.05	195.66	46.96	7.10	39.13	3.18	1.99	0.48	0.07	0.40
Fusion Welder	1	8	1.27	10.16	313.05	195.66	46.96	7.10	39.13	3.18	1.99	0.48	0.07	0.40
Portable Power Generators	1	8	1.27	10.16	313.05	195.66	46.96	7.10	39.13	3.18	1.99	0.48	0.07	0.40
Total =										201.00	60.62	16.57	5.62	14.99

Notes:
(1) See notes for combustion emissions.

Construction Equipment Annual Exhaust Emissions
East Altamont Energy Center

Equipment	Average Number of Units Per Year(1)	Average Operating Hrs/Day Per Unit	Gals/Hr Per Unit	Average Operating Days per Year	Total Fuel Use (Gals/yr)	Emission Factors (lbs/1000 gals)(2) NOx	CO	POC	SOx	PM10	Annual Emissions (tons/yr) NOx	CO	POC	SOx	PM10
Crawler Crane- Greater than 300 ton	0.27	8	7.5	250	4,090.91	270.01	39.13	15.65	7.10	15.65	0.55	0.08	0.03	0.01	0.03
Crawler Crane- Greater than 200 ton	1.18	8	5	250	11,818.18	270.01	39.13	15.65	7.10	15.65	1.60	0.23	0.09	0.04	0.09
Crane - Mobile 65 ton	0.91	8	4	250	7,272.73	270.01	39.13	15.65	7.10	15.65	0.98	0.14	0.06	0.03	0.06
Cranes -Mobile 45 ton	0.50	8	4	250	4,000.00	270.01	39.13	15.65	7.10	15.65	0.54	0.08	0.03	0.01	0.03
Cranes - Mobile 35 ton	0.95	8	4	250	7,636.36	270.01	39.13	15.65	7.10	15.65	1.03	0.15	0.06	0.03	0.06
Bulldozer D6H	0.14	8	5.5	250	1,500.00	270.01	39.13	15.65	7.10	15.65	0.20	0.03	0.01	0.01	0.01
Bulldozer D4C	0.18	8	3	250	1,090.91	270.01	39.13	15.65	7.10	15.65	0.15	0.02	0.01	0.00	0.01
Excavator- Trencher	0.27	8	2	250	1,090.91	270.01	39.13	15.65	7.10	15.65	0.15	0.02	0.01	0.00	0.01
Excavator- Earth Scraper	0.14	8	9	250	2,454.55	270.01	39.13	15.65	7.10	15.65	0.33	0.05	0.02	0.01	0.02
Excavator-Motor Grader	0.32	8	5	250	3,181.82	270.01	39.13	15.65	7.10	15.65	0.43	0.06	0.02	0.01	0.02
Excavator- Backhoe/loader	0.73	8	2.5	250	3,636.36	270.01	39.13	15.65	7.10	15.65	0.49	0.07	0.03	0.01	0.03
Excavator - loader	0.18	8	2.5	250	909.09	270.01	39.13	15.65	7.10	15.65	0.12	0.02	0.01	0.00	0.01
Vibratory Roller	0.36	8	10	250	7,272.73	270.01	39.13	15.65	7.10	15.65	0.98	0.14	0.06	0.03	0.06
Portable Compaction roller	0.36	8	10	250	7,272.73	270.01	39.13	15.65	7.10	15.65	0.98	0.14	0.06	0.03	0.06
Truck- Water	0.73	8	3.13	250	4,552.73	170.68	106.79	15.33	7.10	9.59	0.39	0.24	0.03	0.02	0.02
Forklift	1.00	8	2.5	250	5,000.00	270.01	39.13	15.65	7.10	15.65	0.68	0.10	0.04	0.02	0.04
Dump Truck	0.27	8	3.13	250	1,707.27	170.68	106.79	15.33	7.10	9.59	0.15	0.09	0.01	0.01	0.01
Service Truck- 1 ton	0.41	8	1.56	250	1,276.36	74.40	59.47	5.57	7.10	4.83	0.05	0.04	0.00	0.00	0.00
Truck- Fuel/Lube	0.77	8	3.13	250	4,837.27	170.68	106.79	15.33	7.10	9.59	0.41	0.26	0.04	0.02	0.02
Concrete Pumper Truck	0.23	8	3.13	250	1,422.73	170.68	106.79	15.33	7.10	9.59	0.12	0.08	0.01	0.01	0.01
Tractor Truck 5th Wheel	0.82	8	3.13	250	5,121.82	270.01	39.13	15.65	7.10	15.65	0.69	0.10	0.04	0.02	0.04
Trucks- Pickup 3/4 ton	3.73	8	0.78	250	5,814.55	74.40	59.47	5.57	7.10	4.83	0.22	0.17	0.02	0.02	0.01
Trucks- 3 ton	1.82	8	1.56	250	5,672.73	74.40	59.47	5.57	7.10	4.83	0.21	0.17	0.02	0.02	0.01
Diesel Powered Welder	5.45	8	1.27	250	13,854.55	313.05	195.66	46.96	7.10	39.13	2.17	1.36	0.33	0.05	0.27
Light Plants	1.55	8	1.27	250	3,925.45	313.05	195.66	46.96	7.10	39.13	0.61	0.38	0.09	0.01	0.08
Portable Compaction- Vibratory Plate	0.82	8	0.25	250	409.09	313.05	195.66	46.96	7.10	39.13	0.06	0.04	0.01	0.00	0.01
Portable Compaction- Vibratory Ram	1.18	8	0.25	250	590.91	313.05	195.66	46.96	7.10	39.13	0.09	0.06	0.01	0.00	0.01
Articulating Boom Platforms	1.00	8	0.25	250	500.00	313.05	195.66	46.96	7.10	39.13	0.08	0.05	0.01	0.00	0.01
Pumps	2.59	8	1.27	250	6,580.91	313.05	195.66	46.96	7.10	39.13	1.03	0.64	0.15	0.02	0.13
Air Compressor 185 CFM	2.05	8	1.27	250	5,195.45	313.05	195.66	46.96	7.10	39.13	0.81	0.51	0.12	0.02	0.10
Air Compressor 750 CFM	0.95	8	1.27	250	2,424.55	313.05	195.66	46.96	7.10	39.13	0.38	0.24	0.06	0.01	0.05
Concrete Vibrators	1.38	8	0.25	250	690.48	313.05	195.66	46.96	7.10	39.13	0.11	0.07	0.02	0.00	0.01
Concrete Trowel Machine	2.64	8	1.27	250	6,696.36	313.05	195.66	46.96	7.10	39.13	1.05	0.66	0.16	0.02	0.13
Fusion Welder	0.27	8	1.27	250	692.73	313.05	195.66	46.96	7.10	39.13	0.11	0.07	0.02	0.00	0.01
Portable Power Generators	0.29	8	1.27	250	725.71	313.05	195.66	46.96	7.10	39.13	0.11	0.07	0.02	0.00	0.01
Total =											18.06	6.62	1.70	0.50	1.49

Notes:
(1) Based on average number of units operating over 22 month construction period.
(2) See notes on combustion emissions.

Notes - Combustion Emissions

(1) For Construction Equipment
For heavy Diesel construction equipment, emission factors based on equipment meeting EPA 1996 off-road Diesel standards and use of CARB low-sulfur fuel.
For trucks, depending on size of truck, emissions factors based on MVE17G version 1.0c for heavy-heavy duty or medium duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin
For portable equipment, emission factors based on EPA's "Non-road Engine and Vehicle Emission Study Report", 11/91, Table 2-07, for generator sets, welders, pumps, and air compressors less than 5(

(2) For Delivery Trucks
From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.

(3) For Worker Travel
From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000, San Francisco Air Basin.

(4) For Rail Deliveries
NOx, CO, POC, and PM10 emission factors from EPA's "Technical Highlights - Emissions Factors for Locomotives", December 1997.
SOx emission factor from Booz-Allen & Hamilton "Locomotive Emission Study", prepared for CARB, January 1991.

Daily Fugitive Dust Emissions (Month 7)
East Altamont Energy Center

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM10 Emissions (lbs/day)
Bulldozer D6H	1	8.0	8.0	hours	0.7528		6.02
Bulldozer D4C	1	8.0	8.0	hours	0.7528		6.02
Excavator- Trencher Excavation							
Excavator- Earth Scraper Excavation	3	8.0	24.0	hours	0.7528		18.07
Excavator- Earth Scraper Unpaved Road Trave	3	14.5	43.6	vmt	0.2656	69%	3.54
Excavator-Motor Grader	1	24.0	24.0	vmt	0.2754		6.61
Excavator- Backhoe Excavation							
Excavator - Loader Excavation	1	3,250.0	3,250.0	tons	0.0004		1.38
Excavator - Loader Unpaved Road Travel	1	28.4	28.4	vmt	0.1148	69%	1.00
Water Truck Unpaved Road Travel	1	20.0	20.0	vmt	0.1522	69%	0.93
Forklift Unpaved Road Travel	1	16.0	16.0	vmt	0.0970	69%	0.47
Dump Truck Unpaved Road Travel	2	13.6	27.3	vmt	0.1589	69%	1.32
Dump Truck Unloading	2	1,625.0	3,250.0	tons	0.0004		1.38
Service Truck Unpaved Road Travel							
Fuel/Lube Truck Unpaved Road Travel	1	3.4	3.4	vmt	0.1181	69%	0.12
Concrete Pumper Truck Unpaved Road Travel							
Tractor Truck 5th Wheel Unpaved Road Travel							
Pickup Truck Unpaved Road Travel	2	17.0	34.1	vmt	0.0599	69%	0.62
3 ton Truck Unpaved Road Travel	1	8.5	8.5	vmt	0.0803	69%	0.21
Windblown Dust (active construction area)	N/A	816,927.0	816,927.0	sq.ft.	2.523E-05	69%	6.30
Worker Paved Road Travel	165	0.5	81.3	vmt	0.0005		0.04
Delivery Truck Paved Road Travel	10	0.5	4.9	vmt	0.0185		0.09
Delivery Truck Unpaved Road Travel	10	0.2	1.7	vmt	0.1589	69%	0.08
Total =							54.21

Notes:
(1) See notes for fugitive dust emission calculations.

Daily Fugitive Dust Emissions (Month 16)
East Altamont Energy Center

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM10 Emissions (lbs/day)
Bulldozer D6H							
Bulldozer D4C							
Excavator- Trencher Excavation	1	3,417.6	3,417.6	cu. yds.	0.0018		6.25
Excavator- Earth Scraper Excavation							
Excavator- Earth Scraper Unpaved Road Travel							
Excavator-Motor Grader							
Excavator- Backhoe Excavation	1	398.4	398.4	cu. yds.	0.0018		0.73
Excavator - Loader Excavation							
Excavator - Loader Unpaved Road Travel							
Water Truck Unpaved Road Travel	1	20.0	20.0	vmt	0.1522	69%	0.93
Forklift Unpaved Road Travel	1	16.0	16.0	vmt	0.0970	69%	0.47
Dump Truck Unpaved Road Travel							
Dump Truck Unloading							
Service Truck Unpaved Road Travel	1	8.5	8.5	vmt	0.0803		0.68
Fuel/Lube Truck Unpaved Road Travel	1	3.4	3.4	vmt	0.1181	69%	0.12
Concrete Pumper Truck Unpaved Road Travel							
Tractor Truck 5th Wheel Unpaved Road Travel	1	8.5	8.5	vmt	0.0970		0.83
Pickup Truck Unpaved Road Travel	6	17.0	102.3	vmt	0.0599	69%	1.87
3 Ton Truck Unpaved Road Travel	2	8.5	17.0	vmt	0.0803	69%	0.42
Windblown Dust (active construction area)	N/A	816,927.0	816,927.0	sq.ft.	0.0000	69%	6.30
Worker Paved Road Travel	500	0.5	246.2	vmt	0.0005		0.12
Delivery Truck Paved Road Travel	40	0.5	19.7	vmt	0.0185		0.36
Delivery Truck Unpaved Road Travel	40	0.2	6.8	vmt	0.1589	69%	0.33
Total =							19.41

Notes:
(1) See notes for fugitive dust emission calculations.

Annual Fugitive Dust Emissions
East Altamont Energy Center

Activity	Average Daily PM10 Emissions(1) (lbs/day)	Days per Year	Annual PM10 Emissions (tons/yr)
Construction Activities	32.19	250	4.02
Windblown Dust	6.30	365	1.15
Total =			5.17

Notes:
(1) Based on average of daily emissions during Months 7, 9, 15, and 16.

Notes - Fugitive Dust Emission Calculations

(1) Paved road travel emission factors for delivery trucks and worker automobiles are based on AP-42, Section 13.2.1, 10/97.
(Based on default road silt loading shown in AP-42, page 13.2.1-5, 10/97, limited access roads.)
(2) Wind erosion emission factor for active construction area is based on "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996.
(3) Finish grading emission factor is based on AP-42, Table 11.9-1, 7/98.
(4) Bulldozer excavation emission factor is based AP-42, Table 11.9-1, 7/98.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(5) Material unloading emission factors are based on AP-42, p. 13.2.4-3, 1/95.
(Based on average annual wind speed recorded onsite and default soil moisture content shown in AP-42, Table 11.9-3, 7/98, overburden.)
(6) Loader unpaved surface travel emission factor is based on AP-42, Section 13.2.2, 1/95.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(7) Trenching emission factor is based on AP-42, Table 11.9-2 (dragline operations), 1/95.
(Based on default soil moisture content shown in AP-42, Table 11.9-3, 7/98, overburden.)
(8) Unpaved surface travel emission factors for water trucks, fuel trucks, service trucks, dump trucks, forklifts, pickup trucks, delivery trucks, and concrete trucks are based on AP-42, Section 13.2.2, 9/98.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(9) Dust control efficiency for unpaved road travel and active excavation area is based on "Control of Open Fugitive Dust Sources", U.S. EPA, 9/88.
(Based on default evaporation rate shown in EPA document, Figure 3-2, 9/88, and typical water application rate shown in EPA document, page 3-23, 9/88.)

Daily Construction Emissions (Month 7) East Altamont Energy Center					
Daily Emissions (lbs/day)					
	NOx	CO	POC	SOx	PM10
Onsite					
Construction Equipment	154.74	39.49	11.01	4.40	10.02
Fugitive Dust					54.21
Subtotal =	154.74	39.49	11.01	4.40	64.23
Offsite					
Worker Travel	27.65	330.56	26.40	0.02	0.56
Truck Deliveries	19.61	12.27	1.76	0.81	1.14
Rail Deliveries	0.00	0.00	0.00	0.00	0.00
Subtotal =	47.26	342.83	28.16	0.83	1.71
Total =	202.00	382.33	39.17	5.23	65.94

Daily Construction Emissions (Month 16) East Altamont Energy Center					
Daily Emissions (lbs/day)					
	NOx	CO	POC	SOx	PM10
Onsite					
Construction Equipment	201.00	60.62	16.57	5.62	14.99
Fugitive Dust					19.41
Subtotal =	201.00	60.62	16.57	5.62	34.40
Offsite					
Worker Travel	83.79	1001.71	79.99	0.05	1.70
Truck Deliveries	78.45	49.08	7.04	3.24	4.58
Rail Deliveries	15.82	1.56	0.59	1.01	0.39
Subtotal =	178.06	1052.35	87.62	4.31	6.67
Total =	379.06	1112.97	104.19	9.93	41.07

Annual Construction Emissions
East Altamont Energy Center

Annual Emissions (tons/yr)

	NOx	CO	POC	SOx	PM10
Onsite					
Construction Equipment	18.06	6.62	1.70	0.50	1.49
Fugitive Dust					5.17
Subtotal =	18.06	6.62	1.70	0.50	6.67
Offsite					
Worker Travel	4.19	50.09	4.00	0.00	0.09
Truck Deliveries	2.38	1.49	0.21	0.10	0.14
Rail Deliveries	0.36	0.04	0.01	0.02	0.01
Subtotal =	6.93	51.61	4.23	0.12	0.23
Total =	25.00	58.23	5.93	0.62	6.90

Appendix 8.1F
Evaluation of Best Available Control Technology

ATTACHMENT 8.1F

EVALUATION OF BEST AVAILABLE CONTROL TECHNOLOGY

To evaluate BACT for the proposed turbines, the guideline for large gas turbines (heat input rating greater than 23 MMBtu/hr) in BAAQMD BACT/TBACT Workbook was reviewed. The relevant BACT determinations for this analysis are shown in Table 8.1F-1.

TABLE 8.1F-1
BAAQMD BACT Guideline For Large Gas Turbines

Pollutant		BACT		Typical Technology
Nitrogen Oxides	1.	<5 ppm dry @ 15% O2	1.	SCR + Combustion Modifications
	2.	5 ppm dry @ 15% O2	2.	SCR + Combustion Modifications
Sulfur Dioxide	1.	Natural gas fuel	1.	Fuel selection
Carbon Monoxide	1.	10 ppm dry @ 15% O2	1.	Catalytic oxidation
	2.	10 ppm dry @ 15% O2	2.	Catalytic oxidation
VOC	1.	>50% reduction by weight	1.	Catalytic oxidation
	2.	50% reduction by weight	2.	Catalytic oxidation
PM_{10}	1.	Natural gas fuel	1.	Fuel selection

Notes:

1. Technologically feasible and cost effective
2. Achieved in practice

The EPA RACT-BACT-LAER Clearinghouse (RBLC) was also consulted to review recent EPA BACT decisions for gas-fired gas turbines. These recent BACT decisions are summarized in Table 8.1F-2 below. NOx levels shown in these BACT determinations are very high, although EPA has recently stated that the SCONOx technology has demonstrated that 2.5 ppm is achievable in practice. CO levels in this listing are also relatively high, and do not indicate that oxidations catalysts have been considered BACT for CO or VOCs.

Finally, the ARB's BACT Clearinghouse Database was reviewed for recent BACT decisions regarding large gas turbine projects in California. Relevant BACT decisions are summarized in Table 8.1F-3. NOx levels shown in these determinations are generally around 5 ppm. None of these recent BACT decisions include a determination for CO, and the determinations for VOC include extremely low catalyst efficiencies (5 to 10 percent).

EAEC proposes to use dry low-NOx combustors with selective catalytic reduction and oxidation catalysts that will achieve NOx exhaust concentrations of 2.5 ppmv or less, CO

TABLE 8.1F-2

Gas Turbine BACT Determinations For EPA RBLC Clearinghouse

Facility/Location	Date Permit Issued	Equipment/Rating	NOx Limit/Control Technology	CO Limit/Control Technology
Alabama Power Company McIntosh, AL	7/10/97	100 MW combustion turbine w/ duct burner	15 ppm (dry low-NOx burners)	n/a
Lordsburg L.P. Lordsburg, NM	6/18/97	100 MW combustion turbine	15 ppm (dry low-NOx technology)	50 ppm (dry low-NOx technology)
Mead Coated Board, Inc. Phenix City, AL	3/12/97	25 MW combustion turbine w/ fired HRSG	25 ppm (dry low-NOx combustor)	28 ppm (proper design and good combustion practices)
Northern California Power Agency Lodi, CA	10/02/97	GE Frame 5 gas turbine	25 ppm	n/a
Portside Energy Corp. Portage, IN	5/13/96	63 MW gas turbine w/ unfired HRSG	n/a	10 ppm (good combustion)
Southwestern Public Service Hobbs, NM	2/15/97	gas turbine	15 ppm w/o power augmentation 25 ppm w/ augmentation	good combustion practices

TABLE 8.1F-3
Summary of BACT Determinations From ARB BACT Clearinghouse

FACILITY/DISTRICT	PERMIT NO.	EQUIPMENT/RATING	NOX LIMIT/CONTROL TECHNOLOGY	VOC/HC LIMIT/CONTROL TECHNOLOGY
Sacramento Cogeneration Authority Sacramento Metropolitan AQMD	A330-849-98 A330-850-98 A330-851-98	GE LM6000 combined-cycle gas turbine w/ supplemental firing (42 MW each)	5 ppm (dry low-NOx combustion and SCR)	oxidation catalyst (10% destruction efficiency)
Sacramento Power Authority Sacramento Metropolitan AQMD	A330-852-98	Siemens V84.2 combined-cycle gas turbine w/ supplemental firing (103 MW)	3 ppm (water injection and SCR)	oxidation catalyst (5% destruction efficiency)
Carson Energy Sacramento Metropolitan AQMD	A330-854-98	GE LM6000 combined-cycle gas turbine w/ supplemental firing (42 MW)	5 ppm (water injection and SCR)	oxidation catalyst (10% destruction efficiency)
SEPCO	A330-855-98	GE Frame 7EA gas turbine w/ supplemental firing (82 MW)	5 ppm (dry low-NOx combustion and SCR)[1]	oxidation catalyst (5% destruction efficiency)

Note:

1. District indicates that applicant proposed 2.6 ppm to lower offset liability.

exhaust concentrations of 6 ppmv or less, and VOC concentrations of 2.0 ppmv or less. The turbines will be fueled with natural gas to minimize SO_2 and PM_{10} emissions. These pollutant levels will achieve emission reductions consistent with the BAAQMD BACT guideline.

BACT is defined in BAAQMD Rule 2-2-206 as the more stringent of:

206.1 The most effective emission control device or technique which has been successfully utilized for the type of equipment comprising such a source; or

206.2 The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source; or

206.3 Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO; or

206.4 The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations.

The APCO shall publish and periodically update a BACT/TBACT Workbook specifying the requirements for commonly permitted sources. BACT will be determined for a source by using the workbook as a guidance document or, on a case-by-case basis, using the most stringent definition of this Section 2-2-206.

Of these four "prongs" of the BACT definition, the first three are generally controlling. In the BAAQMD's BACT guidance document, these three prongs are reduced to two criteria: (1) technologically feasible and cost-effective, and (2) achieved in practice.

This analysis will follow EPA's guidance for the preparation of "top down" BACT analyses focusing specifically on identifying emission limitations or control techniques that are achieved in practice and technically feasible.

A "top-down" analysis format, consistent with guidance provided in EPA's October 1990 Draft New Source Review Workshop Manual, has been used for the BACT analysis. That guidance lays out five steps for a top-down BACT analysis, as follows:

- Identify all control technologies
- Eliminate technically infeasible options
- Rank remaining control technologies by control effectiveness
- Evaluate most effective controls and document results
- Select BACT

This procedure is followed for each of the pollutants evaluated in this analysis.

8.1F.1 Control of Nitrogen Oxides

8.1F.1.1 Identify All Control Technologies

The baseline NOx emission rate for this analysis is considered to be 75 ppmvd @ 15% O_2, based on the governing new source performance standard (40 CFR 60 Subpart GG). This emission rate provides the frame of reference for the evaluation of control effectiveness and feasibility. The maximum degree of control, resulting in the minimum emission rate, is a combination of dry low-NOx combustors and either selective catalytic reduction or SCONOx to achieve a long-term NOx limit of approximately 1 ppmvd. Several intermediate levels of control are also evaluated.

There are three basic means of controlling NOx emissions from combustion turbines: wet combustion controls, dry combustion controls, and post-combustion controls. Wet and dry combustion controls act to reduce the formation of NOx during the combustion process, while post-combustion controls remove NOx from the exhaust stream. Potential NOx control technologies for combustion gas turbines include the following:

Wet combustion controls
Water injection

- Steam injection
- Dry combustion controls
- Dry low-NOx combustor design
- Catalytic combustors (e.g., XONON)
- Other combustion modifications

Post-combustion controls
- Selective non-catalytic reduction (SNCR)
- Non-selective catalytic reduction (NSCR)
- Selective catalytic reduction (SCR)
- SCONOx

8.1F.1.2 Eliminate Technically Infeasible Options

The performance and technical feasibility of available NOx control technologies are discussed in more detail below.

Combustion Modifications

Wet Combustion Controls
Steam or water injection directly into the turbine combustor is one of the most common NOx control techniques for combustion turbines. These wet injection techniques lower the flame temperature in the combustor and thereby reduce thermal NOx formation. The water or steam-to-fuel injection ratio is the most significant factor affecting the performance of wet controls. Steam injection techniques can reduce NOx emissions in gas-fired turbines to between 15 and 25 ppmv at 15% O_2; the practical limit of water injection has been demonstrated at approximately 25-42 ppmv @ 15% O_2 before combustor damage becomes significant. Higher diluent:fuel ratios (especially with steam) not only result in greater NOx reductions, but also increase emissions of CO and hydrocarbons, reduce turbine efficiency,

and may increase turbine maintenance requirements. The principal NOx control mechanisms are identical for water and steam injection. Water or steam is injected into the primary combustion chamber to act as a heat sink, lowering the peak flame temperature of combustion and thus lowering the quantity of thermal NOx formed. The injected water or steam exits the turbine as part of the exhaust.

Since steam has a higher temperature/enthalpy than water, more steam is required to achieve the same quenching effect. Typical steam injection ratios are 0.5 to 2.0 pounds steam per pound fuel; water injection ratios are generally below 1.0 pound water per pound fuel. Because water has a higher heat absorbing capacity than steam (due to the temperature and to the latent heat of vaporization associated with water), it takes more steam than water to achieve an equivalent level of NOx control.

Although the lower peak flame temperature has a beneficial effect on NOx emissions, it can also reduce combustion efficiency and prevent complete combustion. As a result, CO and VOC emissions increase as water/steam-to-fuel ratios increase. Thus, the higher steam-to-fuel ratio required for NOx control will tend to cause higher CO and VOC emissions from steam-injected turbines than from water-injected turbines, due to the kinetic effect of the water molecules interfering with the combustion process. However, steam injection can reduce the heat rate of the turbine so that equivalent power output can be achieved with reduced fuel consumption and reduced SO_2 emission rates.

Water and steam injection have been in use on both oil- and gas-fired turbines in all size ranges for many years, so these NOx control technologies are clearly technologically feasible and widely available.

Dry Combustion Controls

Combustion modifications that lower NOx emissions without wet injection include lean combustion, reduced combustor residence time, lean premixed combustion, and two-stage rich/lean combustion. Lean combustion uses excess air (greater than stoichiometric air-to-fuel ratio) in the combustor primary combustion zone to cool the flame, thereby reducing the rate of thermal NOx formation. Reduced combustor residence times are achieved by introducing dilution air between the combustor and the turbine sooner than with standard combustors. The combustion gases are at high temperatures for a shorter time, which also has the effect of reducing the rate of thermal NOx formation.

The most advanced combination of combustion controls for NOx is referred to as dry low-NOx (DLN) combustors. DLN technology uses lean, premixed combustion to keep peak combustion temperatures low, thus reducing the formation of thermal NOx. This technology is effective in achieving NOx emission levels comparable to levels achieved using wet injection without the need for large volumes of purified water and without the increases in CO and VOC emissions that result from wet injection. Several turbine vendors have developed this technology for their engines, including the engine proposed for this project. This control technique is technically feasible.

Catalytic combustors use a catalytic reactor bed mounted within the combustor to burn a very lean fuel-air mixture. This technology has been commercially demonstrated under the trade name XONON in a 1.5 MW natural gas-fired turbine in Santa Clara, California, and commercial availability of the technology for a 200 MW GE Frame 7 natural gas-fired turbine was recently announced for one project. (The technology has also been announced as

commercially available for some models of small gas turbines, generally 10 MW in size and less.) The combustor used in the Santa Clara demonstration engine is generally comparable in size to that used in GE Frame 7F engines; however, the technology has not been announced commercially for the engines proposed for the Metcalf Energy Center. Based on discussions with the technology's supplier, Catalytica Corporation, a commercial quotation for the use of XONON in this project is not commercially available for MEC. No turbine vendor, other than General Electric, has indicated the commercial availability of catalytic combustion systems at the present time; therefore, catalytic combustion controls are not available for this specific application and are not discussed further.

Post-Combustion Controls

SCR is a post-combustion technique that controls both thermal and fuel NOx emissions by reducing NOx with a reagent (generally ammonia or urea) in the presence of a catalyst to form water and nitrogen. NOx conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask the catalyst (sulfur compounds, particulates, heavy metals, and silica). SCR is used in numerous gas turbine installations throughout the United States, almost exclusively in conjunction with other wet or dry NOx combustion controls. SCR requires the consumption of a reagent (ammonia or urea) and requires periodic catalyst replacement. Estimated levels of NOx control are in excess of 90%.

Selective non-catalytic reduction (SNCR) involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1200° to 2000° F and is most commonly used in boilers. The exhaust temperature for the proposed gas turbine ranges from 1087° to 1200° F, which is well below the minimum SNCR operating temperature. Some method of exhaust gas reheat, such as additional fuel combustion, would be required to achieve exhaust temperatures compatible with SNCR operations, and this requirement makes SNCR technologically infeasible for this application. Even when technically feasible, SNCR is unlikely to achieve NOx reductions in excess of 80%-85%.

Nonselective catalytic reduction (NSCR) uses a catalyst without injected reagents to reduce NOx emissions in an exhaust gas stream. NSCR is typically used in automobile exhaust and rich-burn stationary IC engines, and employs a platinum/rhodium catalyst. NSCR is effective only in a stoichiometric or fuel-rich environment where the combustion gas is nearly depleted of oxygen, and this condition does not occur in turbine exhaust where the oxygen concentrations are typically between 14 and 16%. For this reason, NSCR is not technologically feasible for this application.

SCONOx is a proprietary catalytic oxidation and adsorption technology that uses a single catalyst for the control of NOx, CO, and VOC emissions. The catalyst is a monolithic design, made from a ceramic substrate with both a proprietary platinum-based oxidation catalyst and a potassium carbonate adsorption coating. The catalyst simultaneously oxidizes NO to NO_2, CO to CO_2, and VOCs to CO_2 and water, while NO_2 is adsorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. The SCONOx potassium carbonate layer has a limited adsorption capability and requires regeneration approximately every 12-15 minutes in normal service[2]. Each regeneration cycle

2 Personal communication, ABB Environmental, 1/18/00.

requires approximately 3-5 minutes. At any point in time, approximately 20% of the compartments in a SCONOx system would be in regeneration mode, and the remaining 80% of the compartments would be in oxidation/absorption mode[3].

Regeneration of the adsorption layer requires exposure of the catalyst to hydrogen gas. In practice, this is accomplished by reforming natural gas with high-pressure steam to produce a gas mixture consisting of methane, carbon dioxide, and hydrogen that is passed over the catalyst beds[4]. Initial attempts by the developer of the process to create regeneration gases from natural gas and steam within the SCONOx catalyst bed (internal autothermal regeneration) failed to produce consistent results; this approach was abandoned in favor of the current offering, which uses an external steam-heated reformer that partially reforms the natural gas to produce the gas mixture that is introduced into the catalyst bed.[5] The reformation reaction continues to some extent within the catalyst bed due to the presence of steam and the temperature of the catalyst surface, but some methane and VOCs from the natural gas remain.

Because the active regenerant gas is hydrogen, the regeneration process must be performed in an atmosphere of low oxygen to prevent dilution of the hydrogen. In practice, the oxygen present in the exhaust gas of combustion turbines is excluded from the catalyst bed by dividing the catalyst bed into a number of individual cells or compartments that are equipped with front and rear dampers that are closed at the beginning of each regeneration cycle. Proper regeneration of the SCONOx catalyst system depends upon the proper functioning and sealing of these sets of dampers approximately 4 times per hour so that an adequate concentration of hydrogen can be maintained in each module to accomplish complete regeneration of the catalyst before the dampers are opened and the compartment is placed back in service.

Because the SCONOx catalyst can be "poisoned" or rendered inactive by even the very small amounts of sulfur compounds present in natural gas, a SCOSOx catalyst bed (or "guard bed") that is intended to remove trace quantities of sulfur-bearing compounds from the exhaust gas stream is installed upstream of the SCONOx catalyst bed. Like the SCONOx catalyst, the SCOSOx catalyst must be regenerated. Regeneration of the two catalyst types occurs at the same time, with the same regeneration gas supply provided to both; however, the sulfur-bearing regeneration gases for the SCOSOx catalyst exit the SCONOx modules separately from the SCONOx regeneration gases to avoid contaminating the SCONOx catalyst beds. Both regeneration gas streams are returned to the gas turbine exhaust stream downstream of the SCONOx module.[6]

The external reformer used to create the regeneration gases is supplied with steam and natural gas. For one F-class turbine, an estimated 15,000 to 20,000 lbs/hr of 600°F steam is required, along with approximately 100 pounds per hour (2.2 MMbtu/hr) of natural gas.[7] To avoid poisoning the reformer catalyst, the natural gas supplied to the reformer passes

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3 Stone & Webster, "Independent Technical Review – SCONOx Technology and Design Review", February 2000.
4 Stone & Webster, op cit
5 ABB Environmental, op cit
6 ABB Environmental, op cit
7 Ibid

through an activated carbon filter to remove some of the sulfur-bearing compounds that are added to natural gas to facilitate leak detection.[8]

To properly treat the CT exhaust gas without undue backpressure, an estimated 40-60 catalyst modules would be required for an F-class machine[9]. The pressure drop associated with a NOx removal efficiency of 90% is approximately 5″ of water (in. wg)[10]. The estimated space velocity for such a system is 22,000/hour[11].

The regeneration cycle time is expected to be controlled using a feedback system based on NOx emission rates.[12] That is, the higher the NOx emissions are relative to the design level, the shorter the absorption cycle, and regeneration cycles will occur more frequently. This is analogous to the use of feedback systems for controlling reagent (ammonia or urea) flow rates in an SCR system.

Maintenance requirements for SCONOx systems are expected to include periodic replacement of the reformer fuel sulfur carbon unit, periodic replacement of the reformer catalyst, periodic washings of the SCOSOx and SCONOx catalyst beds, and periodic replacement of the SCOSOx and SCONOx catalyst beds. The replacement frequency for the reformer sulfur carbon unit and reformer catalyst is unknown to MEC at present. The SCOSOx catalyst is expected to require washing once per year. The lead (upstream) SCONOx catalyst bed is expected to require washing once per year, while the trailing (downstream) SCONOx catalyst bed(s) are expected to require washing once every three years. The annual catalyst washing process is expected to take approximately three days for an F-class machine, at an estimated annual cost of $200,000.[13] The estimated catalyst life is reported to be 7 washings;[14] the guaranteed catalyst life is 3 years.[15]

The adsorption temperature operating range for the SCONOx system is 300°F to 700°F, with an optimal temperature of approximately 600°F.[16] However, regeneration cycles are not initiated unless the catalyst bed temperature is above 450°F to avoid the creation of hydrogen sulfide during the regeneration of the SCOSOx catalyst.[17]

Estimates of control system efficiency vary. ABB Environmental has indicated that the SCONOx system is capable of achieving a 90% reduction in NOx; a 90% reduction in CO, to a level of 2 ppm; and an 80%-85% reduction in VOC emissions.[18] (This VOC reduction is not likely to be achieved with low VOC inlet concentrations, in the 1–2 ppm range.[19]) Commercially quoted NOx emission rates for the SCONOx system range from 2.0 ppm on a 3-hour average basis, representing a 78% reduction,[20] to 1.0 ppm with no averaging period

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8 Stone & Webster, op cit
9 ABB Environmental, op cit
10 Ibid
11 Ibid
12 Ibid
13 Ibid
14 Ibid
15 Letter from ABB Alstom Power to Bibb & Associates dated May 5, 2000. (ABB Three Mountain Power or ABB TMP)
16 Ibid
17 ABB Environmental, op cit. Stone & Webster, op cit
18 ABB Environmental, op cit
19 Ibid
20 ABB TMP, op cit

specified (96% reduction).[21] The SCONOx system does not control or reduce emissions of sulfur oxides or particulate matter from the combustion device.[22]

The SCONOx system has been applied at the Sunlaw Federal Cogeneration Plant in Vernon California since December 1996, and at the Genetics Institute Facility in Massachusetts. The Sunlaw facility uses an LM-2500 gas turbine, rated at a nominal 23 MW, and the Genetics Institute facility has a 5 MW Solar gas turbine.

The SCONOx system was proposed for use by PG&E Generating Company at its La Paloma facility; however, PG&E Generating no longer plans to use the SCONOx system at that site.[23] The SCONOx system is currently proposed for demonstration by PG&E Generating Company at the Otay Mesa Generating Project. In addition, the technology's co-developer, Sunlaw, has proposed to use the technology in conjunction with ABB gas turbines at the Nueva Azalea site in Southern California.

As discussed further below, there are serious questions about the probability of a successful commercial demonstration and the commercial availability of the technology for application to the proposed East Altamont Energy Center, as well as the levels of emission control that can be consistently achieved. However, based on the preceding discussion, the SCONOx system will be considered as technologically feasible for the purposes of this analysis.

Based on the discussions above, the following NOx control technologies are available and potentially technologically feasible for the proposed project:

- Water injection
- Steam injection
- Dry Low-NOx Combustors
- Selective Catalytic Reduction
- SCONOx

8.1F.1.3 Rank Remaining Control Technologies by Control Effectiveness

The remaining technically feasible control technologies are ranked by NOx control effectiveness in Table 8.1F-3.

8.1F.1.4 Evaluate Most Effective Controls and Document Results

Water and steam injection are control technologies that, for large gas turbines, have been largely superseded by dry low-NOx combustors, due to the superior emission control performance, additional CO and VOC benefits, and increased efficiency of this technology. Since the MEC project proposes to use dry low-NOx combustors, no further discussion of water injection, steam injection, or dry low-NOx combustors is necessary.

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[21] Letter from ABB Alstom Power to Sunlaw Energy Corporation dated February 11, 2000. (ABB Sunlaw)

[22] ABB Environmental, op cit

[23] Ibid

TABLE 8.1F-3
NOx Control Alternatives

NOx Control Alternative	Available?	Technically Feasible?	NOx Emissions (@ 15% O_2)	Environmental Impact	Energy Impacts
Water Injection	Yes	Yes	25-42 ppm	Increased CO/VOC	Decreased Efficiency
Steam Injection	Yes	Yes	15 – 25 ppm	Increased CO/VOC	Increased Efficiency
Dry Low-NOx Combustors	Yes	Yes	9-25 ppm	Reduced CO/VOC	Increased Efficiency
Selective Catalytic Reduction	Yes	Yes	>90% reduction – 2.5 ppm 1	Ammonia slip	Decreased Efficiency
SCONOx	Yes[1]	Yes[2]	>90% reduction – 2.5 ppm 1	Reduced CO; potential reduction in VOC	Decreased Efficiency

Notes:
There are no standard, commercial guarantees for utility-scale projects for this technology available in the public domain.
This technology has been used on small (5 MW and 22 MW) gas turbines for a limited period of time. It has not been used on utility-scale gas turbines.

The performance of SCR and SCONOx, insofar as NOx emission levels are concerned, is are essentially equivalent. Both technologies have demonstrated the ability to reduce NOx emissions by at least 90%, and differences between low NOx levels (1 ppm vs 2 ppm vs 2.5 ppm) appear, in the case of each technology, to be largely a function of catalyst size, turbine outlet NOx concentration, and compliance terms (e.g., averaging period). The principal differences between the two technologies are associated with whether the low emission levels proposed have been achieved in practice using these technologies, their cost-effectiveness in achieving these levels, and secondary environmental impacts.

Achieved in Practice Evaluation

The Bay Area AQMD does not have any formal, established criteria for determining when a technology should be considered achieved in practice. In general, the BAAQMD guideline states:

The second BACT category, 'achieved in practice', applies to the most effective emission control device already in use or the most stringent emission limit achieved in the field for the type and capacity of equipment comprising the source under review and operating under similar conditions, e.g., process throughput and material usage, hours of operation, site-specific limitations or opportunities, etc.

The South Coast AQMD has established more formal criteria for determining when emission control technologies should be considered achieved in practice (AIP) for the purposes of BACT determinations. That District's BACT Scientific Review Committee has recently reviewed a proposed clarification of those criteria. The proposed criteria include the following elements:

Commercial Availability. At least one vendor must offer this equipment for regular or full-scale operation in the United States. A performance warranty or guaranty must be available with the purchase of the control technology, as well as parts and service.

Reliability. All control technologies must have been installed and operated reliably for at least six months. If the operator did not require the basic equipment to operate daily, then the equipment must have at least 183 cumulative days of operation. During this period, the basic equipment must have operated (1) at a minimum of 50% design capacity; or (2) in a manner that is typical of the equipment in order to provide an expectation of continued reliability of the control technology.

Effectiveness. The control technology must be verified to perform effectively over the range of operation expected for that type of equipment. If the control technology will be allowed to operate at lesser effectiveness during certain modes of operation, then those modes of operation must be identified. The verification shall be based on a performance test or tests, when possible, or other performance data.

Technology Transfer. BACT is based on what is AIP for a category or class of source. However, USEPA guidelines require that technology that is determined to be AIP for one category of source be considered for transfer to other source categories. There are two types of potentially transferable control technologies: (1) exhaust stream controls, and (2) process controls and modifications. For the first type, technology transfer must be considered between source categories that produce similar exhaust streams. For the second type, technology transfer must be considered between source categories with similar processes.

Discussion of SCR-Based Limits – Achieved in Practice Criteria

SCR has been achieved in practice at numerous gas turbine installations throughout the world. Although there are a large number of gas turbines equipped with SCR systems, there are relatively fewer systems in operation that are designed to meet low NOx permit limits of 2.5 ppm or less.

Available CEMS data from the SMUD/SPAC Campbell Soup plant in Sacramento, California, indicate NOx control levels on a continuous basis that are in compliance with a 3.0 ppm limit. Actual NOx levels from that facility, which is equipped with a 120 MW (nominal) Siemens V84.2 turbine, are comfortably below that limit, at approximately 2.5 ppm. This facility has experienced a limited number of events above the permit limit; in each case, the excursion has been associated with a trip of the gas turbine from pre-mix, or low-NOx, mode into diffusion mode. The permit for the facility has since been modified to accommodate up to ten hours per year of excursions above the 3 ppm permit limit under specified conditions.

The extrapolation of SCR experience gained at higher NOx concentrations (3-5 ppm), where there are more sites in operation, to lower NOx permit limits depends on controlling turbine exhaust (SCR inlet) NOx concentrations, increasing catalyst size, improving feed-forward and feed-back control system design to ensure better process control, and ensuring good distribution of reagent to match the distribution of NOx levels. The experience at the SMUD/SPAC site, however, indicates that the ability of the SCR system to track NOx emissions changes upstream of the catalyst is further challenged at progressively lower concentrations.

A further exacerbating factor is related to measurement uncertainty. The South Coast AQMD has indicated that current NOx measurement methods for stationary sources are accurate to ±1 ppm,[24] which becomes problematic at NOx permit levels of 5 ppm and lower.

The following paragraphs evaluate the proposed AIP criteria as applied to the achievement of extremely low NOx levels (2.5 ppm and lower) using SCR technology.

Commercial Availability. SCR technology is available with standard commercial guarantees for NOx levels at least as low as 1 ppm. Consequently, this criterion is satisfied.

Reliability. SCR technology has been shown to be capable of achieving NOx levels consistent with a 3 ppm permit limit during extended, routine operations of the SMUD/SPAC facility. There are no reported adverse effects of operation of the SCR system at these levels on overall plant operation or reliability.

Effectiveness. SCR technology has been demonstrated to achieve NOx levels below 3 ppm. At the SMUD/SPAC site, short-term excursions have resulted in NOx concentrations above 3 ppm; however, these excursions have not been associated with diminished effectiveness of the SCR system. Rather, these excursions have been associated with SCR inlet NOx levels in excess of those for which the SCR system was designed. As a consequence, the application of SCR technology to achieve extremely low NOx levels should reflect the potential for infrequent NOx excursions, under specified conditions.

Conclusion. SCR technology capable of achieving NOx levels below 3 ppm is considered to be achieved in practice. The current BACT guidelines used by the BAAQMD, CARB, and EPA all indicate that NOx levels of 2.5 ppm on a 1-hour average basis, or 2.0 ppm on a 3-hour average basis, should be considered BACT for utility-scale gas turbines. This analysis is consistent with those guidelines. The achievement of NOx concentrations below these levels, on either a short term or long term basis, is not demonstrated in practice.

Discussion of SCONOx-Based Limits – Achieved in Practice Criteria

SCONOx has been demonstrated in service in two applications: The Federal Cogeneration Facility in Vernon, California, and the Genetics Institute Facility in Massachusetts. Because these turbines are much smaller than those proposed for the Metcalf Energy Center, issues related to the application of SCONOx technology to MEC need to be evaluated, in addition to a review of other criteria.

Available CEMS data from the Federal Vernon facility have been obtained from EPA, covering the period July through December 1997. EPA has indicated that this time period reflected the improved performance of the SCONOx system, and led to EPA's March 23, 1998 letter regarding BACT and LAER requirements for combined cycle gas turbines.

A review of the available SCONOx data for the last half of 1997 indicates that, at the Federal site, up to 12 exceedances per year could be expected above a 3.0 ppm, 3-hour average limit, even when exceedances related to startups and shutdowns excluded.

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[24] See, e.g., SCAQMD Protocol for Rule 2012

EPA, ARB, and the BAAQMD have recommended BACT/LAER levels for combined cycle gas turbines of either 2.0 ppm on a 3-hour average basis, or 2.5 ppm on a 1-hour average basis. Under the BACT/LAER levels recommended by these agencies, the 1997 SCONOx data from the Federal site indicate that a 3-hour average limit of 2.0 ppm would be exceeded 44 times per year, and a 1-hour average limit of 2.5 ppm would be exceeded 24 times per year. Again, these data exclude exceedances associated with startups and shutdowns, as described above.

The data supporting these conclusions are shown in Table 8.1F-4.

TABLE 8.1F-4
SCONOx Performance – Summary Prepared by Sierra Research

SCONOx Excursions

All excursions:

Month	No. of Valid CEMS Hrs	No. of 1-hr periods Avail. %	2.0 ppm	c2.5 ppm	c3.0 ppm	No. of 3-hr periods c2.0 ppm	c2.5 ppm	c3.0 ppm	Highest c1-hr
Jul	739.0	099.3	333	321	004.22.				
Aug	741.0	099.6	043	250	004.42				
Sept	715.0	099.3	132	232	25.03.				
Quarter	**2195.0**	**099.4**	**110**	**869**	**225.03.7**				
Oct	731.0	098.2	5955	109	810.9				
Nov	716.0	099.4	418	161	42919149.66				
Dec	723.0	097.1	864	274	15.43				
Quarter	**2170.0**	**098.2**	**833**	**252**	**146322310.97.5**				

Excursions not due to startups or shutdowns:

Month	No. of Valid CEMS Hrs	No. of 1-hr periods Avail. %	2.0 ppm	c2.5 ppm	c3.0 ppm	No. of 3-hr periods c2.0 ppm	c2.5 ppm	c3.0 ppm	Highest c1-hr
Jul	739.0	099.3	311	000	002.61.				
Aug	741.0	099.6	032	140	03.52				
Sept	715.0	099.3	110	000	002.22.				
Quarter	**2195.0**	**099.4**	**153**	**140**	**03.52.2**				
Oct	731.0	098.2	553	355	510.97				
Nov	716.0	099.4	454	382	18.63.				
Dec	723.0	097.1	842	152	04.02				
Quarter	**2170.0**	**098.2**	**814**	**971**	**89610.97.5**				

Note: All NOx readings corrected to 15%

July 1, 1997 to December 31, 1997

The first part of this table shows, by month and quarter, the number of all 1-hour and 3-hour exceedances of various NOx emissions levels associated with operation of the SCONOx system during the period that resulted in EPA's March 1998 letter. The second part of the table shows exceedances that were not due to turbine startups or shutdowns.

In this analysis, no more than 2 hours of NOx emissions following a startup were treated as part of the startup. For the 3-hour averages, any average that included a startup hour was attributed to the startup. This is in contrast with the approach taken by Goal Line Environmental Technologies (GLET) in its comments accompanying the data reports, in

which it is clear that startup periods were considered to extend as much as 6 hours. (This is particularly inappropriate for aeroderivative turbines such as those used at the Federal facility, which are known for their ability to start within tenths of minutes.) NOx emissions greater than 2 ppm occurring during these long startup periods were reported by GLET, but were not considered to be exceedances.

In summary, using a 2-hour startup period for aeroderivative gas turbines, the data reported by GLET to EPA for 1997 do not support a BACT determination below 3 ppm. Based solely on the SCONOx data presented to EPA, even a NOx limit at 3.0 ppm would have to provide for excursions, other than startups and shutdowns, above that limit. The number of excursions needed would depend upon the NOx limit selected and the emission control technology employed.

Additional data have been generated at the Federal site, and were provided to EPA Region IX by CURE.[25] These data were for the period April 1, 1999 through December 31, 1999, and were provided to Sierra Research by EPA Region IX.[26] EPA has indicated that these more recent data formed the basis of the agency's comments on the Preliminary Determination of Compliance for MEC. The more recent data are consistent with the earlier data, and are summarized in Table 8.1F-5.

The 1999 CEMS data from the Federal facility indicated that the turbine equipped with SCONOx was operated fewer than 2,600 hours during the nine-month period for which data were provided. During this period, the turbine was started 149 times. The CEMS data for CO, in particular, are suspect; more than 60% of the CO values reported were less than zero, indicating that the CO analyzer was not properly calibrated on a daily basis. For this reason, the CO data for this period were not analyzed further.

The NOx emissions data for this period were analyzed to evaluate compliance with five hypothetical emission limits (3.0, 2.5, 2.0, 1.5, and 1.3 ppm) and three compliance averaging periods (15 minute, 1 hour, 3 hour). Valid data periods were considered to be those that excluded startups, shutdowns, and documented CEMS maintenance. Startups were defined to be periods commencing with the initiation of fuel flow to the engine, and lasting until the NOx emission limit under evaluation was met, but not exceeding a period of two hours. Shutdown periods were defined to be periods ending with the cessation of fuel flow to the engine and starting when the NOx emission limit under evaluation was no longer met, but not exceeding a period of 30 minutes. A valid 1-hour average period was defined to require at least two valid 15-minute periods; a valid 3-hour average period was defined to require at least two valid 1-hour average periods. All of the above definitions are typical for utility-scale gas turbine CEMS systems.

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[25] Letter dated March 14, 2000, from Katherine Poole, Adams Broadwell Joseph & Cardozo, to Steve Branoff, EPA Region IX.

[26] Letter dated June 28, 2000 from Duong Nguyen, EPA Region IX, to Nancy Matthews, Sierra Research.

TABLE 8.1F-5

April 1, 1999 to December 31, 1999

Plant Statistics

Total Hours in Review Period	6,400	
Number of Operating Hours	2,583	
Number of Turbine Starts	149	
Number of CEM Data Periods with Turbine Operating	10,331	
Number of negative CEM values		
NOx:	0	0%
CO:	6,494	63%

Valid Data Periods (Excludes Startup/Shutdown, CEM Maintenance)

NOx Limit (ppm) -> Averaging Period	3.0	2.5	2.0	1.5	1.3
15 min	9,861	9,813	9,742	9,649	9,607
1 hour	2,501	2,491	2,470	2,445	2,434
3 hour	2,498	2,488	2,468	2,445	2,434

Exceedance Periods (Excludes Startup/Shutdown, CEM Maintenance)

NOx Limit (ppm) -> Averaging Period	3.0	2.5	2.0	1.5	1.3
15 min	71	77	92	111	124
1 hour	18	21	24	29	32
3 hour	20	22	26	32	36

The data indicated that there were 9,600 to 9,900 valid 15-minute periods, excluding startups, shutdowns, and CEMS maintenance, depending on the NOx limit being evaluated. There were numerous exceedances of the hypothetical NOx limits during these periods, ranging from 71 periods in which NOx emissions exceeded 3.0 ppm to 124 periods in which NOx emissions exceeded 1.3 ppm.

There were approximately 2,500 valid 1-hour average periods in the data set, excluding startups, shutdowns, and CEMS maintenance. For 1-hour average limits, the data again showed numerous exceedances, ranging from 18 exceedances of a 3.0 ppm NOx limit to 32 exceedances of a 1.3 ppm limit. Finally, during the approximately 2,500 valid 3-hour average periods in the data set, there were 20 exceedances of a 3.0 ppm limit and 36 exceedances of a 1.3 ppm NOx limit.

In summary, the more recent data fail to support the conclusion that the SCONOx system at the Federal facility is capable of consistently maintaining low NOx levels of 3.0 ppm or less. Depending on the NOx limit evaluated, the periods of non-compliance over a nine-month period ranged from 18 to 32 hours, excluding periods of turbine startup, shutdown, and CEMS maintenance. While each of the exceedances was accompanied in the data file with an explanation, these explanations do not eliminate the exceedances. In fact, of the 24 exceedances of a 3.0 ppm NOx limit on a 1-hour average basis observed in the 1999 data, 14 were explicitly attributed to problems with the SCONOx system in the file presenting the CEMS data.

Table 8.1F-6 compares the results of the analyses of the 1997 and 1999 data, with both data sets normalized to predict exceedances over a 12-month period.

The more recent data do not indicate improved performance as compared with the 1997 CEMS data.

TABLE 8.1F-6
Comparison of 1997 and 1999 SCONOx CEMS Data: Exceedances of Hypothetical Permit Limits – Annualized Basis (Excluding startups/shutdowns/CEMS maintenance)

	1-hour average			3-hour average		
Data Set	3.0 ppm limit	2.5 ppm limit	2.0 ppm limit	3.0 ppm limit	2.5 ppm limit	2.0 ppm limit
1997	16	24	38	12	18	44
1999	24	28	32	26	29	34

In addition to performance-related issues regarding SCONOx, there are concerns regarding the demonstration of durability of the regeneration gas and damper/sealing systems, and the ability of the SCONOx system to respond to transient conditions that result in changes in turbine-exhaust NOx levels.

With respect to the damper/sealing system, there have been three different designs discussed in technical literature regarding SCONOx. Table 8.1F-7 summarizes these designs.

Stone and Webster reported that the initial operation of the SCONOx system at the Genetics Institute facility resulted in a rapid loss of performance due to a lack of regeneration. This problem was traced to mechanical deficiencies, including seal and gasket leakage. Corrective actions taken included replacement of the flexible metal damper seals with tadpole seals, installation of a manual throttling valve in the gas return line, re-gasketing and re-sealing of

the heat exchanger flanges, and adjustment of the damper actuators. Further changes to the overall system included adding an external reformer, adding a sulfur filter to remove sulfur from the gas that feeds the external reformer, and modifying the damper/seal system.

Although the damper/sealing system was subjected to a 101,000 cycle test (equivalent to approximately 25,000 operating hours based on 15-minute cycle times), Stone & Webster reported that a number of damper/seal design changes have been proposed by ABB based on those test results. These changes include a modification to the tadpole design to avoid excessive stress at the location where the damper blade rests on the seal, and modifications to the shaft design to preclude leaks associated with fabric failure near the shaft-seal interface.

As of the date of their report (February 22, 2000), Stone & Webster indicated that full-scale testing of the new seal design had not been performed. In particular, Stone & Webster noted that "the use of fiberglass in the temperature range of 600°F to 700°F with frequent flexing and relaxing, over the expected design period of three years, is yet to be demonstrated."

Based on this information, the following paragraphs evaluate the proposed AIP criteria as applied to the achievement of extremely low NOx levels (2.5 ppm and lower) using SCONOx technology.

Commercial Availability. It is not clear whether SCONOx technology is presently available with standard commercial guarantees for NOx levels at least as low as 2.5 ppm. A request for a copy of the guarantee for SCONOx performance from the developers of the Otay Mesa Generating Project was rejected. An excerpt of the guarantee from the system vendor to Sunlaw Energy, a co-developer of the SCONOx system, was included as an appendix to the Application for Certification for the Nueva Azalea project. However, this guarantee is between two parties with a common financial interest in the demonstration and sale of the SCONOx system, and thus is not necessarily representative of a standard commercial guarantee. Public statements by ABB Environmental, the exclusive licensee of the SCONOx system for gas turbines with a capacity greater than 100 MW, indicate that standard commercial performance guarantees will be provided for this system upon request. It is unclear, however, whether this guarantee will be passed on by the HRSG vendors and/or EPC contractors, as is standard in the industry. Thus, it is possible that this criterion is satisfied but, as yet, there is no publicly available documentation to support such a conclusion.

TABLE 8.1F-7
Summary of SCONOx Installations

	Federal Cogeneration[1]	Genetics Institute[1]	Proposed Future (F-class turbine)
Regeneration Gas System			
Regeneration system type	Direct hydrogen injection	External reformer	External reformer
Regen Gas Flow Rate	1520 acfm	1050 acfm	
SCOSOx (Guard Bed) Catalyst System			
Cell Density	Not installed (periodic water washing of catalyst is performed instead)		
Substrate			
Catalyst Volume		26.25 cu ft	
Space Velocity		116,630	114,000

Absorption		6,000	4,000
Regeneration			
Cycle Times		12 min	
Absorption		3 min	
Regeneration			
SCONOx Catalyst System			
Cell Density	230	230	
Substrate	Ceramic	Ceramic	
Catalyst Volume	294 cu ft	157.5 cu ft	
Space Velocity			
Absorption	11,100	19,440	22,000
Regeneration	275	1,000	750
Cycle Times	12 min	12 min	
Absorption	4 min	3 min	
Regeneration			
Damper/Seal Systems			
Number of Modules	4	5	40-60[2]
Number of Dampers	12	10	80-120[2]
Damper Type	Louver, flap type	Louver, flap type	Louver, flap type
Damper Support	End supported	Center supported	Center supported
Misc			
Seal Material/Type	316 SS, 'S' type	Fiberglass/stainless steel wool tadpole design	
Actuator Type	Electrical	Electrical	

Notes:
Stone & Webster, op city Modules are joined, four together, to form linked "shelves."

Reliability. To date, there have been no unqualified demonstrations of the ability of the SCONOx system to meet interest in the demonstration and sale of the SCONOx system, and thus is not necessarily representative of a standard commercial guarantee. Public statements by ABB Environmental, the exclusive licensee of the SCONOx system for gas turbines with a capacity greater than 100 MW, indicate that standard commercial performance guarantees will be provided for this system upon request. It is unclear, however, whether this guarantee will be passed on by the HRSG vendors and/or EPC contractors, as is standard in the industry. Thus, it is possible that this criterion is satisfied but, as yet, there is no publicly available documentation to support such a conclusion.

Reliability. To date, there have been no unqualified demonstrations of the ability of the SCONOx system to meet NOx levels of 3 ppm or lower over extended periods of time. The demonstrations at the Federal Cogeneration facility have indicated numerous circumstances under which a 3 ppm level would be exceeded (excluding startup and shutdown conditions), with data from as recently as 1999 having been evaluated. Furthermore, the SCONOx system at the Federal facility uses a different scheme for catalyst regeneration, sulfur protection, and dampers/sealing than that proposed for use in a full-scale, commercial project. The catalyst regeneration system used at the Federal facility involved direct hydrogen injection to the catalyst bed; this system appears to have been rejected for use by ABB Environmental for larger, utility-scale applications. The current sulfur protection system for the SCONOx catalyst-the SCOSOx guard bed system-was not used at the Federal facility, and the sulfur protection system used at the Federal facility (periodic water washing of catalyst elements) appears to have been rejected by ABB Environmental for larger, utility-scale applications.

Finally, the end-supported damper system with metal seals used at the Federal facility appears to have been rejected by ABB Environmental for larger, utility-scale applications. Consequently, the Federal facility is not indicative of the reliability of the SCONOx system for utility-scale applications.

The SCONOx installation at the Genetics Institute facility currently uses the new designs for catalyst regeneration, sulfur protection, and dampers/sealing. However, problems associated with that facility's ability to consistently meet NOx levels lower than 3 ppm were reported as recently as February 2000. Although some of those problems were attributed to fluctuations in turbine NOx emissions, rather than problems with SCONOx catalyst efficiency, the Genetics Institute facility does not yet constitute a demonstration that the SCONOx system can reliably meet NOx levels of less than 3 ppm.

Furthermore, the revised damper/seal system in use at the Genetics Institute facility has not been fully tested in field service, as noted by Stone & Webster. The next-prior version of the damper/seal system, which was tested for ABB Environmental in a test facility, exhibited failures of various kinds after approximately 60,000 cycles. Improvements to the damper/seal system to address those failures have not been similarly tested (or, at least, the reports of any such tests have not been presented publicly). Since an F-class gas turbine is expected to require the use of 40-60 modules, with 40-60 pairs of dampers/seals, 40-60 shaft actuators, and approximately 2.7 million damper-cycles per turbine per year,[27] it is unclear that the performance tests conducted to date demonstrate the ability of this portion of the system to ensure compliance with sub-3 ppm NOx levels on a continuous basis.

Effectiveness. As discussed above, the Federal facility uses different catalyst regeneration, sulfur protection, and sealer/damper systems than those being offered by ABB Environmental. Thus, it is not clear that the Federal installation can be used to demonstrate the effectiveness of the systems being proposed for larger, utility-scale projects. The SCONOx configuration at the Genetics Institute facility is more similar to that proposed for larger turbines; however, that facility "has met or exceeded the performance requirement of 2.5 ppm [NOx] for approximately 330 hours, out of the total hours of operation of approximately 410 hours for which valid data is available."[28] This means that the 2.5 ppm NOx performance target was not met during approximately 20% of the hours within this period. As noted above, many of the exceedances of the 2.5 ppm NOx level at the Genetics Institute site were attributable to operation of the gas turbine's transient pilot. Nonetheless, the available data from that site are not sufficient to conclude that NOx levels of 3 ppm or less can be achieved using the SCONOx system on a consistent basis, nor are the available data from the Federal site suitable for reaching such a conclusion. At a minimum, if SCONOx technology were used to achieve extremely low NOx levels, permit conditions would need to reflect the potential for frequent NOx excursions under specified conditions.

Conclusion. SCONOx technology has been found to be capable of achieving NOx levels below 2.5 ppm by the SCAQMD and EPA. However, the presently available technical

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[27] Calculated as 40 pairs of dampers per turbine, 2 dampers per pair, 4 cycles per damper per hour, 8400 operating hours per year: 40 x 2 x 4 x 8400 = 2,688,000 damper cycles per year per turbine.

[28] Stone & Webster, op cit

information does not support a conclusion that this technology is achieved in practice based on South Coast AQMD or BAAQMD guidelines.

8.1F.1.4 Select BACT

Based on the above analysis, both SCR and SCONOx-based systems are generally considered to be technologically capable of achieving NOx levels below 2.5 ppm, given appropriate consideration to turbine outlet NOx levels, catalyst volume (space velocity), and control system design. For both types of systems, some provision will be necessary to accommodate short-term excursions above permit limits, and for both types of systems, particular attention to CEMS design will be necessary to ensure that low permit limits can be monitored on a continuous and accurate basis.

Based on this information, BACT for NOx is considered to be the use of either SCR or SCONOx systems to achieve NOx levels not higher than 2.5 ppm on a 1-hour average basis, or 2.0 ppm on a 3-hour average basis. The East Altamont Energy Center proposes to use SCR technology to meet a NOx level of 2.5 ppm on a 1-hour average basis, and the equivalent of 2.0 ppm on an annual average basis. Consequently, EAEC's proposal is consistent with BACT requirements for NOx.

8.1F.2 Control of Ammonia Emissions

Although the BAAQMD regulations expressly exclude secondary emissions associated with the operation of an air pollution control device from BACT requirements, the following section discusses alternative control techniques for ammonia emissions.

8.1F.2.1 Identify All Control Technologies

Ammonia emissions result from the use of ammonia-based NOx control technologies. There are three basic means of controlling NOx emissions from combustion turbines: wet combustion controls, dry combustion controls, and post-combustion controls. Wet and dry combustion controls act to reduce the formation of NOx during the combustion process, while post-combustion controls remove NOx from the exhaust stream. Potential NOx control technologies for combustion gas turbines include the following:

<u>Wet combustion controls</u>

- Water injection
- Steam injection

<u>Dry combustion controls</u>

- Dry low-NOx combustor design
- Catalytic combustors (e.g., XONON)
- Other combustion modifications

<u>Post-combustion controls</u>

- Selective non-catalytic reduction (SNCR)
- Non-selective catalytic reduction (NSCR)
- Selective catalytic reduction (SCR)
- SCONOx

Of these NOx control technologies, only two result in ammonia emissions: selective non-catalytic reduction, and selective catalytic reduction.

8.1F.2.2 Eliminate Technically Infeasible Options

The performance and technical feasibility of available NOx control technologies were discussed above. Based on the discussions above, the following NOx control technologies are available and potentially technologically feasible for the proposed project:

- Water injection (no ammonia emissions)
- Steam injection (no ammonia emissions)
- Dry Low-NOx Combustors (no ammonia emissions)
- Selective Catalytic Reduction (some ammonia emissions)
- SCONOx (no ammonia emissions)

8.1F.2.3 Rank Remaining Control Technologies by Control Effectiveness

The remaining technically feasible control technologies are ranked by ammonia emission rate in Table 6.

TABLE 8.1F-8
Ammonia Control Alternatives

Ammonia Control Alternative	Available ?	Technically Feasible?	Ammonia Emissions (@ 15% O_2)	Environmental Impact	Energy Impacts
Water Injection	Yes	Yes	0 ppm	Increased CO/VOC	Decreased Efficiency
Steam Injection	Yes	Yes	0 ppm	Increased CO/VOC	Increased Efficiency
Dry Low-NOx Combustors	Yes	Yes	0 ppm	Reduced CO/VOC	Increased Efficiency
Selective Catalytic Reduction	Yes	Yes	2-10 ppm	Ammonia slip	Decreased Efficiency
SCONOx	Yes[1]	Yes[2]	0 ppm	Reduced CO; potential reduction in VOC	Decreased Efficiency

Notes:
The availability of standard, commercial guarantees for utility-scale projects is unclear at this time.
Technology has been demonstrated on small (5 MW and 22 MW) gas turbines for a limited period of time. No demonstration on utility-scale gas turbines.

8.1F.2.3 Evaluate Most Effective Controls and Document Results

Water and steam injection are control technologies that, for large gas turbines, have been largely superseded by dry low-NOx combustors, due to the superior emission control performance, additional CO and VOC benefits, and increased efficiency of this technology. Since the project proposes to use dry low NOx combustors, no further discussion of water injection, steam injection, or dry low NOx combustors is necessary.

The performance of SCR and SCONOx, insofar as NOx emission levels are concerned, has been discussed above. SCONOx results in no emissions of ammonia, while SCR results in ammonia slip levels of up to 10 ppm. The following discussion evaluates potential ammonia

slip limits of 10 ppm, 5 ppm, 2 ppm, and 0 ppm. The last limit would be achievable, at the present time, only through the use of SCONOx technology.

Achieved in Practice Evaluation

This portion of the analysis is performed based on the proposed Achieved in Practice criteria under consideration in the South Coast AQMD. These criteria were discussed above.

Discussion of 10 ppm Ammonia Slip Limit – Achieved in Practice Criteria.

SCR has been installed and operated at numerous gas turbine installations throughout the world. Although there are a large number of gas turbines equipped with SCR systems, there are relatively few operating systems designed to meet low NOx permit limits of 3.0 ppm or less. Ammonia slip associated with SCR system operation results from a gradual decline in catalyst activity over time, necessitating the use of increasing amounts of ammonia injection to maintain NOx concentrations at or below the design rate.

The parameters of NOx concentration, ammonia slip limit, and catalyst life are integrally related. That is, catalyst performance is generally specified as being a particular NOx concentration (e.g., 2.5 ppm), guaranteed for N years (e.g., 3 years), with a maximum ammonia slip level of X ppm (e.g., 5 ppm). Such a specification indicates that catalyst performance will degrade over time such that at the end of three years, ammonia slip will increase to not more than 10 ppm while maintaining NOx concentrations at or below 2.5 ppm. During the early period of performance, ammonia slip from an oxidation catalyst is typically less than 1-2 ppm, and will approach the guarantee level only towards the end of the catalyst life.

Early SCR installations, as well as some later installations, have been associated with ammonia slip levels of 10 ppm. In August 1999, the California Air Resources Board adopted a BACT guideline for large gas turbines that proposed to limit ammonia slip to not more than 5 ppm. However, as evidenced by the approval of 10 ppm ammonia slip levels for more recent projects such as Elk Hills and La Paloma, we believe that recommendation is tempered by whether the region is ammonia-rich or not. In the case of EAEC, we believe that the same ammonia-rich conditions prevail as for other projects located in the San Joaquin Valley, and therefore a 10 ppm ammonia slip level is justified for this project. Additional discussion of the impacts of ammonia emissions on nitrate formation in the San Joaquin Valley is included in Appendix 8.1I.

Ammonia slip levels of 2 ppm have been required in several permits issued in the eastern United States. However, these permits have typically been associated with higher NOx levels than are proposed here. In particular, the 2 ppm ammonia slip limits have been proposed in conjunction with NOx levels that range between 2.0 and 3.5 ppm, depending on operating mode. Although EAEC is proposing a 1-hour average NOx limit of 2.5 ppm, the facility is also proposing an annual average NOx limit based on 2.0 ppm. As noted above, the SCR parameters related to NOx limits, ammonia slip, and catalyst life are all integrally related. There are a very few projects that have proposed emission limits of 2 ppm ammonia slip in conjunction with a long-term NOx average of 2.0 ppm; however, none are in operation.

Finally, SCONOx has the potential to achieve this low a NOx level without any ammonia slip.

Consequently, the following discussion compares the use of SCR with a 10 ppm ammonia slip level with SCONOx to meet comparable NOx levels, but without any ammonia slip.

The following paragraphs evaluate the proposed AIP criteria as applied to the achievement of 10 ppm ammonia slip in conjunction with a NOx emission limit of 2.0 ppm on an annual average basis, using SCR technology.

Commercial availability. SCR technology is available with standard commercial guarantees with ammonia slip levels of 10 ppm and 2 ppm, in conjunction with NOx levels at least as low as 2 ppm.

Reliability. SCR technology has been shown to be capable of achieving ammonia slip levels below 10 ppm over at least a three-year catalyst life period. There are no reported adverse effects of operation of the SCR system at these levels on overall plant operation or reliability.

Effectiveness. SCR technology has been demonstrated to achieve ammonia slip levels of less than 5 ppm in conjunction with NOx levels below 3 ppm.

Conclusion. SCR technology capable of achieving ammonia slip levels at or below 10 ppm, in conjunction with NOx levels below 3 ppm, is considered to be achieved in practice. The South Coast AQMD's web site lists three SCR-based BACT determinations for ammonia slip.

The earliest SCR-based BACT determination for ammonia slip listed on the SCAQMD's web site is for the Sutter Power Project, which was approved by the Feather River AQMD in April 1999. This project is required to meet an ammonia slip limit of 10 ppm on a 3-hour average basis, in conjunction with a 2.5 ppm NOx limit on a 1-hour average basis.

The next SCR-based BACT determination for ammonia slip listed on the SCAQMD's web site is for the La Paloma Generating project, which was approved by the San Joaquin Unified APCD in October 1999. This project is required to meet a 10 ppm ammonia slip limit on a 24-hour average basis in conjunction with a 2.5 ppm NOx limit on a 1-hour average basis.

The third SCR-based BACT determination for ammonia slip listed on the SCAQMD's web site is for the Sithe Energy Mystic facility, which was approved by the Massachusetts Department of Environmental Protection (Mass DEP) in January 2000. This project is required to comply with a 2 ppm ammonia slip limit on a 1-hour average basis in conjunction with a 2 ppm NOx limit, 1-hour average basis. The Sithe Mystic facility is also required to evaluate the availability, reliability, and cost of technologies that eliminate ammonia slip emissions, in accordance with the terms of a Memorandum of Understanding between the project operator and Mass DEP.

These permits indicate that, as recently as one year ago, ammonia slip limits of 10 ppm were considered best available control technology. The rapid changes during the last year are indicative of increasing confidence of SCR system vendors in sustaining low ammonia slip rates in conjunction with low NOx emission rates. However, given the lack of any real-world demonstration of these low NOx and ammonia slip levels at the present time, BACT for ammonia slip using SCR-based controls is considered to be 10 ppm for this project.

Discussion of SCONOx-Based Limits – Achieved in Practice Criteria.

Based on the discussion presented in the NOx BACT section regarding SCONOx technology, the presently available technical information does not support a conclusion that this technology is achieved in practice based on SCAQMD guidelines, when the objective is meeting low NOx levels (below 3 ppm) in combination with low (or zero) ammonia slip.

8.1F2.3 Select BACT

Based on the above analysis, SCR systems capable of achieving ammonia slip limits of 2 ppm and 10 ppm in conjunction with NOx limits of 2 ppm or 2.5 ppm appear to be commercially available, but have not yet been demonstrated in practice.

Consequently, since EAEC has proposed to achieve an ammonia slip limit of 10 ppm, this value would constitute BACT if an SCR-based control system is selected.

Although SCONOx technology to eliminate ammonia slip is not considered to be achieved in practice, it may be technologically feasible. Therefore, a further evaluation of the cost-effectiveness of this technology was performed. In this analysis, the cost of a SCONOx system was compared with the cost of an SCR system, with the incremental cost assigned to the benefit of eliminating ammonia slip.

It is appropriate to make such an assignment because the performance of the SCR system at MEC is comparable to that proposed for SCONOx with respect to NOx emission levels for this project. POC emissions are expected to be at or below the limits of detection with or without the SCONOx system, and thus no incremental POC benefits can be ascribed to this technology in this analysis.

With respect to ammonia emissions, the use of SCONOx is assumed to eliminate all ammonia emissions. For the EAEC project, this is a reduction of 464 tons per year.

The Bay Area AQMD's BACT guidelines do not include cost-effectiveness thresholds for ammonia. Since the objective of reducing ammonia emissions is to avoid downwind formation of PM_{10}, the BAAQMD's cost-effectiveness threshold of $5,300 per ton for PM_{10} is used for ammonia emission reductions.

Based on these criteria, SCONOx would be cost/effective for the reduction of ammonia emissions if the annual incremental cost for the entire EAEC facility, as compared with SCR, is not more than $2,173,000 per year. The calculation is as follows:

410 tpy * $5300/ton = $2,173,000 / year

As shown in Tables 8.1F-9A through C, the annual incremental cost of SCONOx is $3.6 million per year per turbine, or over $10 million per year for the EAEC facility. Consequently, SCONOx is not cost/effective as compared with SCR.

Based on the above information, BACT for ammonia is considered to be an ammonia slip limit of 10 ppm.

The East Altamont Energy Center proposes to use SCR technology to meet an ammonia slip limit of 10 ppm in conjunction with NOx levels of 2.5 ppm on a 1-hour average basis and 2.0 ppm on an annual average basis. Consequently, EAEC's proposal is consistent with BAAQMD BACT requirements.

Table 8.1F-9A

SCR Costs (per gas turbine/HRSG)

Description of Cost					Cost Factor	Cost ($)	Notes
Direct Capital Costs (DC):							
Purchased Equip. Cost (PE):							
Basic Equipment:							
Auxiliary Equipment: HRSG tube/fin modifications							
Instrumentation: SCR controls							
Ammonia storage system:							
Taxes and freight:							
PE Total:						$1,750,000	1
Direct Install. Costs (DI):							
Foundation & supports:					0.08 PE	$140,000	2
Handling and erection (included in PE cost):						$0	1
Electrical (included in PE cost):						$0	1
Piping (included in PE cost):						$0	1
Insulation (included in PE cost):						$0	1
Painting (included in PE cost):						$0	1
DI Total:						$140,000	
Site preparation for ammonia tanks (included in PE cost)						$0	1
DC Total (PE+DI):						$1,890,000	
Indirect Costs (IC):							
Engineering:					0.10 PE	$175,000	2
Construction and field expenses:					0.05 PE	$87,500	2
Contractor fees:					0.10 PE	$175,000	2
Start-up:					0.02 PE	$35,000	2
Performance testing:					0.01 PE	$17,500	2
Contingencies:					0.05 PE	$87,500	1
IC Total:						$577,500	
Less: Capital cost of initial catalyst charge						-$630,000	
Total Capital Investment (TCI = DC + IC):						$1,837,500	
Direct Annual Costs (DAC): 0.5 hr/SCR per shift					hr/yr: 4,380		
Operating Costs (O):	sched. (hr/day):	24	day/week:	7	wk/yr: 52		
Operator:	hr/shift:	1.0	operator pay ($/hr):		39.20	$42,806	2
Supervisor:	15% of operator					$6,421	2
Maintenance Costs (M): 0.5 hr/SCR per shift							
Labor:	hr/shift:	1.0	labor pay ($/hr):		39.2	$42,806	2
Material:	% of labor cost:	100%				$42,806	2
Utility Costs:							
Perf. loss:	(kwh/unit):	0.0	SCONOx losses are shown as incremental to SCR losses				1
Electricity cost	($/kwh):					$0	
Ammonia	based on 116 lbs/hr of anhydrous ammonia, $400/ton					$203,232	1, 4
Catalyst replace:	based on 3 year catalyst life					$210,000	1
Catalyst dispose:	based on 2,750 ft^3 catalyst, $15/$ft^3$, 3 yr. Life					$13,750	1
Total DAC:						$561,822	
Indirect Annual Costs (IAC):							
Overhead:	60% of O&M					$80,904	2
Administrative:					0.02 TCI	$36,750	2
Insurance:					0.01 TCI	$18,375	2
Property tax:					0.01 TCI	$18,375	2
Total IAC:						$154,404	
Total Annual Cost (DAC + IAC):						**$716,226**	
Capital Recovery (CR):							
Capital recovery:	interest rate (%):	10					
	period (years):	15			0.1315	**$241,583**	2
Total Annualized Costs						**$957,809**	

TABLE 8.1F-9B
SCONOx Cost and Incremental Cost (per gas turbine/HRSG)

			Notes
Direct Capital Costs			
	Capital (less cost of initial catalyst charge)	$3,900,000	3, 5
	Installation	$1,700,000	3
Indirect Capital Costs			
	Engineering	$200,000	3
	Contingency	$250,000	3
	Other	-	
Total Capital Investment		$6,050,000	
Direct Annual Costs			
	Maintenance	$250,000	3
	Ammonia	-	3
	Natural Gas: 2.2 MMbtu/hr @ $3.65/MMbtu	$70,343	1,7
	Pressure Drop	$226,000	3
	Catalyst Replacement (based on 3-yr catalyst life)	$3,033,333	5,6
	Catalyst Disposal	$0	
Total Direct Annual Costs		$3,579,676	
Indirect Annual Costs			
	Overhead	-	3
	Administrative, Tax & Insurance	$225,000	3
Total Indirect Annual Costs		$225,000	
TOTAL ANNUAL COST		$3,804,676	
Capital Recovery Factor		0.1315	2
Capital Recovery		$795,416	
TOTAL ANNUALIZED COSTS		$4,600,092	

SCONOx Incremental Cost (per gas turbine/HRSG)		Notes
SCONOx Annualized Costs	$4,600,092	
SCR Annualized Costs	$957,809	
Incremental Annualized Costs	$3,642,283	

Notes: SCONOx Cost Effectiveness Analysis

Note No.	Source
1	Based on information from Calpine and Bechtel Power Corporation. Natural gas price range is $3.65 to $4.65.
2	From EPA/OAQPS Control Cost Manual. EPA-450/3-90-006. January 1990.
3	From April 12, 2000 letter from ABB Alstom Power to Matt Haber EPA Region IX (SCONOx capital cost of $13,000,000).
4	Based on anhydrous ammonia cost of $400/ton.
5	Based on information from May 8, 2000 "Testimony of J. Phyllis Fox, Ph.D. on Behalf of the California Unions for Reliable Energy on Air Quality Impacts of the Elk Hills Power Project", cost of replacement catalyst for SCONOx is 70% of initial capital investment.
6	Based on information from May 5, 2000 letter from ABB Alstom Power to Bibb and Associates indicating that SCONOx catalyst life is guaranteed for a 3-year period.
7	Personal communication, ABB Environmental, 1/18/00

Appendix 8.1G
Offset Listing

APPENDIX 8.1G

OFFSET LISTING

B A A Q M D Emission Bank Status
Emission Reduction Credits Available, (tons/year). October 10, 2000

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
11	Hewlett-Packard Co; Printed Circuit Divsn						159.5	
12	S&W Fine Foods	0.67	0.2	11.66	0.04	1.13		
16	Hunt-Wesson Foods; Inc	1.0		21.0		1.8		
17	Allied Corporation				182.9			
18	National Can Corporation		31.1					
19	Glorietta Foods	1.54	0.46	32.24	0.09	2.61		
28	Carnation Company	3.7						
29	Stauffer Chemical Company	0.2		1.2		0.2		
36	United Airlines; Maintenance Operations Ctr						1.8	
37	Morton International Inc			0.4		0.4		
38	FMC Corporation						53.7	
39	FMC Corporation		5.8					
40	Stauffer Chemical Co; San Jose	0.7	0.7	28.5		9.1	0.4	
47	United Airlines; Maintenance Operations Ctr		6.4					
49	Owens Corning			22.3				
51	Continental Can Company		71.0					
53	A O Smith Corporation		10.8					
57	Tosco Refining Company	3.6				4.9		
59	Continental Can Company		4.5					
68	FMC Corporation		0.4					
69	FMC Corporation		1.0					
70	Chevron Products Company		29.3					
96	U.S. Navy		1.018					
108	Owens Corning		0.003					
110	Myers Container Corporation		20.03				7.39	
112	Owens Corning	1.3	14.4	0.22		0.15		0.7
117	Chevron Products Company	0.5	20.7	10.6	0.1	2.1		
118	Chevron Products Company	0.25	9.63	5.04	0.05	1.0		
131	Tosco Refining Company		0.38					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
132	U.S. Navy			0.39		0.34		
135	Gallagher & Burk; Inc							6.23
137	National Semiconductor Corporation		13.615					
141	Tosco Refining Company		0.373					
142	Tosco Refining Company		0.34					
149	Varian Oncology Systems						12.25	
151	Lawrence Livermore National Laboratory						1.66	
155	U.S. Navy		0.065	1.878	10.66	0.939		0.375
159	National Semiconductor Corporation		7.944					
160	National Semiconductor Corporation		1.747					
168	Martinez Refining Company		11.62					
172	Chevron Products Company			-.001		-.001		0.384
173	Varian Oncology Systems		0.235				4.469	
175	National Semiconductor Corporation		7.602					
177	Gilroy Foods; Inc		0.338					
180	United Technologies Corporation		0.076				4.397	
181	Advanced Micro Devices Inc		10.88					
182	Chevron Research and Technology Co	0.07	0.039	0.7	0.008	0.003		
183	Chevron Research and Technology Co		0.31					
194	RMC Lonestar	0.73						0.44
195	RMC Lonestar	0.4						0.24
196	National Semiconductor Corporation		7.827					
205	U.S. Navy						6.034	
207	Owens Corning	17.9	23.3	9.5		3.9		
215	Monsanto Company							0.067
218	New United Motor Manufacturing; Inc		78.83					
223	Chevron Products Company		60.122	20.674	1.047	9.129		5.37
227	HMT Technology Corporation		0.2				2.24	

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
230	National Semiconductor Corporation		4.9					
232	American Lithographers & Business Forms		6.164	0.095		0.1		
239	IBM Corporation						24.37	
241	Dexter Hysol Aerospace; Inc		4.7					
243	United Can Company		0.002					
248	Chevron Products Company		3.56					
251	Triangle Wire & Cable; Inc			0.594				
252	General Electric Co		0.003					
259	Burke Industries; Inc		3.026				24.85	
262	Lawrence Livermore National Laboratory						1.05	
263	National Semiconductor Corporation		2.209					
265	Solectron Corporation		3.71				3.35	
266	Santa Rosa Memorial Hospital			0.97				0.3
270	Stanford University			17.3				
272	Louis Roesch Company		1.716					
273	National Semiconductor Corporation		5.22					
280	California Canners & Growers	0.8				6.0		
287	Philips Semiconductor		2.61					
288	Philips Semiconductor		9.039				0.32	
298	Exar Corporation		22.056					
302	Chevron Products Company		7.948					
310	Trumbull Asphalt Company		8.9	0.4	25.9	24.2		4.2
312	North American Refractories Co		0.017	1.026				
315	Chevron Research and Technology Co		0.747					
316	United Airlines; Maintenance Operations Ctr		0.5					
325	New United Motor Manufacturing; Inc		20.79					
328	Crockett Cogeneration; A Cal Ltd Partnership		11.05	0.84		0.2		
329	Advanced Micro Devices Inc		9.615					
332	Rexam Beverage Can Company		15.55					

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
333	U.S. Navy		13.49					
337	James H Barry Co		4.23					
341	Pacific Lithograph Company		5.862	1.3				
344	Chevron Products Company		8.992					
345	Chevron Products Company		94.6					
350	Hewlett-Packard Company		3.29					
351	U.S. Navy		22.786				54.6	
353	Chevron Products Company		8.55					
360	Gallagher & Burk; Inc		0.2	0.17	0.17	0.53		0.18
366	Amdahl Corporation		0.046				7.528	
367	Amdahl Corporation		0.977				5.12	
368	Amdahl Corporation		0.143				2.26	
370	Pacific Refining Company			1.0				
371	Zanker Road Resource Management;Ltd		0.65	10.7	0.77			
372	Pacific Refining Company		0.44	0.224				
373	National Semiconductor Corporation		0.081					
376	George Rice & Sons		45.0					
381	Laidlaw Environmental Services (San Jose); Inc		1.4				1.46	
382	California Oils Corporation		0.195					
385	Quantum Corporation						3.2	
387	Martinez Refining Company		0.096					
392	Richard Mariani	0.6				3.3		
393	Anacomp Inc		7.13					
408	Rexam Beverage Can Company		36.526					
409	Wickland Oil Company		5.868					
410	IBM Corporation						13.98	
412	Amdahl Corporation		0.13				2.03	
414	Intel Corporation		13.92				2.14	

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
415	Martinez Refining Company				15.1			8.92
417	Chevron Products Company		5.15					
419	Phoenix Iron Works							1.197
423	Ciba Corning Diagnostics Corp		0.53					
424	Chevron Products Company		1.608					
425	Beckman Coulter						3.11	
428	Martinez Refining Company		6.288					
434	Genentech; Inc		0.384	6.646		7.798		2.66
443	Lawrence Livermore National Laboratory						0.121	
445	Stanford University		3.79	14.84				
446	Red Wing Co /California Div	0.07	0.052	0.419	0.002	0.083		0.091
447	Suba Mfg; Inc		7.08					
452	Solectron Corporation		2.674					
455	Time Oil Company		8.816					
456	National Semiconductor Corporation		0.047					
462	Intel Corporation			30.0				
465	Ball Metal Beverage Container Corporation			0.275				
471	Container Management Service-LLC		10.787	0.559		0.11	4.85	0.028
475	U.S. Navy		0.3	0.13		0.42		0.3
477	U.S. Navy		7.911					
478	Central Contra Costa Sanitary District		0.581	2.243		30.937		
481	National Semiconductor Corporation		0.45					
483	The Glidden Company		4.7					
486	U.S. Navy		3.44	1.21	1.2	2.71		0.98
487	Chevron Chemical Company	3.504		3.028				5.254
489	Chevron Products Company			71.4				
491	U.S. Navy		1.62	5.762	0.46	1.241	1.03	0.405
492	Cardinal Cogen a Joint Venture			7.1				

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
495	Tosco Refining Company	0.4	0.527		2.15	42.7		
496	New United Motor Manufacturing; Inc			3.79				
500	San Francisco Energy Company		102.6					
501	U.S. Navy		0.315	8.432	0.135	9.001		0.563
503	U.S. Navy		0.354	4.342	0.347	0.935		0.305
504	Chevron Products Company		1.995	1.027	0.06	0.537		0.312
505	New United Motor Manufacturing; Inc		18.47					
510	U.S. Navy		3.49	2.43	0.21	0.58	0.22	0.59
512	IBM Corporation		-.001	0.059				
514	Owens Corning		6.453					
520	New United Motor Manufacturing; Inc		112.76					
521	UCSF/Parnassus			0.5		0.13		
525	Central Contra Costa Sanitary District		0.153	1.12		8.158		
529	U.S. Navy		2.88	14.75	1.43	11.47		3.71
531	Crown Cork & Seal Company		20.249	4.595		0.965		0.345
532	Martinez Cogen Limited Partnership			50.2				
538	New United Motor Manufacturing; Inc		131.9					
540	New United Motor Manufacturing; Inc		0.218					
541	Chevron Chemical Company		0.047				1.6	
543	Hanson Permanente Cement							25.074
545	U.S. Navy		2.495					
546	Alameda Reuse & Redevelopment Authority		29.97					
547	Cirrus Logic		1.34	0.34				
550	Chevron Products Company		43.402	36.225	133.81	485.47		31.134
554	Lawrence Livermore National Laboratory			0.051			2.4	
555	U.S. Navy			1.05	0.02	0.89		0.11

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
556	Martinez Refining Company		36.772	13.8	0.1			
557	U.S. Navy		0.65	9.09	0.14	8.16		0.7
558	Pacific Refining Company		3.04	57.19	1.03	33.32		9.97
559	U.S. Navy		0.34	2.11				
560	Criterion Catalysts Company LP		0.34					
561	Pechiney Plastic Packaging; Inc		1.249					
562	United Technologies Corporation		2.432	0.623				
563	Owens Corning		1.245					
566	Shell Martinez Catalyst Plant		11.62					
570	Quebecor World San Jose Inc		6.11	1.81				
571	Huntway Refining Company		0.657					
573	LSI Logic Corporation		15.856					
577	Lockheed Martin Corporation		0.308					
578	Chevron Chemical Company		0.212	1.802	0.046	0.357		0.57
580	Tosco Refining Company		1.29	21.23	4.19	16.14		6.45
581	Tosco Refining Company		3.17	6.88	0.01	5.78		0.2
583	WinCup Holdings;L P		0.426					
584	Chevron Products Company		1.265					
586	United Airlines; Maintenance Operations Ctr		49.728					
588	Chevron Chemical Company			31.771		2.069		
593	Dow Chemical Company		15.34					
598	USS-POSCO Industries				0.14	0.79		0.7
600	U.S. Navy		0.55	3.21	0.06	8.43		0.76
602	Calpine Corporation	0.2	40.97	2.143		0.357		
603	Port of Oakland			2.45				
605	Owens-Brockway Glass Container Inc	11.2	0.4			0.74		

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
609	Martinez Refining Company				50.61			
611	C & H Sugar Company; Inc		2.353	48.962		37.282		0.094
613	Martinez Refining Company			89.783				
617	Chevron Products Company		68.898	8.79	0.473	7.449		1.514
619	Raisch Products					0.84		
622	Huntway Refining Company		0.898					
625	Quebecor World San Jose Inc		356.0					
628	Owens Brockway Glass Containers		10.78			10.78		
630	USS-POSCO Industries			14.821	0.09	2.51		0.36
633	Crown Cork & Seal Co.		0.086	1.564	0.009	1.308	0.036	0.119
635	Calpine Corp. & Bechtel Enterprises Hold		0.1	1.31				7.7
637	Huntway Refining Company		0.174					
638	Time Oil Company		6.153					
640	New United Motor Manufacturing; Inc		27.94					13.63
641	Tosco Corp; Avon Refinery		145.69					
643	Homestake Mining Company	87.53				86.97		
644	USS-POSCO Industries	3.0	1.1	3.8	0.2	2.4		
645	Calpine Corporation			107.9				
648	Emerald Packaging Inc						40.0	
652	Shore Terminals - Selby		10.802	11.352				
656	Duke Energy Oakland LLC		324.81					
658	Calpine Corporation		10.0	32.9		14.38		
659	Calpine Construction Finance Co.;L.P.				30.4			

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
660	Calpine Corporation			39.55	5.92			
661	Calpine Corporation		31.75					
662	Calpine Corporation			73.62	46.3			
665	Calpine Corp. & Bechtel Enterprises Hold		22.778					
666	Calpine Corp. & Bechtel Enterprises Hold		15.518					
671	Calpine Corp. & Bechtel Enterprises Hold		2.7	468.0	90.0	33.0		28.0
674	Calpine Corp. & Bechtel Enterprises Hold					9.797	0.669	
675	Calpine Corp. & Bechtel Enterprises Hold				18.285			
676	Calpine Corp. & Bechtel Enterprises Hold		0.014					
679	Calpine Corp. & Bechtel Enterprises Hold		45.8					
680	Calpine Corp. & Bechtel Enterprises Hold		4.4					
681	Valero Refining Company - California		28.994					
682	Valero Refining Company - California		14.769					
685	Calpine Corp. & Bechtel Enterprises Hold	0.21	0.91	6.42	0.03	1.65		7.64
686	Calpine Corp. & Bechtel Enterprises Hold			6.5				12.33
687	Calpine Corp. & Bechtel Enterprises Hold		43.819	0.601				
688	Calpine Corp. & Bechtel Enterprises Hold		52.27					
689	SFPP; LP		2.358					
690	Western Spray Painting; Inc.		5.14					
691	Burns Philip Food Inc.		2.1					
692	Chevron Products Company		1.608					
693	Southern Energy California		125.88	437.56	321.9	450.6		209.9
694	Southern Energy California		5.3	299.0	158.2	114.0		25.0

No.	Certificate Owner	PM	POC	NOx	SO_2	CO	NPOC	PM_{10}
695	Southern Energy California	4.2	0.39	1.173	0.179	14.602		6.443
696	Siliconix; Incorporated		1.362				0.001	
697	Calpine Corp. & Bechtel Enterprises Hold		85.863					
698	Chevron Products Company		0.319					
699	Calpine Corporation			20.9				
700	Chevron Products Company		0.286					
701	Calpine Corp. & Bechtel Enterprises Hold			142.21	465.27	54.34		
702	Catalytica Combustion Systems Inc			0.04		15.66		
703	Valero Refining Company - California			31.418				
	Total Emission Reduction Credits Available	**144**	**3071**	**2475**	**1570**	**1609**	**454**	**432**

Appendix 8.1H
Cumulative Impacts Analysis Protocol

APPENDIX 8.1H

CUMULATIVE IMPACTS ANALYSIS PROTOCOL

Potential cumulative air quality impacts that might be expected to occur resulting from EAEC and other reasonably foreseeable projects are both regional and localized in nature. These cumulative impacts will be evaluated as follows.

Cumulative impacts from EAEC could result from emissions of carbon monoxide, oxides of nitrogen, sulfur oxides, and directly emitted PM_{10}. To ensure that other projects that might have significant cumulative impacts in conjunction with EAEC are identified, a search area with a radius of 6 km will be used for the cumulative impacts analysis.

Within this search area, three categories of projects with combustion sources will be used as criteria for identification:

- Projects that are existing and have been in operation since at least 1999.
- Projects for which air pollution permits to construct have been issued and that began operation after 1999.
- Projects for which air pollution permits to construct have not been issued, but that are reasonably foreseeable.

Projects that are existing and have been in operation since at least 1999 will be reflected in the ambient air quality data that has been used to represent background concentrations; consequently, no further analysis of the emissions from this category of facilities will be performed. The cumulative impacts analysis adds the modeled impacts of selected facilities to the maximum measured background air quality levels, thus ensuring that these existing projects are taken into account.

Projects for which air pollution permits to construct have been issued but that were not operational by 1999 will be identified through a request of permit records from the Bay Area AQMD and the San Joaquin Valley Unified APCD. The search will be requested to be performed at two levels. Projects that had a permit to construct issued after January 1, 1998, will be included in the cumulative air quality impacts analysis. The January 1, 1998 date was selected based on the typical length of time a permit to construct is valid and typical project construction times, to ensure that projects that are not reflected in the 1999 ambient air quality data are included in the analysis. Projects for which the emissions change was smaller than 10 pounds per day will be assumed to be *de minimis*, and will not be included in the dispersion modeling analysis.

A list of projects within the area for which air pollution permits to construct have not yet been issued, but that are reasonably foreseeable, will be requested from the BAAQMD and SJVUAPCD staffs.

Appendix 8.1I
Calculation of Reasonable Worst-Case Day Emissions for Mitigation

APPENDIX 8.1I

NITRATE DEPOSITION

To determine the potential for ammonia emissions from EAEC to contribute to particulate formation in the area, we have investigated the ambient monitoring data from nearby Livermore to establish whether the area can be characterized as ammonia-rich. Available monitoring data suggests that the East Altamont project area is mostly ammonia-rich, suggesting that ammonia emissions will not contribute significantly to particulate nitrate formation or deposition in the area.

Adding more ammonia to the ambient air will result in the immediate formation of ammonium nitrate particulate only if the area is ammonia-limited: that is, if there are excess acidic nitrates and sulfates available for reaction, the addition of ammonia to the atmosphere will result in the formation of ammonium nitrate and sulfate compounds. However, if the area is ammonia-rich, adding more ammonia to the air will not automatically result in more ammonium nitrate formation because the area is NOx and SOx limited. An examination of 1997 PM_{10}, PM_{10} nitrate and PM_{10} sulfate concentrations for the Livermore monitoring station indicates that the project area probably can be characterized as mostly ammonia-rich.

Because data on ambient ammonia concentrations are not available, it is necessary to deduce ammonia concentrations indirectly based on available data regarding nitrate and sulfate concentrations. Ammonium nitrate concentrations are low to non-existent under ammonia-poor conditions. In general, if no nitrates are present, the conditions are clearly ammonia-poor. Under ammonia-rich conditions, fairly large amounts of nitrates are found, since all available sulfuric acid has been neutralized. The 1997 Livermore data show occasional episodic nitrate events, during which the aerosol mass becomes predominantly composed of nitrates, such as occasionally occur in major urban areas of California.

Studies of secondary PM_{10} formation in the San Joaquin Valley (Chow et al, 1993; Sonoma Technologies[29]) also conclude that the San Joaquin Valley is generally ammonia-rich during the winter season when ambient PM_{10} levels are highest. In combination with the Livermore data described above, this data suggests that the East Altamont project area is NOx/SO_2 limited, so that nitrate formation will be most effectively controlled by minimizing NOx and SO_2 emissions from the turbines. The proposed 2 ppm NOx emission limit (on an annual basis) and the use of natural gas fuel will achieve this objective.

Therefore, we believe that ammonium nitrate formation as a result of ammonia slip from the turbines will not be significant.

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29 Cited in the Elk Hills FSA at p. 50.

Appendix 8.2A
California Department of Fish and Game Natural Diversity Data Base List of Species for EAEC Project Area

Search for EAEC AFC List of Elements and Status by Co

Common/Scientific Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
ALKALI MEADOW	None/ None	G3/ S2.1		
ALKALI MILK-VETCH *ASTRAGALUS TENER VAR TENER*	None/ None	G2T1/ S1.2	1B/ 3-2-3	
ALKALI SEEP	None/ None	G3/ S2.1		
BIG TARPLANT *BLEPHARIZONIA PLUMOSA SSP PLUMOSA*	None/ None	G4T1/ S1.1	1B/ 3-3-3	
BIG-SCALE BALSAMROOT *BALSAMORHIZA MACROLEPIS VAR MACROLEPIS*	None/ None	G3T2/ S2.2	1B/ 2-2-3	
BRISTLY SEDGE *CAREX COMOSA*	None/ None	G5/ S1.1	2/ 3-3-1	
BRITTLESCALE *ATRIPLEX DEPRESSA*	None/ None	G2Q/ S2.2	1B/ 2-2-3	
BURROWING OWL *ATHENE CUNICULARIA (BURROW SITES)*	None/ None	G4T2/ S2		SC
CALIFORNIA BLACK RAIL *LATERALLUS JAMAICENSIS COTURNICULUS*	None/ Threatened	G4T1/ S1		
CALIFORNIA HORNED LARK *EREMOPHILA ALPESTRIS ACTIA*	None/ None	G4G5T3 / S3		SC
CALIFORNIA HORNED LIZARD *PHRYNOSOMA CORONATUM FRONTALE*	None/ None	G4T3T4 / S3S4		SC
CALIFORNIA MASTIFF BAT *EUMOPS PEROTIS CALIFORNICUS*	None/ None	G5T4?/ S3?		SC
CALIFORNIA RED-LEGGED FROG *RANA AURORA DRAYTONII*	Threatened/ None	G4T2T3 / S2S3		SC

Search for EAEC AFC List of Elements and Status by Co

Common/Scientific Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
CALIFORNIA TIGER SALAMANDER *AMBYSTOMA CALIFORNIENSE*	Endangered/ None	G2G3/ S2S3		SC
CAPER-FRUITED TROPIDOCARPUM *TROPIDOCARPUM CAPPARIDEUM*	Species of Concern/ None	GH/ SH	1A/ *	
CISMONTANE ALKALI MARSH	None/ None	G1/ S1.1		
COASTAL AND VALLEY FRESHWATER MARSH	None/ None	G3/ S2.1		
CONTRA COSTA GOLDFIELDS *LASTHENIA CONJUGENS*	Endangered/ None	G1/ S1.1	1B/ 3-3-3	
CURVED-FOOT HYGROTUS DIVING BEETLE *HYGROTUS CURVIPES*	None/ None	G1/ S1		
DELTA MUDWORT *LIMOSELLA SUBULATA*	None/ None	G4?/ S2.1	2/ 2-3-1	
DELTA TULE PEA *LATHYRUS JEPSONII VAR JEPSONII*	Species of Concern/ None	G5T2/ S2.2	1B/ 2-2-3	
DIAMOND-PETALED CALIFORNIA POPPY *ESCHSCHOLZIA RHOMBIPETALA*	Species of Concern/ None	G1/ S1.1	1A/ *	
FERRIS'S MILK-VETCH *ASTRAGALUS TENER VAR FERRISIAE*	Species of Concern/ None	G2T1/ S1.1	1B/ 3-3-3	
GREAT VALLEY VALLEY OAK RIPARIAN FOREST	None/ None	G1/ S1.1		
HAIRLESS POPCORN-FLOWER *PLAGIOBOTHRYS GLABER*	None/ None	GH/ SH	1A/ *	

Search for EAEC AFC List of Elements and Status by Co

Common/Scientific Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
HEARTSCALE *ATRIPLEX CORDULATA*	Species of Concern/ None	G2?/ S2.2?	1B/ 2-2-3	
HISPID BIRD'S-BEAK *CORDYLANTHUS MOLLIS SSP HISPIDUS*	Species of Concern/ None	G2T2/ S2.1	1B/ 2-3-3	
LARGE-FLOWERED FIDDLENECK *AMSINCKIA GRANDIFLORA*	Endangered/ Endangered	G1/ S1.1	1B/ 3-3-3	
LONGHORN FAIRY SHRIMP *BRANCHINECTA LONGIANTENNA*	Endangered/ None	G1/ S1		
MARSH SKULLCAP *SCUTELLARIA GALERICULATA*	None/ None	G5/ S2.2?	2/ 2-2-1	
MASON'S LILAEOPSIS *LILAEOPSIS MASONII*	Species of Concern/ Rare	G3/ S3.2	1B/ 2-2-3	
MOLESTAN BLISTER BEETLE *LYTTA MOLESTA*	None/ None	G2/ S2		
MT. DIABLO BUCKWHEAT *ERIOGONUM TRUNCATUM*	None/ None	GH/ SH	1A/ *	
NORTHERN CLAYPAN VERNAL POOL	None/ None	G1/ S1.1		
PALMATE-BRACTED BIRD'S-BEAK *CORDYLANTHUS PALMATUS*	Endangered/ Endangered	G1/ S1.1	1B/ 3-3-3	
RAYLESS RAGWORT *SENECIO APHANACTIS*	None/ None	G3?/ S1.2	2/ 3-2-1	
RECURVED LARKSPUR *DELPHINIUM RECURVATUM*	Species of Concern/ None	G2/ S2.2	1B/ 1-2-3	
RIPARIAN (=SAN JOAQUIN VALLEY) WOODRAT *NEOTOMA FUSCIPES RIPARIA*	Endangered/ None	G5T1/ S1		SC

Search for EAEC AFC List of Elements and Status by Co

Common/Scientific Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
ROSE-MALLOW *HIBISCUS LASIOCARPUS*	None/ None	G4/ S2.2	2/ 2-2-1	
SAN JOAQUIN KIT FOX *VULPES MACROTIS MUTICA*	Endangered/ Threatened	G4T2T3 / S2S3		
SAN JOAQUIN POCKET MOUSE *PEROGNATHUS INORNATUS INORNATUS*	None/ None	G4T2T3 / S2S3		
SAN JOAQUIN SALTBUSH *ATRIPLEX JOAQUINIANA*	Species of Concern/ None	G2/ S2.1	1B/ 2-2-3	
SAN JOAQUIN WHIPSNAKE *MASTICOPHIS FLAGELLUM RUDDOCKI*	None/ None	G5T2?/ S2?		SC
SHOWY MADIA *MADIA RADIATA*	None/ None	G2/ S2.1	1B/ 2-3-3	
SUISUN MARSH ASTER *ASTER LENTUS*	Species of Concern/ None	G2/ S2.2	1B/ 2-2-3	
SWAINSON'S HAWK *BUTEO SWAINSONI (NESTING)*	None/ Threatened	G4/ S2		
SYCAMORE ALLUVIAL WOODLAND	None/ None	G1/ S1.1		
TRICOLORED BLACKBIRD *AGELAIUS TRICOLOR (NESTING COLONY)*	None/ None	G3/ S3		SC
VALLEY ELDERBERRY LONGHORN BEETLE *DESMOCERUS CALIFORNICUS DIMORPHUS*	Threatened/ None	G3T2/ S2		
VALLEY NEEDLEGRASS GRASSLAND	None/ None	G1/ S3.1		

Search for EAEC AFC List of Elements and Status by Co

Common/Scientific Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
VALLEY SINK SCRUB	None/ None	G1/ S1.1		
VERNAL POOL FAIRY SHRIMP *BRANCHINECTA LYNCHI*	Threatened/ None	G2G3/ S2S3		
WESTERN POND TURTLE *CLEMMYS MARMORATA*	None/ None	G4/ S3		SC
WESTERN SPADEFOOT *SCAPHIOPUS HAMMONDII*	None/ None	G3?/ S3?		SC
WHITE-TAILED KITE *ELANUS LEUCURUS (NESTING)*	None/ None	G5/ S3		

California Department of Fish and Game
Natural Diversity Data Base

Union Island Location Summary Report

BUTEO SWAINSONI (NESTING)
SWAINSON'S HAWK — Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status:
State: Threatened	State: S2	

Occurrence No. 18 — Map Index: 11440
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: HOWARD AND UNDINE RD JCTS.
Lat/Long: 37°50'03" / 121°23'20"
UTM: Zone-10 N4188433 E641776
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1982-06-29
Site: 1983-04-23

Township: 01S
Range: 05E
Section: 23 Qtr NE
Meridian: M
Elevation: 5 ft

Occurrence No. 19 — Map Index: 11404
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary: Old River/El Pescaders
Owner/Manager: PVT
Location: OLD RIVER/PARADISE CUT NEAR MACARTHUR DRIVE NE OF TRACY.
Lat/Long: 37°48'02" / 121°24'17"
UTM: Zone-10 N4184679 E640448
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1983-04-23
Site: 1983-04-23

Township: 01S
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 119 — Map Index: 11346
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: INTERSECTION OF W GRANTLINE RD AND TRACY BLVD IN TRACY.
Lat/Long: 37°45'16" / 121°26'02"
UTM: Zone-10 N4179520 E637965
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1981-06-23
Site: 1983-04-23

Township: 02S
Range: 05E
Section: 20 Qtr NE
Meridian: M
Elevation: 25 ft

BUTEO SWAINSONI (NESTING) (cont.)
SWAINSON'S HAWK — Element Code: ABNKC19070

Status		NDDB Element Ranks		Other Lists	
Federal:	None	Global:	G4	CDFG Status:	
State:	Threatened	State:	S2		

Occurrence No. 157 — Map Index: 11429
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CANAL AND TOM PAINE AVE JUNCTION.
Lat/Long: 37°46'44" / 121°23'30"
UTM: Zone-10 N4182295 E641638
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

Dates Last Seen — Element: 1983-04-23 — Site: 1983-04-23
Township: 02S
Range: 05E
Section: 11 Qtr NW
Meridian: M
Elevation:

Occurrence No. 234 — Map Index: 11422
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CANAL BLVD AND TOM PAINE AVE JCT; APPROX 2 MI NE OF TRACY.
Lat/Long: 37°46'52" / 121°23'42"
UTM: Zone-10 N4182537 E641341
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

Dates Last Seen — Element: 1983-04-23 — Site: 1983-04-23
Township: 02S
Range: 05E
Section: 11 Qtr SE
Meridian: M
Elevation: 10 ft

Occurrence No. 691 — Map Index: 36522
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: SOUTH SIDE OF OLD RIVER, 0.25 MILE DOWNSTREAM FROM THE TRACY BLVD BRIDGE, 3 MILES NNW OF TRACY
Lat/Long: 37°48'06" / 121°27'05"
UTM: Zone-10 N4184733 E636337
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

Dates Last Seen — Element: 1987-06-30 — Site: 1987-06-30
Township: 01S
Range: 05E
Section: 32 Qtr XX
Meridian: M
Elevation: 5 ft

BUTEO SWAINSONI (NESTING) (cont.)
SWAINSON'S HAWK — Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status:
State: Threatened	State: S2	

Occurrence No. 692 — Map Index: 36523
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: UNNAMED SLOUGH, LOCATED JUST UPSTREAM FROM THE CONFLUENCE OF OLD RIVER AND TOM PAINE SLOUGH, 3 MILES NORTH OF TRACY
Lat/Long: 37°48'13" / 121°25'22"
UTM: Zone-10 N4184978 E638845
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1987-06-30
Site: 1987-06-30

Township: 01S
Range: 05E
Section: 33 Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 714 — Map Index: 41217
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager:
Location: JUST EAST OF THE TRACY BOULEVARD BRIDGE OVER OLD RIVER, 3 MILES NORTH OF TRACY.
Lat/Long: 37°48'16" / 121°26'51"
UTM: Zone-10 N4185068 E636651
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1999-04-01
Site: 1999-04-01

Township: 01S
Range: 05E
Section: 32 Qtr SW
Meridian: M
Elevation: 5 ft

Union Island Location Summary Report

ATHENE CUNICULARIA (BURROW SITES)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 312 — Map Index: 40527
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: CALTRANS?
Location: JUST WEST OF TRACY BLVD, ALONG THE NORTH SIDE OF I-205, NORTH OF TRACY.
Lat/Long: 37°45'48" / 121°26'05"
UTM: Zone-10 N4180506 E637873
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1994-05-30
Site: 1994-05-30

Township: 02S
Range: 05E
Section: 17 Qtr NE
Meridian: M
Elevation: 15 ft

Occurrence No. 336 — Map Index: 41707
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: JUST SOUTH OF I-205, 0.4 MILE EAST OF THE INTERSECTION OF BYRON ROAD AND LAMMERS FERRY ROAD, WEST OF TRACY.
Lat/Long: 37°44'59" / 121°28'03"
UTM: Zone-10 N4178948 E635009
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1999-09-23
Site: 1999-09-23

Township: 02S
Range: 05E
Section: 19 Qtr XX
Meridian: M
Elevation: 30 ft

AGELAIUS TRICOLOR (NESTING COLONY)
TRICOLORED BLACKBIRD — Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	CDFG Status: SC
State: None	State: S3	

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 98 Map Index: 11408

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1936-06-03
Site: 1936-06-03

Township:
Range:
Section: Qtr
Meridian:
Elevation:

Union Island Location Summary Report

PEROGNATHUS INORNATUS INORNATUS
SAN JOAQUIN POCKET MOUSE — Element Code: AMAFD01061

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2T3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 45 — Map Index: 11261

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)*, CLIFTON COURT FOREBAY (3712175/463D)
County Summary: SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: 7 MI NW TRACY.
Lat/Long: 37°49'57" / 121°28'55"
UTM: Zone-10 N4188111 E633590
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1941-03-29
Site: 1941-03-29

Township: 02S
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation:

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX — Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 — Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

GREAT VALLEY VALLEY OAK RIPARIAN FOREST

Element Code: CTT61430CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G1	
State: None	State: S1.1	

Occurrence No. 29 Map Index: 11360

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary: Old River/El Pescaders
Owner/Manager: UNKNOWN
Location: OLD (SAN JOAQUIN) RIVER FROM PARADISE CUT D/S ABOUT 2 MI.
Lat/Long: 37°48'20" / 121°24'58"
UTM: Zone-10 N4185214 E639430
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 150.7 ac

—Dates Last Seen—
Element: 1987-09-13
Site: 1987-09-13

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

Occurrence No. 30 Map Index: 11291

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary: Old River/El Pescaders
Owner/Manager: UNKNOWN
Location: OLD RIVER (SAN JOAQUIN) WEST OF OAK ISLAND.
Lat/Long: 37°47'52" / 121°28'00"
UTM: Zone-10 N4184276 E635000
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 31.5 ac

—Dates Last Seen—
Element: 1987-09-13
Site: 1987-09-13

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Union Island Location Summary Report

DESMOCERUS CALIFORNICUS DIMORPHUS
VALLEY ELDERBERRY LONGHORN BEETLE — Element Code: IICOL48011

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G3T2	CDFG Status:
State: None	State: S2	

Occurrence No. 158 — Map Index: 39500

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: WING LEVEE ROAD NEAR MIDDLE RIVER OR OLD RIVER. MAJORITY OF ELDERBERRIES ARE BETWEEN HOWARD AND UNLINE ROADS.
Lat/Long: 37°50'25" / 121°24'03"
UTM: Zone-10 N4189103 E640694
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 171.0 ac

—Dates Last Seen—
Element: 1984-XX-XX
Site: 1984-XX-XX

Township: 01S
Range: 05E
Section: 15 Qtr XX
Meridian: M
Elevation: 3 ft

Union Island Location Summary Report

LILAEOPSIS MASONII
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 145 — Map Index: 35475

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DFG-CLIFTON COURT FOREBAY
Location: OLD RIVER, 0.3 MI N OF JCT REEVE ROAD AND BETHANY ROAD.
Lat/Long: 37°47'08" / 121°29'53"
UTM: Zone-10 N4182892 E632268
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1991-10-17
Site: 1991-10-17

Township: 02S
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 4 — Map Index: 11363

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: TRACY.

Dates Last Seen
Element: 1935-09-07
Site: 1935-09-07

Lat/Long: 37°44'24" / 121°25'30"
UTM: Zone-10 N4177930 E638775
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 02S
Range: 05E
Section: 21 Qtr XX
Meridian: M
Elevation: 50 ft

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status		NDDB Element Ranks		Other Lists	
Federal:	Species of Concern	Global:	GH	CNPS List:	1A
State:	None	State:	SH	R-E-D Code:	*

Occurrence No. 2 — Map Index: 11363

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: TRACY.
Lat/Long: 37°44'24" / 121°25'30"
UTM: Zone-10 N4177930 E638775
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1937-04-03
Site: 1987-03-XX

Township: 02S
Range: 05E
Section: 21 Qtr XX
Meridian: M
Elevation: 50 ft

California Department of Fish and Game
Natural Diversity Data Base

Tracy Location Summary Report

SCAPHIOPUS HAMMONDII
WESTERN SPADEFOOT — Element Code: AAABF01030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3?	CDFG Status: SC
State: None	State: S3?	

Occurrence No. 52 — Map Index: 32321

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Quad Summary: TRACY (3712164/444B)*, MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DFG-CORRAL HOLLOW ER
Location: SSW OF TRACY; CORRAL HOLLOW; APPROX. 0.6 KM NORTH OF CASTLE ROCK.
Lat/Long: 37°38'32" / 121°29'26"
UTM: Zone-10 N4166991 E633166
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile

—Dates Last Seen—
Element: 1992-05-18
Site: 1992-05-18

Township: 03S
Range: 04E
Section: 25 Qtr XX
Meridian: M
Elevation: 475 ft

RANA AURORA DRAYTONII
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 26 — Map Index: 17126
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CORRAL HOLLOW CREEK AT 4TH BRIDGE UPSTREAM FROM HWY 580. SITE IS ABOUT 0.5 MI DOWNSTREAM FROM CORRAL HOLLOW ECO RESERVE.
Lat/Long: 37°39'15" / 121°29'14"
UTM: Zone-10 N4168309 E633447
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 59.5 ac

—Dates Last Seen—
Element: 1993-05-10
Site: 1993-05-10

Township: 03S
Range: 04E
Section: 24 Qtr SW
Meridian: M
Elevation: 400 ft

Occurrence No. 72 — Map Index: 24869
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DFG-CORRAL HOLLOW ER
Location: CORRAL HOLLOW CREEK, JUST WEST OF CORRAL HOLLOW ROAD, CORRAL HOLLOW ECOLOGICAL RESERVE, 18 MILES EAST OF LIVERMORE.
Lat/Long: 37°38'36" / 121°29'27"
UTM: Zone-10 N4167101 E633158
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 37.8 ac

—Dates Last Seen—
Element: 1992-05-18
Site: 1992-05-18

Township: 03S
Range: 04E
Section: 25 Qtr W
Meridian: M
Elevation: 500 ft

Tracy Location Summary Report

ATHENE CUNICULARIA (BURROW SITES)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 170 — Map Index: 23897
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT-LYON'S DEVELOPMENT COMPANY
Location: 0.4 MILE SE OF THE INTERSECTION OF JEFFERSON BLVD AND VALPICO ROAD, 2 MILES SOUTH OF TRACY.
Lat/Long: 37°42'22" / 121°25'45"
UTM: Zone-10 N4174171 E638471
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1991-08-11 — Site: 1991-08-11
Township: 03S
Range: 05E
Section: 04 Qtr NW
Meridian: M
Elevation: 115 ft

Occurrence No. 201 — Map Index: 24674
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: BETWEEN DELTA-MENDOTA CANAL AND SCHULTE ROAD, 1.1 MILES WEST OF LAMMERS ROAD, 4 MILES SW OF TRACY.
Lat/Long: 37°42'56" / 121°29'45"
UTM: Zone-10 N4175120 E632581
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1992-09-28 — Site: 1992-09-28
Township: 02S
Range: 04E
Section: 35 Qtr NE
Meridian: M
Elevation: 150 ft

Occurrence No. 250 — Map Index: 36446
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: VICINITY OF THE INTERSECTION OF SCHULTE ROAD AND THE SOUTHERN PACIFIC RAILROAD TRACKS, TRACY.
Lat/Long: 37°43'33" / 121°26'49"
UTM: Zone-10 N4176338 E636844
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile
Dates Last Seen — Element: 1998-08-27 — Site: 1998-08-27
Township: 02S
Range: 05E
Section: 29 Qtr SW
Meridian: M
Elevation: 70 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 259 — Map Index: 38274
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: JUST EAST OF THE INTERSECTION OF I-205 AND THE 11TH STREET ON-RAMP (WHERE IT CROSSES I-205), 3 MILES WEST OF TRACY.
Lat/Long: 37°44'29" / 121°29'31"
UTM: Zone-10 N4177988 E632879
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 24 Qtr SW
Meridian: M
Elevation: 75 ft

Occurrence No. 275 — Map Index: 39726
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: BETWEEN BYRON ROAD AND WEST 11TH STREET, 0.7 MILE WEST OF THE INTERSECTION OF THESE ROADS, WEST OF TRACY.
Lat/Long: 37°44'30" / 121°27'26"
UTM: Zone-10 N4178088 E635926
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1998-08-03
Site: 1998-08-03

Township: 02S
Range: 05E
Section: 19 Qtr SE
Meridian: M
Elevation: 40 ft

Occurrence No. 336 — Map Index: 41707
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: JUST SOUTH OF I-205, 0.4 MILE EAST OF THE INTERSECTION OF BYRON ROAD AND LAMMERS FERRY ROAD, WEST OF TRACY.
Lat/Long: 37°44'59" / 121°28'03"
UTM: Zone-10 N4178948 E635009
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1999-09-23
Site: 1999-09-23

Township: 02S
Range: 05E
Section: 19 Qtr XX
Meridian: M
Elevation: 30 ft

EREMOPHILA ALPESTRIS ACTIA
CALIFORNIA HORNED LARK — Element Code: ABPAT02011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4G5T3	CDFG Status: SC
State: None	State: S3	

Occurrence No. 22 — Map Index: 34880
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: BETWEEN CA AQUEDUCT AND DELTA-MENDOTA CANAL; 2.1 KM NNW OF I-580/HWY 132 JUNCTION; SOUTH OF TRACY.
Lat/Long: 37°39'18" / 121°24'28"
UTM: Zone-10 N4168520 E640461
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-08
Site: 1993-04-08

Township: 03S
Range: 05E
Section: 22 Qtr SW
Meridian: M
Elevation: 195 ft

Occurrence No. 23 — Map Index: 34879
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: ON EAST BANK OF DELTA-MENDOTA CANAL; 0.6 KM SSW OF DURHAM FERRY ROAD X MACARTHUR DRIVE; SOUTH OF TRACY.
Lat/Long: 37°39'43" / 121°25'02"
UTM: Zone-10 N4169280 E639617
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1993-04-21
Site: 1993-04-21

Township: 03S
Range: 05E
Section: 21 Qtr NE
Meridian: M
Elevation: 180 ft

Occurrence No. 24 — Map Index: 34878
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: ON WEST BANK OF DELTA-MENDOTA CANAL; IMMEDIATELY SOUTHWEST OF TRACY MUNICIPAL AIRPORT; SOUTH OF TRACY.
Lat/Long: 37°41'01" / 121°26'41"
UTM: Zone-10 N4171641 E637141
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-08
Site: 1993-04-08

Township: 03S
Range: 05E
Section: 08 Qtr SW
Meridian: M
Elevation: 210 ft

EREMOPHILA ALPESTRIS ACTIA (cont.)
CALIFORNIA HORNED LARK — Element Code: ABPAT02011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4G5T3	CDFG Status: SC
State: None	State: S3	

Occurrence No. 27 — Map Index: 34884
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SOUTH OF TRACY; 1.4 KM NNW OF HWY 132 X CHRISMAN ROAD; BETWEEN CA AQUEDUCT AND DELTA-MENDOTA CANAL.
Lat/Long: 37°39'02" / 121°24'08"
UTM: Zone-10 N4168045 E640960
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-08
Site: 1993-04-08

Township: 03S
Range: 05E
Section: 27 Qtr NE
Meridian: M
Elevation: 215 ft

Occurrence No. 28 — Map Index: 34883
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SOUTH OF TRACY; NORTHEAST CORNER OF HWY 132 X CHRISMAN ROAD.
Lat/Long: 37°38'21" / 121°23'46"
UTM: Zone-10 N4166777 E641510
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-03-31
Site: 1993-03-31

Township: 03S
Range: 05E
Section: 26 Qtr SW
Meridian: M
Elevation: 270 ft

EUMOPS PEROTIS CALIFORNICUS
CALIFORNIA MASTIFF BAT — Element Code: AMACD02011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5T4?	CDFG Status: SC
State: None	State: S3?	

Occurrence No. 17 — Map Index: 33090

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CASTLE ROCK, ON THE EAST SIDE OF CORRAL HOLLOW ROAD, 7 MILES SSW OF TRACY.
Lat/Long: 37°38'11" / 121°29'23"
UTM: Zone-10 N4166342 E633261
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1991-07-18
Site: 1991-07-18

Township: 03S
Range: 04E
Section: 25 Qtr SW
Meridian: M
Elevation: 700 ft

Tracy Location Summary Report

PEROGNATHUS INORNATUS INORNATUS
SAN JOAQUIN POCKET MOUSE — Element Code: AMAFD01061

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2T3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 44 — Map Index: 11232

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, LONE TREE CREEK (3712154/444C), MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW, 8 MI SW TRACY.
Lat/Long: 37°38'18" / 121°29'24"
UTM: Zone-10 N4166555 E633229
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Dates Last Seen
Element: 1911-03-18
Site: 1911-03-18

Township: 03S
Range: 04E
Section: 25 Qtr W
Meridian: M
Elevation:

NEOTOMA FUSCIPES RIPARIA
RIPARIAN (=SAN JOAQUIN VALLEY) WOODRAT — Element Code: AMAFF08081

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G5T1	CDFG Status: SC
State: None	State: S1	

Occurrence No. 1 — Map Index: 11232

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, LONE TREE CREEK (3712154/444C), MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW CREEK, 4 MI E ALAMEDA CO LINE.
Lat/Long: 37°38'18" / 121°29'24"
UTM: Zone-10 N4166555 E633229
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1955-10-13
Site: 1955-10-13

Township: 03S
Range: 04E
Section: 25 Qtr W
Meridian: M
Elevation:

Tracy Location Summary Report

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX — Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 — Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

Tracy Location Summary Report

CLEMMYS MARMORATA
WESTERN POND TURTLE — Element Code: ARAAD02030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status: SC
State: None	State: S3	

Occurrence No. 113 — Map Index: 34683

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW CREEK; 2.0 ROAD MILES WEST OF INTERSTATE 580 ON CORRAL HOLLOW ROAD.
Lat/Long: 37°39'24" / 121°28'55"
UTM: Zone-10 N4168589 E633899
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.3 ac

—Dates Last Seen—
Element: 1993-05-10
Site: 1993-05-10

Township: 03S
Range: 04E
Section: 24 Qtr SE
Meridian: M
Elevation: 330 ft

Tracy Location Summary Report

PHRYNOSOMA CORONATUM FRONTALE
CALIFORNIA HORNED LIZARD — Element Code: ARACF12022

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T3T4	CDFG Status: SC
State: None	State: S3S4	

Occurrence No. 4 — Map Index: 23072
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: 1.25 MILES SW OF I-580, 2.7 MILES SOUTH OF THE TRACY AIRPORT.
Lat/Long: 37°38'38" / 121°26'50"
UTM: Zone-10 N4167240 E636985
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1991-06-22
Site: 1991-06-22

Township: 03S
Range: 05E
Section: 29 Qtr SW
Meridian: M
Elevation: 450 ft

Occurrence No. 29 — Map Index: 39895
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ~2.5 MILES WEST OF I-580 & CORRAL HOLLOW ROAD JUNCTION, 2.3 MILES SOUTH OF CROSSING OF WESTERN PACIFIC RAILWAY & I-580.
Lat/Long: 37°40'11" / 121°30'01"
UTM: Zone-10 N4170044 E632260
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1990-06-07
Site: 1990-06-07

Township: 03S
Range: 04E
Section: 14 Qtr SE
Meridian: M
Elevation: 700 ft

Tracy Location Summary Report

MASTICOPHIS FLAGELLUM RUDDOCKI
SAN JOAQUIN WHIPSNAKE — Element Code: ARADB21021

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5T2?	CDFG Status: SC
State: None	State: S2?	

Occurrence No. 2 — Map Index: 33715

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW ROAD, NEAR THE MOUTH OF CORRAL HOLLOW, 6 MILES SSW OF TRACY.
Lat/Long: 37°39'23" / 121°28'59"
UTM: Zone-10 N4168576 E633809
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1991-05-19
Site: 1991-05-19

Township: 03S
Range: 04E
Section: 24 Qtr NE
Meridian: M
Elevation: 500 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 4 — Map Index: 11363

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: TRACY.
Lat/Long: 37°44'24" / 121°25'30"
UTM: Zone-10 N4177930 E638775
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1935-09-07
Site: 1935-09-07

Township: 02S
Range: 05E
Section: 21 Qtr XX
Meridian: M
Elevation: 50 ft

Occurrence No. 13 — Map Index: 37336

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: NW SLOPE OF BLACK BUTTE, SOUTH OF CORRAL HOLLOW ROAD. ABOUT 2 MI W OF I-5.
Lat/Long: 37°39'20" / 121°29'07"
UTM: Zone-10 N4168487 E633612
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-10-04
Site: 1996-10-04

Township: 03S
Range: 04E
Section: 24 Qtr SW
Meridian: M
Elevation: 500 ft

Tracy Location Summary Report

AMSINCKIA GRANDIFLORA
LARGE-FLOWERED FIDDLENECK — Element Code: PDBOR01050

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CNPS List: 1B
State: Endangered	State: S1.1	R-E-D Code: 3-3-3

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 8 Map Index: 23733

—Dates Last Seen—
Element: 1996-05-16
Site: 1996-05-16

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

Township:
Range:
Section: Qtr
Meridian:
Elevation:

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status		NDDB Element Ranks		Other Lists	
Federal:	Species of Concern	Global:	GH	CNPS List:	1A
State:	None	State:	SH	R-E-D Code:	*

Occurrence No. 2 — Map Index: 11363

Occ Rank:	None
Origin:	Natural/Native occurrence
Presence:	Extirpated
Trend:	Unknown
Quad Summary:	TRACY (3712164/444B)*, UNION ISLAND (3712174/462C)
County Summary:	SAN JOAQUIN
SNA Summary:	
Owner/Manager:	PVT
Location:	TRACY.
Lat/Long:	37°44'24" / 121°25'30"
UTM:	Zone-10 N4177930 E638775
Mapping Precision:	NON-SPECIFIC
Symbol Type:	POINT
Radius:	1 mile

—Dates Last Seen—
Element: 1937-04-03
Site: 1987-03-XX

Township: 02S
Range: 05E
Section: 21 Qtr XX
Meridian: M
Elevation: 50 ft

California Department of Fish and Game
Natural Diversity Data Base

Midway Location Summary Report

AMBYSTOMA CALIFORNIENSE
CALIFORNIA TIGER SALAMANDER

Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 102 Map Index: 17087
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary: Draney Canyon
Owner/Manager: DPR-CARNEGIE SVRA, UNKNOWN
Location: ALONG PORTIONS OF TESLA AND CORRAL HOLLOW ROADS, BETWEEN TRACY AND LIVERMORE.
Lat/Long: 37°38'03" / 121°32'47"
UTM: Zone-10 N4166030 E628241
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 346.8 ac

—Dates Last Seen—
Element: 1998-01-27
Site: 1998-01-27

Township: 03S
Range: 04E
Section: 33 Qtr XX
Meridian: M
Elevation: 700 ft

Occurrence No. 104 Map Index: 17089
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: ALTAMONT PASS ROAD BTWN GREENVILLE AND NORTH MIDWAY ROAD, AND THE SOUTHERN HALF OF DYER ROAD.
Lat/Long: 37°44'07" / 121°40'11"
UTM: Zone-10 N4177074 E617208
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 732.1 ac

—Dates Last Seen—
Element: 1995-01-26
Site: 1995-01-26

Township: 02S
Range: 03W
Section: 22 Qtr XX
Meridian: M
Elevation: 500 ft

Occurrence No. 106 Map Index: 17093
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Draney Canyon
Owner/Manager: UNKNOWN
Location: ALONG TESLA ROAD AND A SMALL PORTION OF GREENVILLE ROAD, SOUTHEAST OF LIVERMORE.
Lat/Long: 37°39'16" / 121°40'02"
UTM: Zone-10 N4168115 E617570
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 834.4 ac

—Dates Last Seen—
Element: 1989-11-25
Site: 1989-11-25

Township: 03S
Range: 03E
Section: 21 Qtr SW
Meridian: M
Elevation:

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 130 — Map Index: 23735
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 2 MILES SOUTHWEST OF THE JUNCTION OF I-580/I-205, 10 MILES SE OF LIVERMORE.
Lat/Long: 37°42'38" / 121°36'47"
UTM: Zone-10 N4174398 E622265
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 35 Qtr SE
Meridian: M
Elevation: 650 ft

Occurrence No. 189 — Map Index: 25036
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1.5 MILES SOUTHWEST OF THE I-580/I-205 JUNCTION, 10 MILES SE OF LIVERMORE.
Lat/Long: 37°42'52" / 121°36'34"
UTM: Zone-10 N4174837 E622553
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 35 Qtr SE
Meridian: M
Elevation: 500 ft

Occurrence No. 330 — Map Index: 33111
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH OF MOUNTAIN HOUSE CREEK, 2.4 MILES WSW OF MOUNTAIN HOUSE.
Lat/Long: 37°44'01" / 121°36'32"
UTM: Zone-10 N4176950 E622583
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1994-04-27
Site: 1994-04-27

Township: 02S
Range: 03E
Section: 26 Qtr NE
Meridian: M
Elevation: 460 ft

SCAPHIOPUS HAMMONDII
WESTERN SPADEFOOT

Element Code: AAABF01030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3?	CDFG Status: SC
State: None	State: S3?	

Occurrence No. 31 Map Index: 23074
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DPR-CARNEGIE SVRA
Location: JUST NORTH OF CORRAL HOLLOW ROAD, 12 MILES WEST OF TRACY, WITHIN CARNEGIE OHV RECREATION AREA.
Lat/Long: 37°37'58" / 121°32'16"
UTM: Zone-10 N4165869 E629012
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-11-14
Site: 1992-11-14

Township: 03S
Range: 04E
Section: 33 Qtr NE
Meridian: M
Elevation: 660 ft

Occurrence No. 52 Map Index: 32321
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Quad Summary: TRACY (3712164/444B)*, MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DFG-CORRAL HOLLOW ER
Location: SSW OF TRACY; CORRAL HOLLOW; APPROX. 0.6 KM NORTH OF CASTLE ROCK.
Lat/Long: 37°38'32" / 121°29'26"
UTM: Zone-10 N4166991 E633166
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile

—Dates Last Seen—
Element: 1992-05-18
Site: 1992-05-18

Township: 03S
Range: 04E
Section: 25 Qtr XX
Meridian: M
Elevation: 475 ft

Occurrence No. 152 Map Index: 38749
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW ROAD, 0.2 MILE WEST OF THE ALA/SJQ COUNTY LINE, BETWEEN LIVERMORE AND TRACY.
Lat/Long: 37°38'13" / 121°33'36"
UTM: Zone-10 N4166299 E627044
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1998-01-26
Site: 1998-01-26

Township: 03S
Range: 04E
Section: 29 Qtr SW
Meridian: M
Elevation: 720 ft

RANA AURORA DRAYTONII
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 35 — Map Index: 17147
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: APPROXIMATELY 4 MI WNW OF INTERSECTION OF HWY 580 & CORRAL HOLLOW RD, N OF LAWRENCE RADIATION LAB SITE 300, SW OF TRACY.
Lat/Long: 37°41'09" / 121°31'47"
UTM: Zone-10 N4171769 E629637
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-10-17
Site: 1989-10-17

Township: 03S
Range: 04E
Section: 10 Qtr SW
Meridian: M
Elevation: 800 ft

Occurrence No. 43 — Map Index: 23078
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT-YROZ RANCH
Location: ONE MILE NORTH OF THE LAWRENCE RADIATION LABORATORY BOUNDARY, 7 MILES SW OF TRACY.
Lat/Long: 37°41'31" / 121°31'33"
UTM: Zone-10 N4172450 E629971
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 189.5 ac

—Dates Last Seen—
Element: 1992-06-29
Site: 1992-06-29

Township: 03S
Range: 04E
Section: 09 Qtr XX
Meridian: M
Elevation: 500 ft

Occurrence No. 44 — Map Index: 23734
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1.5 MILES NW OF PATTERSON PASS ROAD (STONE CORRAL), 11 MILES SE OF LIVERMORE.
Lat/Long: 37°42'41" / 121°36'18"
UTM: Zone-10 N4174499 E622962
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 12.1 ac

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 35 Qtr SE
Meridian: M
Elevation: 550 ft

RANA AURORA DRAYTONII (cont.)
CALIFORNIA RED-LEGGED FROG

Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 45 Map Index: 25036

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1.5 MILES SOUTHWEST OF THE I-580/I-205 JUNCTION, 10 MILES SE OF LIVERMORE.
Lat/Long: 37°42'52" / 121°36'34"
UTM: Zone-10 N4174837 E622553
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 35 Qtr SE
Meridian: M
Elevation: 500 ft

Occurrence No. 82 Map Index: 23735

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 2 MILES SOUTHWEST OF THE JUNCTION OF I-580/I-205, 10 MILES SE OF LIVERMORE.
Lat/Long: 37°42'38" / 121°36'47"
UTM: Zone-10 N4174398 E622265
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 35 Qtr SE
Meridian: M
Elevation: 650 ft

Occurrence No. 98 Map Index: 25526

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, CEDAR MTN. (3712155/445D)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DPR-CARNEGIE SVRA
Location: SOUTH SIDE OF CORRAL HOLLOW, 0.75 MILE EAST OF THE ALAMEDA/SAN JOAQUIN COUNTY LINE, CARNEGIE SVRA.
Lat/Long: 37°37'42" / 121°32'41"
UTM: Zone-10 N4165367 E628429
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 39.9 ac

—Dates Last Seen—
Element: 1989-05-15
Site: 1989-05-15

Township: 03S
Range: 04E
Section: 33 Qtr W
Meridian: M
Elevation: 750 ft

RANA AURORA DRAYTONII (cont.)
CALIFORNIA RED-LEGGED FROG

Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 99 Map Index: 25525
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary:
Owner/Manager: DPR-CARNEGIE SVRA
Location: SOUTH SIDE OF CORRAL HOLLOW, IN THE VICINITY OF THE ALAMEDA/SAN JOAQUIN COUNTY LINE, CARNEGIE SVRA.
Lat/Long: 37°37'55" / 121°33'23"
UTM: Zone-10 N4165763 E627386
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1989-05-15
Site: 1989-05-15

Township: 03S
Range: 04E
Section: 32 Qtr XX
Meridian: M
Elevation: 800 ft

Occurrence No. 131 Map Index: 33111
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH OF MOUNTAIN HOUSE CREEK, 2.4 MILES WSW OF MOUNTAIN HOUSE.
Lat/Long: 37°44'01" / 121°36'32"
UTM: Zone-10 N4176950 E622583
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1994-04-27
Site: 1994-04-27

Township: 02S
Range: 03E
Section: 26 Qtr NE
Meridian: M
Elevation: 460 ft

Occurrence No. 132 Map Index: 33112
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: MOUNTAIN HOUSE CREEK, 2.2 MILES WSW OF MOUNTAIN HOUSE.
Lat/Long: 37°44'06" / 121°36'25"
UTM: Zone-10 N4177129 E622755
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1994-04-27
Site: 1994-04-27

Township: 02S
Range: 03E
Section: 26 Qtr NE
Meridian: M
Elevation: 400 ft

RANA AURORA DRAYTONII (cont.)
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 133 — Map Index: 33113
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: MOUNTAIN HOUSE CREEK, 3 MILES WSW OF MOUNTAIN HOUSE.
Lat/Long: 37°43'58" / 121°37'16"
UTM: Zone-10 N4176871 E621509
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1994-04-27
Site: 1994-04-27

Township: 02S
Range: 03E
Section: 26 Qtr NW
Meridian: M
Elevation: 500 ft

Occurrence No. 275 — Map Index: 40431
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, CEDAR MTN. (3712155/445D)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DPR
Location: S SIDE OF MOUNTAIN, 1 MILES S OF TESLA, 1.7 MILES WNW OF MITCHELL SHAFT AT HETCH HETCHY AQUEDUCT.
Lat/Long: 37°37'30" / 121°35'56"
UTM: Zone-10 N4164954 E623626
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 8.3 ac

—Dates Last Seen—
Element: 1998-09-30
Site: 1998-09-30

Township: 03S
Range: 03E
Section: 36 Qtr SW
Meridian: M
Elevation: 1900 ft

ATHENE CUNICULARIA (BURROW SITES)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 47 — Map Index: 10965
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: ON N SIDE OF ALTAMONT PASS, 1.5 MI SW OF MOUNTAIN HOUSE, APPROX 10 MI NE OF LIVERMORE.
Lat/Long: 37°44'50" / 121°35'52"
UTM: Zone-10 N4178481 E623541
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1973-04-30
Site: 1973-04-30

Township: 02S
Range: 03E
Section: 24 Qtr NW
Meridian: M
Elevation: 400 ft

Occurrence No. 48 — Map Index: 11007
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: NEAR MIDWAY, IMMEDIATELY E OF PATTERSON PASS ROAD AND WESTERN PACIFIC RAILROAD JCT.
Lat/Long: 37°42'25" / 121°34'20"
UTM: Zone-10 N4174055 E625858
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1982-12-11
Site: 1982-12-11

Township: 03S
Range: 04E
Section: 06 Qtr NE
Meridian: M
Elevation: 500 ft

Occurrence No. 73 — Map Index: 11037
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: EAST SIDE OF NORTH MIDWAY ROAD, 8 MILES WEST OF TRACY.
Lat/Long: 37°44'40" / 121°34'13"
UTM: Zone-10 N4178213 E625970
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1982-06-27
Site: 1982-06-27

Township: 02S
Range: 04E
Section: 19 Qtr NE
Meridian: M
Elevation: 300 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 171 — Map Index: 23898
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: 1.75 MILES SOUTH OF THE INTERSECTION OF PATTERSON PASS ROAD AND I-580, 5 MILES SW OF TRACY.
Lat/Long: 37°41'36" / 121°31'50"
UTM: Zone-10 N4172598 E629556
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1992-07-03 — Site: 1992-07-03
Township: 03S
Range: 04E
Section: 04 Qtr SE
Meridian: M
Elevation: 700 ft

Occurrence No. 182 — Map Index: 24456
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: WEST SIDE OF MIDWAY ROAD, 0.5 MILE SOUTH OF I-580, 10 MILES SOUTH OF TRACY.
Lat/Long: 37°44'13" / 121°34'06"
UTM: Zone-10 N4177383 E626149
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 19.1 ac
Dates Last Seen — Element: 1992-05-XX — Site: 1992-05-XX
Township: 02S
Range: 04E
Section: 30 Qtr NE
Meridian: M
Elevation: 315 ft

Occurrence No. 202 — Map Index: 24675
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: JUST EAST OF PATTERSON PASS ROAD, 0.3 MILE SOUTH OF I-205, SW OF TRACY.
Lat/Long: 37°44'15" / 121°31'42"
UTM: Zone-10 N4177516 E629663
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1992-09-29 — Site: 1992-09-29
Township: 02S
Range: 04E
Section: 22 Qtr SW
Meridian: M
Elevation: 160 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL

Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 203 Map Index: 24677

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: BETWEEN PATTERSON PASS ROAD AND HANSEN ROAD, 0.6 MILE SOUTH OF I-205, SW OF TRACY.
Lat/Long: 37°43'58" / 121°31'16"
UTM: Zone-10 N4176995 E630310
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-09-29
Site: 1992-09-29

Township: 02S
Range: 04E
Section: 27 Qtr N
Meridian: M
Elevation: 150 ft

Occurrence No. 204 Map Index: 24676

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: BETWEEN PATTERSON PASS ROAD AND HANSEN ROAD, 0.5 MILE SOUTH OF I-205, SW OF TRACY.
Lat/Long: 37°44'05" / 121°31'08"
UTM: Zone-10 N4177210 E630509
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-02-11
Site: 1993-02-11

Township: 02S
Range: 04E
Section: 27 Qtr NE
Meridian: M
Elevation: 140 ft

Occurrence No. 205 Map Index: 24678

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: EAST SIDE OF HANSEN ROAD, 0.5 MILE NORTH OF DELTA MENDOTA CANAL, SW OF TRACY.
Lat/Long: 37°43'34" / 121°30'40"
UTM: Zone-10 N4176256 E631210
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-06
Site: 1993-04-06

Township: 02S
Range: 04E
Section: 26 Qtr SW
Meridian: M
Elevation: 150 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL
Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 260 Map Index: 38275
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH SIDE OF I-580, 0.4 MILE EAST OF GRANT LINE ROAD, 12 MILES EAST OF TRACY.
Lat/Long: 37°44'26" / 121°34'39"
UTM: Zone-10 N4177769 E625339
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 19 Qtr SW
Meridian: M
Elevation: 400 ft

Occurrence No. 261 Map Index: 38277
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: ALTAMONT SPEEDWAY PARKING LOT, SE OF THE INTERSECTION OF I-205 AND I-580, 8 MILES WEST OF TRACY.
Lat/Long: 37°44'26" / 121°33'49"
UTM: Zone-10 N4177792 E626567
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 20 Qtr SW
Meridian: M
Elevation: 300 ft

Occurrence No. 262 Map Index: 38278
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 0.5 MILE WEST OF ALTAMONT SPEEDWAY, EAST OF MIDWAY ROAD, AND JUST SOUTH I-580, WEST OF TRACY
Lat/Long: 37°44'28" / 121°34'12"
UTM: Zone-10 N4177855 E625985
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 19 Qtr SW
Meridian: M
Elevation: 300 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL
Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 263 Map Index: 38279
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: NORTH SIDE OF I-205, JUST NE OF THE DELTA-MENDOTA CANAL WHERE IT CROSSES I-205, 7 MILES WEST OF TRACY.
Lat/Long: 37°44'40" / 121°33'03"
UTM: Zone-10 N4178229 E627685
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 12.7 ac

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 20 Qtr NE
Meridian: M
Elevation: 200 ft

Occurrence No. 264 Map Index: 38284
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: NORTH SIDE OF I-580, 0.4 MILE EAST OF MIDWAY ROAD, NEAR I-580/I-205 SPLIT. 8 MILES WEST OF TRACY.
Lat/Long: 37°44'41" / 121°33'55"
UTM: Zone-10 N4178262 E626395
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1997-10-10
Site: 1997-10-10

Township: 02S
Range: 04E
Section: 20 Qtr NW
Meridian: M
Elevation: 300 ft

AGELAIUS TRICOLOR (NESTING COLONY)
TRICOLORED BLACKBIRD

Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	CDFG Status: SC
State: None	State: S3	

*** SENSITIVE ***

*** SENSITIVE ***

Occurrence No. 235 Map Index: 23077
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1992-06-29
Site: 1992-06-29

Township:
Range:
Section: Qtr
Meridian:
Elevation:

PEROGNATHUS INORNATUS INORNATUS
SAN JOAQUIN POCKET MOUSE — Element Code: AMAFD01061

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2T3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 3 — Map Index: 10990
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, CEDAR MTN. (3712155/445D)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW: 1 MI E TESLA.
Lat/Long: 37°38'15" / 121°34'54"
UTM: Zone-10 N4166337 E625142
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Dates Last Seen — Element: 1939-06-18; Site: 1939-06-18
Township: 03S; Range: 04E; Section: 30 Qtr SW; Meridian: M; Elevation:

Occurrence No. 44 — Map Index: 11232
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TRACY (3712164/444B)*, LONE TREE CREEK (3712154/444C), MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW, 8 MI SW TRACY.
Lat/Long: 37°38'18" / 121°29'24"
UTM: Zone-10 N4166555 E633229
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Dates Last Seen — Element: 1911-03-18; Site: 1911-03-18
Township: 03S; Range: 04E; Section: 25 Qtr W; Meridian: M; Elevation:

Occurrence No. 72 — Map Index: 38740
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CREDO RANCH, 1 MILE SE OF JUNCTION OF I-580, I-205 & MIDWAY ROAD, 0.3 MILE SW OF MILE 10 CALIFORNIA AQUEDUCT.
Lat/Long: 37°44'06" / 121°33'16"
UTM: Zone-10 N4177199 E627382
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1992-04-08; Site: 1992-04-08
Township: 02S; Range: 04E; Section: 29 Qtr NE; Meridian: M; Elevation: 280 ft

Midway Location Summary Report

NEOTOMA FUSCIPES RIPARIA
RIPARIAN (=SAN JOAQUIN VALLEY) WOODRAT — Element Code: AMAFF08081

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G5T1	CDFG Status: SC
State: None	State: S1	

Occurrence No. 1 — Map Index: 11232

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

Dates Last Seen
Element: 1955-10-13
Site: 1955-10-13

Quad Summary: TRACY (3712164/444B)*, LONE TREE CREEK (3712154/444C), MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW CREEK, 4 MI E ALAMEDA CO LINE.
Lat/Long: 37°38'18" / 121°29'24"
UTM: Zone-10 N4166555 E633229
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 03S
Range: 04E
Section: 25 Qtr W
Meridian: M
Elevation:

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX

Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

PHRYNOSOMA CORONATUM FRONTALE
CALIFORNIA HORNED LIZARD — Element Code: ARACF12022

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T3T4	CDFG Status: SC
State: None	State: S3S4	

Occurrence No. 2 — Map Index: 23073
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT-CREDO RANCH
Location: 0.5 MILE EAST OF ALTAMONT SPEEDWAY, JUST NORTH OF I-580.
Lat/Long: 37°44'16" / 121°33'05"
UTM: Zone-10 N4177496 E627648
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1992-04-13 — Site: 1992-04-13
Township: 02S
Range: 04E
Section: 20 Qtr SE
Meridian: M
Elevation: 200 ft

Occurrence No. 3 — Map Index: 23076
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT-YROZ RANCH
Location: 1.6 MILES NORTH OF THE LAWRENCE RADIATION LABORATORY BOUNDARY, 7 MILES WSW OF TRACY.
Lat/Long: 37°42'04" / 121°32'33"
UTM: Zone-10 N4173449 E628500
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1992-06-29 — Site: 1992-06-29
Township: 03S
Range: 04E
Section: 04 Qtr NW
Meridian: M
Elevation: 400 ft

Occurrence No. 29 — Map Index: 39895
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, TRACY (3712164/444B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ~2.5 MILES WEST OF I-580 & CORRAL HOLLOW ROAD JUNCTION, 2.3 MILES SOUTH OF CROSSING OF WESTERN PACIFIC RAILWAY & I-580.
Lat/Long: 37°40'11" / 121°30'01"
UTM: Zone-10 N4170044 E632260
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile
Dates Last Seen — Element: 1990-06-07 — Site: 1990-06-07
Township: 03S
Range: 04E
Section: 14 Qtr SE
Meridian: M
Elevation: 700 ft

MASTICOPHIS FLAGELLUM RUDDOCKI
SAN JOAQUIN WHIPSNAKE

Element Code: ARADB21021

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5T2?	CDFG Status: SC
State: None	State: S2?	

Occurrence No. 20 Map Index: 40665

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UC-BERKELEY
Location: SITE 300, LAWRENCE LIVERMORE NATIONAL LABORATORY, BETWEEN LIVERMORE AND TRACY.
Lat/Long: 37°38'57" / 121°33'12"
UTM: Zone-10 N4167672 E627610
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1998-07-08
Site: 1998-07-08

Township: 03S
Range: 04E
Section: 29 Qtr NE
Meridian: M
Elevation: 1300 ft

VALLEY SINK SCRUB

Element Code: CTT36210CA

Status		NDDB Element Ranks		Other Lists
Federal:	None	Global:	G1	
State:	None	State:	S1.1	

Occurrence No. 24 Map Index: 10933

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: NORTH OF ALTAMONT PASS RD FROM 1.5-3.2 MI EAST OF SUMMIT SCHOOL.
Lat/Long: 37°44'36" / 121°37'28"
UTM: Zone-10 N4178026 E621198
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 32.4 ac

—Dates Last Seen—
Element: 1987-04-14
Site: 1987-04-14

Township: 02S
Range: 03E
Section: 23 Qtr SW
Meridian: M
Elevation: 480 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 5 — Map Index: 11164
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG RAILROAD TRACKS 6.5 MILES WEST OF TRACY. (MAPPED ABOUT 2 MILES EAST OF MIDWAY ON SOUTHERN PACIFIC TRACKS).
Lat/Long: 37°42'53" / 121°31'11"
UTM: Zone-10 N4174989 E630472
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Dates Last Seen — Element: 1908-10-19; Site: 1908-10-19
Township: 02S; Range: 04E; Section: 34 Qtr XX; Meridian: M; Elevation: 240 ft

Occurrence No. 6 — Map Index: 31490
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: ABOUT 0.7 AIRMI N OF TESLA, SOUTH SIDE OF TESLA ROAD, ABOUT 0.6 MI EAST OF SUMMIT.
Lat/Long: 37°38'54" / 121°35'56"
UTM: Zone-10 N4167525 E623595
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1996-10-04; Site: 1996-10-04
Township: 03S; Range: 03E; Section: 25 Qtr NW; Meridian: M; Elevation: 1120 ft

Occurrence No. 7 — Map Index: 31491
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, CEDAR MTN. (3712155/445D)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 1 MILE SOUTHWEST OF TESLA, MOUNT HAMILTON RANGE.
Lat/Long: 37°37'44" / 121°36'46"
UTM: Zone-10 N4165348 E622411
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile

Dates Last Seen — Element: 1932-10-16; Site: 1932-10-16
Township: 03S; Range: 03E; Section: 35 Qtr NE; Meridian: M; Elevation: 1500 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 14 — Map Index: 37337
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1 AIRMI SW OF JOHNSON CAMP, SOUTH SIDE OF TESLA ROAD, 0.2 MI NW OF SUMMIT.
Lat/Long: 37°39'02" / 121°36'22"
UTM: Zone-10 N4167745 E622962
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-10-04
Site: 1996-10-04

Township: 03S
Range: 03E
Section: 23 Qtr SE
Meridian: M
Elevation: 1400 ft

Occurrence No. 15 — Map Index: 37344
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: MIDWAY; BETWEEN MIDWAY ROAD AND POWER SUBSTATION.
Lat/Long: 37°42'38" / 121°33'31"
UTM: Zone-10 N4174465 E627060
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.8 ac

—Dates Last Seen—
Element: 1996-10-04
Site: 1996-10-04

Township: 02S
Range: 04E
Section: 32 Qtr SW
Meridian: M
Elevation: 370 ft

Occurrence No. 16 — Map Index: 37366
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE NATIONAL LAB, SITE 300. FROM 2.5 MI NE TO 3.0 MI ENE OF JCT COUNTY LINE & CORRAL HOLLOW RD ON TOPO.
Lat/Long: 37°38'53" / 121°30'31"
UTM: Zone-10 N4167604 E631572
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 29.1 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 26 Qtr N
Meridian: M
Elevation: 800 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 17 — Map Index: 37453
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. E SIDE ELK RAVINE, 2.25 AIRMI NE OF JCT COUNTY LINE & CORRAL HOLLOW RD ON TOPO.
Lat/Long: 37°39'25" / 121°31'30"
UTM: Zone-10 N4168584 E630118
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 2.2 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 22 Qtr W
Meridian: M
Elevation: 980 ft

Occurrence No. 18 — Map Index: 37455
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LABORATORY, SITE 300. 2.5 MI NE OF JCT COUNTY LINE & CORRAL HOLLOW RD ON TOPO. E SIDE OF ELK RAVINE.
Lat/Long: 37°39'56" / 121°31'52"
UTM: Zone-10 N4169528 E629556
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 8.8 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 16 Qtr SE
Meridian: M
Elevation: 1150 ft

Occurrence No. 19 — Map Index: 37457
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 2.1 MI NNE OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD ON TOPO.
Lat/Long: 37°39'59" / 121°33'05"
UTM: Zone-10 N4169568 E627765
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 17 Qtr SE
Meridian: M
Elevation: 1300 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT
Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 20 Map Index: 37458
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. APPROX. 3.2 MI SE OF MIDWAY.
Lat/Long: 37°40'25" / 121°31'47"
UTM: Zone-10 N4170400 E629669
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 4.5 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 16 Qtr NE
Meridian: M
Elevation: 1200 ft

Occurrence No. 21 Map Index: 37459
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 2 MI NE OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD ON TOPO.
Lat/Long: 37°39'21" / 121°31'49"
UTM: Zone-10 N4168446 E629649
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 21 Qtr SE
Meridian: M
Elevation: 1080 ft

Occurrence No. 22 Map Index: 37465
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 1.6 MI NE OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD ON TOPO.
Lat/Long: 37°39'06" / 121°32'06"
UTM: Zone-10 N4167986 E629236
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 21 Qtr SE
Meridian: M
Elevation: 1340 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 23 — Map Index: 37466
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 1.3-1.6 MI N OF CARNEGIE (SITE).
Lat/Long: 37°38'50" / 121°31'31"
UTM: Zone-10 N4167505 E630092
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 4.8 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 27 Qtr NW
Meridian: M
Elevation: 1200 ft

Occurrence No. 24 — Map Index: 37467
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 2.2 MI ENE OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD ON TOPO.
Lat/Long: 37°38'33" / 121°31'00"
UTM: Zone-10 N4166990 E630864
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 5.4 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 27 Qtr NE
Meridian: M
Elevation: 950 ft

Occurrence No. 25 — Map Index: 37468
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 1.85 MI NE OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD.
Lat/Long: 37°38'32" / 121°31'24"
UTM: Zone-10 N4166952 E630288
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 27 Qtr SW
Meridian: M
Elevation: 1100 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 26 — Map Index: 37469
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 0.7 MI NE OF CARNEGIE (SITE).
Lat/Long: 37°38'11" / 121°31'07"
UTM: Zone-10 N4166307 E630715
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 27 Qtr SE
Meridian: M
Elevation: 920 ft

Occurrence No. 27 — Map Index: 37470
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE LAB, SITE 300. 2.7 MI E OF JCT COUNTY LINE AND CORRAL HOLLOW ROAD.
Lat/Long: 37°38'10" / 121°30'22"
UTM: Zone-10 N4166294 E631813
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 2.7 ac

—Dates Last Seen—
Element: 1996-09-27
Site: 1996-09-27

Township: 03S
Range: 04E
Section: 26 Qtr SW
Meridian: M
Elevation: 650 ft

Occurrence No. 28 — Map Index: 41670
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DPR
Location: CORRAL HOLLOW, 0.5 MILES SSE OF TESLA (SITE), SOUTHWEST OF MIDWAY.
Lat/Long: 37°38'02" / 121°35'53"
UTM: Zone-10 N4165926 E623690
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 3.9 ac

—Dates Last Seen—
Element: 1998-10-13
Site: 1998-10-13

Township: 03S
Range: 03E
Section: 36 Qtr NW
Meridian: M
Elevation: 1650 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 29 — Map Index: 41671

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DPR
Location: CORRAL HOLLOW, ABOUT 0.4 MILE ESE OF TESLA (SITE), SOUTHWEST OF MIDWAY.
Lat/Long: 37°38'19" / 121°35'37"
UTM: Zone-10 N4166465 E624079
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 3.5 ac

—Dates Last Seen—
Element: 1998-10-13
Site: 1998-10-13

Township: 03S
Range: 03E
Section: 25 Qtr SE
Meridian: M
Elevation: 1000 ft

MADIA RADIATA
SHOWY MADIA

Element Code: PDAST650E0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-3-3

Occurrence No. 24 Map Index: 24801

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: CORRAL HOLLOW, MT. HAMILTON RANGE.
Lat/Long: 37°37'48" / 121°32'03"
UTM: Zone-10 N4165562 E629352
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 336.4 ac

—Dates Last Seen—
Element: 1922-04-02
Site: 1922-04-02

Township: 03S
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 600 ft

AMSINCKIA GRANDIFLORA
LARGE-FLOWERED FIDDLENECK — Element Code: PDBOR01050

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CNPS List: 1B
State: Endangered	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 4 — Map Index: 11087
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary: Draney Canyon
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: ABOUT 0.5 MILE EAST OF THE ALAMEDA COUNTY LINE, NORTH SIDE OF CORRAL CANYON AT LAWRENCE LIVERMORE LAB SITE 300.
Lat/Long: 37°38'44" / 121°32'47"
UTM: Zone-10 N4167278 E628241
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1996-04-09
Site: 1996-04-09

Township: 03S
Range: 04E
Section: 28 Qtr NW
Meridian: M
Elevation: 950 ft

Occurrence No. 7 — Map Index: 11043
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Draney Canyon
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: DRANEY CYN, NORTH OF CORRAL HOLLOW, LAWRENCE LIVERMORE NATL LABORATORY.
Lat/Long: 37°39'02" / 121°33'41"
UTM: Zone-10 N4167813 E626909
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1996-04-15
Site: 1996-04-15

Township: 03S
Range: 04E
Section: 20 Qtr SW
Meridian: M
Elevation: 1000 ft

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 1 — Map Index: 11164
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: 2 MI E OF MIDWAY.
Lat/Long: 37°42'53" / 121°31'11"
UTM: Zone-10 N4174989 E630472
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile
Dates Last Seen — Element: 1932-03-20 — Site: 1987-03-XX
Township: 02S — Range: 04E — Section: 34 Qtr XX — Meridian: M — Elevation: 240 ft

Occurrence No. 3 — Map Index: 22136
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: CLIFTON COURT FOREBAY (3712175/463D)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: MOUNTAIN HOUSE, APPROX 5 AIRMI S OF CLIFTON COURT FOREBAY.
Lat/Long: 37°45'18" / 121°34'24"
UTM: Zone-10 N4179376 E625668
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile
Dates Last Seen — Element: 1933-03-17 — Site: 1933-03-17
Township: 02S — Range: 04E — Section: 18 Qtr XX — Meridian: M — Elevation: 200 ft

Occurrence No. 5 — Map Index: 11015
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, CLIFTON COURT FOREBAY (3712175/463D)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ROAD FROM MOUNTAIN HOUSE TO MIDWAY, W OF TRACY.
Lat/Long: 37°44'38" / 121°34'19"
UTM: Zone-10 N4178154 E625820
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile
Dates Last Seen — Element: 1932-03-19 — Site: 1987-03-XX
Township: 02S — Range: 04E — Section: 19 Qtr XX — Meridian: M — Elevation: 300 ft

TROPIDOCARPUM CAPPARIDEUM (cont.)
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 11 — Map Index: 36869

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A), LIVERMORE (3712167/446A), BYRON HOT SPRINGS (3712176/463C), TASSAJARA
SNA Summary: (3712177/464D)
County Summary: ALAMEDA
Owner/Manager: UNKNOWN
Location: BY RAILROAD EAST OF LIVERMORE.
Lat/Long: 37°42'02" / 121°42'55"
UTM: Zone-10 N4173164 E613259
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: 1897-03-XX
Site: 1897-03-XX

Township: 03S
Range: 02E
Section: 02 Qtr XX
Meridian: M
Elevation: 540 ft

ASTRAGALUS TENER VAR FERRISIAE
FERRIS'S MILK-VETCH — Element Code: PDFAB0F8R3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 8 — Map Index: 22136

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: CLIFTON COURT FOREBAY (3712175/463D)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MOUNTAIN HOUSE.
Lat/Long: 37°45'18" / 121°34'24"
UTM: Zone-10 N4179376 E625668
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1884-05-XX
Site: 1884-05-XX

Township: 02S
Range: 04E
Section: 18 Qtr XX
Meridian: M
Elevation: 200 ft

ESCHSCHOLZIA RHOMBIPETALA
DIAMOND-PETALED CALIFORNIA POPPY — Element Code: PDPAP0A0D0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G1	CNPS List: 1A
State: None	State: S1.1	R-E-D Code: *

Occurrence No. 4 — Map Index: 36880

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, MIDWAY (3712165/445A), ALTAMONT (3712166/445B), CLIFTON COURT FOREBAY (3712175/463D),
SNA Summary: WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA, SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: HILLS SOUTH OF BYRON.
Lat/Long: 37°48'17" / 121°38'25"
UTM: Zone-10 N4184813 E619707
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 01S
Range: 03E
Section: 34 Qtr XX
Meridian: M
Elevation: 100 ft

Occurrence No. 6 — Map Index: 37002

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DOE-LAWRENCE LIVERMORE LAB
Location: LAWRENCE LIVERMORE NATIONAL LABORATORY; SITE 300.
Lat/Long: 37°38'22" / 121°33'52"
UTM: Zone-10 N4166588 E626663
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1997-05-06
Site: 1997-05-06

Township: 03S
Range: 04E
Section: 29 Qtr SW
Meridian: M
Elevation: 900 ft

ERIOGONUM TRUNCATUM
MT. DIABLO BUCKWHEAT — Element Code: PDPGN085Z0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 6 — Map Index: 10961
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: HEAD OF CORRAL HOLLOW.
Lat/Long: 37°38'25" / 121°35'42"
UTM: Zone-10 N4166627 E623969
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1940-12-01
Site: 1940-12-01

Township: 03S
Range: 03E
Section: 25 Qtr SE
Meridian: M
Elevation: 880 ft

Occurrence No. 7 — Map Index: 10942
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: NEAR SUMMIT ON ROAD FROM LIVERMORE TO CORRAL HOLLOW.
Lat/Long: 37°38'57" / 121°36'35"
UTM: Zone-10 N4167594 E622648
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1940-12-01
Site: 1987-03-XX

Township: 03S
Range: 03E
Section: 26 Qtr NE
Meridian: M
Elevation: 1600 ft

California Department of Fish and Game
Natural Diversity Data Base

Altamont Location Summary Report

AMBYSTOMA CALIFORNIENSE
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 24 — Map Index: 10737
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 0.3 MI N (BY ROAD) JCT VASCO RD AND U.S. 50 (580).
Lat/Long: 37°42'47" / 121°43'26"
UTM: Zone-10 N4174540 E612479
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1961-01-25
Site: 1961-01-25
Township: 02S
Range: 02E
Section: 35 Qtr SE
Meridian: M
Elevation: 525 ft

Occurrence No. 25 — Map Index: 10742
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG VASCO ROAD, 1.8 MILES NORTH OF I-580, NE OF LIVERMORE.
Lat/Long: 37°44'11" / 121°43'24"
UTM: Zone-10 N4177129 E612493
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1981-11-21
Site: 1981-11-21
Township: 02S
Range: 02E
Section: 26 Qtr NE
Meridian: M
Elevation: 560 ft

Occurrence No. 27 — Map Index: 10724
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 10.8 MI S JCT. CAMINO DIABLO RD ON VASCO RD TO APPROXIMATELY 2.6 MILES FROM HIGHWAY 580 INTERCHANGE IN LIVERMORE.
Lat/Long: 37°45'04" / 121°43'46"
UTM: Zone-10 N4178769 E611923
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 91.6 ac

—Dates Last Seen—
Element: 1982-04-10
Site: 1982-04-10
Township: 02S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 800 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 28 — Map Index: 10879
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: 0.5 MI E ALTAMONT ON ALTAMONT PASS RD, 10 MI W OF TRACY.
Lat/Long: 37°44'47" / 121°39'19"
UTM: Zone-10 N4178323 E618474
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1975-01-30
Site: 1975-01-30

Township: 02S
Range: 03E
Section: 21 Qtr NW
Meridian: M
Elevation: 700 ft

Occurrence No. 39 — Map Index: 10768
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: TESLA RD BETWEEN LAS POSITAS AVE AND GREENVILLE RD; SE LIVERMORE.
Lat/Long: 37°39'55" / 121°42'25"
UTM: Zone-10 N4169247 E614056
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 82.2 ac

—Dates Last Seen—
Element: 1966-01-XX
Site: 1966-01-XX

Township: 03S
Range: 02E
Section: 13 Qtr SW
Meridian: M
Elevation: 680 ft

Occurrence No. 104 — Map Index: 17089
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: ALTAMONT PASS ROAD BTWN GREENVILLE AND NORTH MIDWAY ROAD, AND THE SOUTHERN HALF OF DYER ROAD.
Lat/Long: 37°44'07" / 121°40'11"
UTM: Zone-10 N4177074 E617208
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 732.1 ac

—Dates Last Seen—
Element: 1995-01-26
Site: 1995-01-26

Township: 02S
Range: 03W
Section: 22 Qtr XX
Meridian: M
Elevation: 500 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 105 — Map Index: 17092
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Patterson Reservoir
Owner/Manager: UNKNOWN
Location: ALONG PATTERSON AND SOUTH FLYNN ROADS, EAST OF LIVERMORE.
Lat/Long: 37°41'50" / 121°40'24"
UTM: Zone-10 N4172854 E616958
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 108.3 ac

—Dates Last Seen—
Element: 1989-11-25
Site: 1989-11-25

Township: 03S
Range: 03E
Section: 05 Qtr XX
Meridian: M
Elevation:

Occurrence No. 106 — Map Index: 17093
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Draney Canyon
Owner/Manager: UNKNOWN
Location: ALONG TESLA ROAD AND A SMALL PORTION OF GREENVILLE ROAD, SOUTHEAST OF LIVERMORE.
Lat/Long: 37°39'16" / 121°40'02"
UTM: Zone-10 N4168115 E617570
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 834.4 ac

—Dates Last Seen—
Element: 1989-11-25
Site: 1989-11-25

Township: 03S
Range: 03E
Section: 21 Qtr SW
Meridian: M
Elevation:

Occurrence No. 131 — Map Index: 23822
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1 MILE SOUTH OF THE REDMOND CUT RAILROAD CROSSING OVER I-580 AND MOUNTAIN HOUSE CREEK, 6 MILES EAST OF LIVERMORE.
Lat/Long: 37°42'49" / 121°37'44"
UTM: Zone-10 N4174721 E620862
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 34 Qtr SE
Meridian: M
Elevation: 1100 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 132 — Map Index: 23821
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 0.75 MILE EAST OF THE INTERSECTION OF NORTH FLYNN ROAD AND I-580, 5 MILES EAST OF LIVERMORE.
Lat/Long: 37°42'59" / 121°38'43"
UTM: Zone-10 N4175019 E619391
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-14
Site: 1993-04-14

Township: 02S
Range: 03E
Section: 33 Qtr NE
Meridian: M
Elevation: 1100 ft

Occurrence No. 141 — Map Index: 24123
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: LIVERMORE (3712167/446A)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG WENTE AVENUE, SOUTH OF PLEASANT VIEW LANE, LIVERMORE.
Lat/Long: 37°39'56" / 121°45'01"
UTM: Zone-10 N4169237 E610227
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1993-01-21
Site: 1993-01-21

Township: 03S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 550 ft

Occurrence No. 188 — Map Index: 33751
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: CITY OF LIVERMORE, PVT
Location: SPRINGTOWN, SOUTH OF RAYMOND ROAD AND WEST OF VASCO ROAD, NORTH OF LIVERMORE.
Lat/Long: 37°43'23" / 121°44'13"
UTM: Zone-10 N4175637 E611325
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 478.1 ac

—Dates Last Seen—
Element: 1999-05-14
Site: 1999-05-14

Township: 02S
Range: 02E
Section: 27 Qtr XX
Meridian: M
Elevation: 500 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 208 — Map Index: 25528

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: WEST SIDE OF GREENVILLE ROAD, 0.4 MILE NORTH OF TESLA ROAD, SW OF LAWRENCE LIVERMORE RADIATION LAB.
Lat/Long: 37°40'16" / 121°41'47"
UTM: Zone-10 N4169908 E614959
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1991-04-27
Site: 1991-04-27

Township: 03S
Range: 02E
Section: 13 Qtr SE
Meridian: M
Elevation: 720 ft

RANA AURORA DRAYTONII
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 78 — Map Index: 25006
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: APPROXIMATELY 3 MILES NNE OF THE VASCO ROAD JUNCTION WITH I-580, NE OF LIVERMORE.
Lat/Long: 37°44'47" / 121°42'30"
UTM: Zone-10 N4178243 E613790
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1981-11-21
Site: 1981-11-21

Township: 02S
Range: 02E
Section: 24 Qtr NW
Meridian: M
Elevation: 600 ft

Occurrence No. 79 — Map Index: 25005
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: EAST SIDE OF LAUGHLIN ROAD, 1.7 MILES NORTH OF I-580, NE OF LIVERMORE.
Lat/Long: 37°44'21" / 121°42'41"
UTM: Zone-10 N4177462 E613533
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1981-11-21
Site: 1981-11-21

Township: 02S
Range: 02E
Section: 24 Qtr SW
Meridian: M
Elevation: 625 ft

Occurrence No. 80 — Map Index: 25004
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: JUST OFF VASCO ROAD, 2 MILES NORTH OF I-580, NE OF LIVERMORE.
Lat/Long: 37°44'02" / 121°43'28"
UTM: Zone-10 N4176847 E612391
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1981-11-21
Site: 1981-11-21

Township: 02S
Range: 02E
Section: 26 Qtr N
Meridian: M
Elevation: 575 ft

RANA AURORA DRAYTONII (cont.)
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 81 — Map Index: 20660
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG LAUGHLIN ROAD, 0.5 MILE NORTH OF I-580, NE OF LIVERMORE.
Lat/Long: 37°43'21" / 121°42'30"
UTM: Zone-10 N4175598 E613833
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1981-11-21
Site: 1981-11-21

Township: 02S
Range: 02E
Section: 36 Qtr NW
Meridian: M
Elevation: 550 ft

Occurrence No. 95 — Map Index: 25529
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DWR
Location: DRAINAGE DITCH FROM PATTERSON RESERVOIR, NORTH OF PATTERSON PASS ROAD AND EAST OF GREENVILLE ROAD, NE OF LIVERMORE LAB.
Lat/Long: 37°41'47" / 121°41'03"
UTM: Zone-10 N4172743 E616002
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 29.1 ac

—Dates Last Seen—
Element: 2000-05-19
Site: 2000-05-19

Township: 03S
Range: 03E
Section: 06 Qtr SE
Meridian: M
Elevation: 680 ft

Occurrence No. 256 — Map Index: 39037
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 1 MILE SOUTH OF TESLA ROAD AND 1300 FEET EAST OF GREENVILLE ROAD, SE OF LIVERMORE.
Lat/Long: 37°39'01" / 121°41'28"
UTM: Zone-10 N4167614 E615467
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/10 mile

—Dates Last Seen—
Element: 1997-12-07
Site: 1997-12-07

Township: 03S
Range: 03E
Section: 30 Qtr NW
Meridian: M
Elevation: 820 ft

RANA AURORA DRAYTONII (cont.)
CALIFORNIA RED-LEGGED FROG — Element Code: AAABH01022

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G4T2T3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 268 — Map Index: 40070
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DWR
Location: JUST WEST OF GREENVILLE ROAD AND 0.5 MILE SOUTH OF TESLA ROAD, SE OF LIVERMORE.
Lat/Long: 37°39'29" / 121°41'53"
UTM: Zone-10 N4168495 E614827
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.4 ac

—Dates Last Seen—
Element: 1997-09-18
Site: 1997-09-18

Township: 03S
Range: 02E
Section: 24 Qtr NE
Meridian: M
Elevation: 100 ft

Occurrence No. 387 — Map Index: 43056
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: DWR
Location: 0.2 MILE NNE OF PATTERSON RESERVOIR, EAST OF THE CALIFORNIA AQUEDUCT, NE OF LAWRENCE LIVERMORE LAB.
Lat/Long: 37°42'00" / 121°40'50"
UTM: Zone-10 N4173172 E616316
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 2000-05-19
Site: 2000-05-19

Township: 03S
Range: 03E
Section: 06 Qtr SE
Meridian: M
Elevation: 680 ft

ATHENE CUNICULARIA (BURROW SITES)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 46 — Map Index: 10685
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: UNKNOWN
Location: VICINITY OF DAGNINO ROAD AND RAYMOND ROAD JUNCTION, NE EDGE OF LIVERMORE.
Lat/Long: 37°43'50" / 121°44'45"
UTM: Zone-10 N4176452 E610510
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile
Dates Last Seen — Element: 1982-05-21 — Site: 1982-05-21
Township: 02S
Range: 02E
Section: 27 Qtr W
Meridian: M
Elevation: 530 ft

Occurrence No. 50 — Map Index: 10785
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: FROM INTERSECTION OF TESLA ROAD & GREENVILLE ROAD TO SOUTH END OF GREENVILLE ROAD, SE OF LIVERMORE.
Lat/Long: 37°39'21" / 121°41'42"
UTM: Zone-10 N4168230 E615100
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 108.9 ac
Dates Last Seen — Element: 1979-05-19 — Site: 1979-05-19
Township: 03S
Range: 03E
Section: 19 Qtr E
Meridian: M
Elevation: 100 ft

Occurrence No. 77 — Map Index: 10712
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: UNKNOWN
Location: SPRINGTOWN, IN THE VICINITY OF BLUEBELL DRIVE, NE PART OF LIVERMORE.
Lat/Long: 37°42'52" / 121°44'24"
UTM: Zone-10 N4174671 E611065
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile
Dates Last Seen — Element: 1978-06-03 — Site: 1978-06-03
Township: 02S
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 500 ft

ATHENE CUNICULARIA (BURROW SITES) (cont.)
BURROWING OWL — Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 206 — Map Index: 24679
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: CITY OF LIVERMORE, PVT
Location: SPRINGTOWN ALKALI SINK, 0.7 MILE WEST OF THE INTERSECTION OF VASCO ROAD AND RAYMOND ROAD, LIVERMORE.
Lat/Long: 37°43'37" / 121°44'09"
UTM: Zone-10 N4176058 E611396
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1993-XX-XX
Site: 1993-XX-XX

Township: 02S
Range: 02E
Section: 27 Qtr SE
Meridian: M
Elevation: 510 ft

Occurrence No. 209 — Map Index: 35360
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: JUST NE OF THE INTERSECTION OF DALTON AVENUE AND AMES STREET, LIVERMORE.
Lat/Long: 37°43'40" / 121°43'54"
UTM: Zone-10 N4176150 E611770
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-05-10
Site: 1993-05-10

Township: 02S
Range: 02E
Section: 26 Qtr SW
Meridian: M
Elevation: 500 ft

Altamont Location Summary Report

AGELAIUS TRICOLOR (NESTING COLONY)
TRICOLORED BLACKBIRD — Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	CDFG Status: SC
State: None	State: S3	

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 190 Map Index: 21505

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1992-01-05
Site: 1992-01-05

Township:
Range:
Section: Qtr
Meridian:
Elevation:

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX

Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

VALLEY SINK SCRUB

Element Code: CTT36210CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G1	
State: None	State: S1.1	

Occurrence No. 18 Map Index: 10697

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: CITY OF LIVERMORE
Location: WEST OF BROADMOOR STREET AND SOUTH OF RAYMOND ROAD, NORTHEAST OF LIVERMORE.
Lat/Long: 37°43'30" / 121°44'19"
UTM: Zone-10 N4175847 E611163
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1986-06-05
Site: 1986-06-05

Township: 02S
Range: 02E
Section: 27 Qtr SE
Meridian: M
Elevation: 510 ft

Occurrence No. 24 Map Index: 10933

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A)
County Summary: ALAMEDA
SNA Summary: Redmond Cut
Owner/Manager: UNKNOWN
Location: NORTH OF ALTAMONT PASS RD FROM 1.5-3.2 MI EAST OF SUMMIT SCHOOL.
Lat/Long: 37°44'36" / 121°37'28"
UTM: Zone-10 N4178026 E621198
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 32.4 ac

—Dates Last Seen—
Element: 1987-04-14
Site: 1987-04-14

Township: 02S
Range: 03E
Section: 23 Qtr SW
Meridian: M
Elevation: 480 ft

Altamont Location Summary Report

SYCAMORE ALLUVIAL WOODLAND

Element Code: CTT62100CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G1	
State: None	State: S1.1	

Occurrence No. 14 Map Index: 22693

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MENDENHALL SPRINGS (3712156/445C)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: ARROYO MOCHO, SOUTH OF LIVERMORE. APPROX 2 MI SSW OF LAWRENCE LIVERMORE LAB, ALAMEDA COUNTY.
Lat/Long: 37°39'15" / 121°43'27"
UTM: Zone-10 N4168014 E612542
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 87.4 ac

—Dates Last Seen—
Element: 1992-10-12
Site: 1992-10-12

Township: 03S
Range: 02E
Section: 26 Qtr E
Meridian: M
Elevation: 680 ft

BRANCHINECTA LONGIANTENNA
LONGHORN FAIRY SHRIMP

Element Code: ICBRA03020

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CDFG Status:
State: None	State: S1	

*** SENSITIVE ***

*** SENSITIVE ***

Occurrence No. 3 Map Index: 17236

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1937-XX-XX
Site: 1937-XX-XX

Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

Township:
Range:
Section: Qtr
Meridian:
Elevation:

BRANCHINECTA LYNCHI
VERNAL POOL FAIRY SHRIMP — Element Code: ICBRA03030

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G2G3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 99 — Map Index: 25002
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: CITY OF LIVERMORE, PVT
Location: SPRINGTOWN, SOUTH OF RAYMOND ROAD AND WEST OF VASCO ROAD, NORTH OF LIVERMORE.
Lat/Long: 37°43'22" / 121°44'13"
UTM: Zone-10 N4175598 E611325
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 504.4 ac

—Dates Last Seen—
Element: 1993-XX-XX
Site: 1993-XX-XX

Township: 02S
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 500 ft

Occurrence No. 142 — Map Index: 28335
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: LIVERMORE (3712167/446A)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 0.6 MILE EAST OF HARTFORD AVENUE & NORTH LIVERMORE AVENUE INTERSECTION; 1.3 MILES NORTH OF INTERSTATE 580.
Lat/Long: 37°43'23" / 121°45'28"
UTM: Zone-10 N4175636 E609473
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 64.8 ac

—Dates Last Seen—
Element: 1996-11-27
Site: 1996-11-27

Township: 02S
Range: 02E
Section: 33 Qtr NW
Meridian: M
Elevation: 515 ft

Altamont Location Summary Report

BALSAMORHIZA MACROLEPIS VAR MACROLEPIS
BIG-SCALE BALSAMROOT — Element Code: PDAST11061

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3T2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 13 — Map Index: 37776

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: POPPY RIDGE, ABOUT 1.5 MILES SOUTHEAST OF TESLA ROAD AT GREENVILLE ROAD, SOUTHEAST OF LIVERMORE.
Lat/Long: 37°38'51" / 121°40'52"
UTM: Zone-10 N4167305 E616358
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-04-02
Site: 1993-04-02

Township: 03S
Range: 03E
Section: 30 Qtr NE
Meridian: M
Elevation: 900 ft

Altamont Location Summary Report

PLAGIOBOTHRYS GLABER
HAIRLESS POPCORN-FLOWER — Element Code: PDBOR0V0B0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 5 — Map Index: 28362

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1942-05-03
Site: 1942-05-03

Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: IN FIELD NEAR HIGHWAY 50 (NOW I-580?), 2 MILES EAST OF LIVERMORE STATION.
Lat/Long: 37°41'25" / 121°44'35"
UTM: Zone-10 N4172002 E610814
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 03S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 520 ft

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 11 — Map Index: 36869

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1897-03-XX
Site: 1897-03-XX

Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A), LIVERMORE (3712167/446A), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D)
SNA Summary:
County Summary: ALAMEDA
Owner/Manager: UNKNOWN
Location: BY RAILROAD EAST OF LIVERMORE.
Lat/Long: 37°42'02" / 121°42'55"
UTM: Zone-10 N4173164 E613259
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

Township: 03S
Range: 02E
Section: 02 Qtr XX
Meridian: M
Elevation: 540 ft

Altamont Location Summary Report

ATRIPLEX CORDULATA
HEARTSCALE

Element Code: PDCHE040B0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2?	CNPS List: 1B
State: None	State: S2.2?	R-E-D Code: 2-2-3

Occurrence No. 11 Map Index: 10712

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: UNKNOWN
Location: SPRINGTOWN ALKALI SINK, NORTHEAST OF LIVERMORE.
Lat/Long: 37°42'52" / 121°44'24"
UTM: Zone-10 N4174671 E611065
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile

Township: 02S
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 500 ft

Altamont Location Summary Report

ATRIPLEX JOAQUINIANA
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 1 — Map Index: 20662
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: NE CORNER LIVERMORE VALLEY AND WITHIN ADJACENT CYN. W AND N OF FRICK LAKE ALONG LAUGHLIN ROAD.
Lat/Long: 37°44'50" / 121°42'32"
UTM: Zone-10 N4178364 E613755
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 22.8 ac

—Dates Last Seen—
Element: 1989-04-07
Site: 1989-04-07

Township: 02S
Range: 02E
Section: 24 Qtr W
Meridian: M
Elevation: 600 ft

Occurrence No. 2 — Map Index: 20661
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: CITY OF LIVERMORE
Location: SPRINGTOWN SITE, NORTH END OF LIVERMORE, ABOUT 1/2 MILE SOUTH OF RAYMOND ROAD. "SPRINGVALE" HOUSING DEVELOPMENT.
Lat/Long: 37°43'24" / 121°44'43"
UTM: Zone-10 N4175646 E610574
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 39.8 ac

—Dates Last Seen—
Element: 1991-06-23
Site: 1991-06-23

Township: 02S
Range: 02E
Section: 27 Qtr SW
Meridian: M
Elevation: 500 ft

Occurrence No. 3 — Map Index: 20663
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: DYER ROAD; AT JUNCTION WITH ALTAMONT PASS ROAD.
Lat/Long: 37°44'20" / 121°40'15"
UTM: Zone-10 N4177463 E617104
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 7.4 ac

—Dates Last Seen—
Element: 1987-04-14
Site: 1987-04-14

Township: 02S
Range: 03E
Section: 20 Qtr SW
Meridian: M
Elevation: 750 ft

ATRIPLEX JOAQUINIANA (cont.)
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 4 — Map Index: 20660

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: S OF ALTAMONT CREEK, ABOUT 0.8 MI E OF VASCO ROAD, NE OF SCENIC AVENUE.
Lat/Long: 37°43'21" / 121°42'30"
UTM: Zone-10 N4175598 E613833
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1982-07-21
Site: 1982-07-21

Township: 02S
Range: 02E
Section: 36 Qtr NW
Meridian: M
Elevation: 550 ft

Occurrence No. 33 — Map Index: 24332

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: LIVERMORE, BETWEEN LAUGHLIN ROAD AND VASCO RD, FROM 0.1 MI W OF FRICK LAKE TO 0.8 MI SW OF LAKE.
Lat/Long: 37°43'28" / 121°43'13"
UTM: Zone-10 N4175801 E612769
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 63.5 ac

—Dates Last Seen—
Element: 1994-08-31
Site: 1994-08-31

Township: 02S
Range: 02E
Section: 26 Qtr SE
Meridian: M
Elevation: 530 ft

ATRIPLEX DEPRESSA
BRITTLESCALE

Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 5 Map Index: 28765
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: LIVERMORE, EAST SIDE OF VASCO ROAD, AT JUNCTION WITH RAYMOND ROAD, APPROX 0.6 MILE SOUTHWEST OF FRICK LAKE.
Lat/Long: 37°43'34" / 121°43'12"
UTM: Zone-10 N4175982 E612809
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.4 ac

—Dates Last Seen—
Element: 1992-07-15
Site: 1992-07-15

Township: 02S
Range: 02E
Section: 26 Qtr SE
Meridian: M
Elevation: 530 ft

Occurrence No. 6 Map Index: 24330
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, BYRON HOT SPRINGS (3712176/463C)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 3/4-1 1/4 MI N OF FRICK LAKE, BOTH SIDES OF LAUGHLIN RD.
Lat/Long: 37°45'01" / 121°42'27"
UTM: Zone-10 N4178694 E613856
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.1 ac

—Dates Last Seen—
Element: 1989-05-26
Site: 1989-05-26

Township: 02S
Range: 02E
Section: 24 Qtr NW
Meridian: M
Elevation: 750 ft

Occurrence No. 7 Map Index: 24331
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 0.5 MI N OF FRICK LAKE, 0.6 MI E OF VASCO RD.
Lat/Long: 37°44'24" / 121°42'41"
UTM: Zone-10 N4177558 E613542
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-04-07
Site: 1989-04-07

Township: 02S
Range: 02E
Section: 24 Qtr SW
Meridian: M
Elevation: 600 ft

ATRIPLEX DEPRESSA (cont.)
BRITTLESCALE — Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 27 — Map Index: 10684
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: UNKNOWN
Location: SPRINGTOWN WETLANDS RESERVE, VICINITY OF LIVERMORE, N OF I-580.
Lat/Long: 37°43'12" / 121°44'41"
UTM: Zone-10 N4175281 E610641
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1990-11-08
Site: 1990-11-08

Township: 02S
Range: 02E
Section: 34 Qtr NW
Meridian: M
Elevation: 500 ft

Occurrence No. 28 — Map Index: 25527
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALTAMONT PASS.
Lat/Long: 37°44'31" / 121°39'50"
UTM: Zone-10 N4177823 E617728
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 61.5 ac

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 02S
Range: 03E
Section: 20 Qtr XX
Meridian: M
Elevation: 800 ft

Occurrence No. 54 — Map Index: 35360
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: INTERSECTION OF DALTON AVE AND AMES ST, WEST OF VASCO ROAD AND NORTH OF LIVERMORE.
Lat/Long: 37°43'40" / 121°43'54"
UTM: Zone-10 N4176150 E611770
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1995-08-08
Site: 1995-08-08

Township: 02S
Range: 02E
Section: 26 Qtr SW
Meridian: M
Elevation: 500 ft

ATRIPLEX DEPRESSA (cont.)
BRITTLESCALE — Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 58 — Map Index: 28764

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: LIVERMORE; BOTH SIDES OF GREENVILLE RD, ABOUT 0.5 MI S OF I-580.
Lat/Long: 37°42'38" / 121°41'52"
UTM: Zone-10 N4174304 E614785
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1996-07-16
Site: 1996-07-16

Township: 02S
Range: 02E
Section: 36 Qtr SE
Meridian: M
Elevation: 600 ft

Altamont Location Summary Report

ASTRAGALUS TENER VAR TENER
ALKALI MILK-VETCH
Element Code: PDFAB0F8R1

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2T1	CNPS List: 1B
State: None	State: S1.2	R-E-D Code: 3-2-3

Occurrence No. 8 Map Index: 24680

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: UNKNOWN
Location: EAST END OF LIVERMORE VALLEY.
Lat/Long: 37°42'39" / 121°43'01"
UTM: Zone-10 N4174306 E613085
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1938-04-26
Site: 1938-04-26

Township: 02S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 550 ft

Altamont Location Summary Report

ESCHSCHOLZIA RHOMBIPETALA
DIAMOND-PETALED CALIFORNIA POPPY — Element Code: PDPAP0A0D0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G1	CNPS List: 1A
State: None	State: S1.1	R-E-D Code: *

Occurrence No. 4 — Map Index: 36880

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, MIDWAY (3712165/445A), ALTAMONT (3712166/445B), CLIFTON COURT FOREBAY (3712175/463D),
SNA Summary: WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA, SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: HILLS SOUTH OF BYRON.
Lat/Long: 37°48'17" / 121°38'25"
UTM: Zone-10 N4184813 E619707
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 01S
Range: 03E
Section: 34 Qtr XX
Meridian: M
Elevation: 100 ft

Altamont Location Summary Report

ERIOGONUM TRUNCATUM
MT. DIABLO BUCKWHEAT — Element Code: PDPGN085Z0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 7 — Map Index: 10942

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: MIDWAY (3712165/445A)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: NEAR SUMMIT ON ROAD FROM LIVERMORE TO CORRAL HOLLOW.
Lat/Long: 37°38'57" / 121°36'35"
UTM: Zone-10 N4167594 E622648
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1940-12-01
Site: 1987-03-XX

Township: 03S
Range: 03E
Section: 26 Qtr NE
Meridian: M
Elevation: 1600 ft

CORDYLANTHUS MOLLIS SSP HISPIDUS
HISPID BIRD'S-BEAK — Element Code: PDSCR0J0D1

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2T2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-3-3

Occurrence No. 15 — Map Index: 10713
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Fluctuating
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: PVT, FCC, CITY OF LIVERMORE
Location: SPRINGTOWN WETLANDS RESERVE; LIVERMORE. NEAR RAYMOND RD & VASCO RD.
Lat/Long: 37°43'38" / 121°44'04"
UTM: Zone-10 N4176108 E611536
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 16.6 ac

—Dates Last Seen—
Element: 1993-08-17
Site: 1993-08-17

Township: 02S
Range: 02E
Section: 27 Qtr SE
Meridian: M
Elevation: 510 ft

Occurrence No. 16 — Map Index: 10684
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: PVT, FCC, CITY OF LIVERMORE
Location: SPRINGTOWN WETLANDS RESERVE, BLUEBELL DR AREA, N OF LIVERMORE.
Lat/Long: 37°43'12" / 121°44'41"
UTM: Zone-10 N4175281 E610641
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1986-08-06
Site: 1991-08-25

Township: 02S
Range: 02E
Section: 34 Qtr NW
Meridian: M
Elevation: 500 ft

CORDYLANTHUS PALMATUS
PALMATE-BRACTED BIRD'S-BEAK — Element Code: PDSCR0J0J0

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CNPS List: 1B
State: Endangered	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 10 — Map Index: 10692

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Increasing

—Dates Last Seen—
Element: 1993-XX-XX
Site: 1993-XX-XX

Quad Summary: ALTAMONT (3712166/445B)*, LIVERMORE (3712167/446A)
County Summary: ALAMEDA
SNA Summary: Springtown Wetlands
Owner/Manager: PVT, CITY OF LIVERMORE
Location: SPRINGTOWN WETLANDS RESERVE, APPROX 2.5 MI N OF LIVERMORE, W OF VASCO RD, S OF RAYMOND RD-HARTFORD AVE.
Lat/Long: 37°43'21" / 121°44'13"
UTM: Zone-10 N4175576 E611308
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 358.0 ac

Township: 02S
Range: 02E
Section: 27 Qtr S
Meridian: M
Elevation: 510 ft

California Department of Fish and Game
Natural Diversity Data Base

Brentwood Location Summary Report

AMBYSTOMA CALIFORNIENSE
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 30 — Map Index: 10740
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Stable
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, TASSAJARA (3712177/464D), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: CAMINO DIABLO, VASCO AND MARSH CREEK ROADS.
Lat/Long: 37°49'16" / 121°43'52"
UTM: Zone-10 N4186528 E611691
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 3,012.1 ac

—Dates Last Seen—
Element: 1993-09-25
Site: 1993-09-25

Township: 01S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 400 ft

Occurrence No. 35 — Map Index: 10761
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, JUST EAST OF MARSH CREEK ROAD, NEAR EAST END OF MARSH CREEK RESERVOIR DAM, ~3 MILES SSW OF BRENTWOOD.
Lat/Long: 37°53'19" / 121°43'09"
UTM: Zone-10 N4194036 E612611
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 35 Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 149 — Map Index: 24155
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, BRIONES VALLEY ROAD, NEAR UNNAMED RESERVOIR, ~3 MILES SW OF BRENTWOOD.
Lat/Long: 37°54'24" / 121°44'12"
UTM: Zone-10 N4196029 E611045
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 2.5 ac

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 27 Qtr XX
Meridian: M
Elevation: 180 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 457 — Map Index: 41846
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, JUST WEST OF GAS PUMPING STATION AND CONCORD AVENUE, ~2.5 MILES SW OF BRENTWOOD.
Lat/Long: 37°54'16" / 121°43'23"
UTM: Zone-10 N4195778 E612243
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 26 Qtr XX
Meridian: M
Elevation: 139 ft

Occurrence No. 458 — Map Index: 41847
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, DRY CREEK, ALONG BIONES VALLEY ROAD, 1.2 AIR MILES WSW OF INTERSECTION BRIONES VALLEY ROAD & CONCORD AVE.
Lat/Long: 37°54'18" / 121°44'55"
UTM: Zone-10 N4195828 E609993
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 27 Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 459 — Map Index: 41849
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, 0.5 MILE SOUTH OF JUNCTION OF BRIONES VALLEY ROAD AND CONCORD AVENUE, ~3 MILES SW OF BRENTWOOD.
Lat/Long: 37°54'09" / 121°43'52"
UTM: Zone-10 N4195581 E611554
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 14.7 ac

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 26 Qtr XX
Meridian: M
Elevation: 200 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 460 — Map Index: 41850
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, 0.75 MILE SOUTH OF JUNCTION OF BRIONES VALLEY ROAD AND CONCORD AVENUE, ~3 MILES SW OF BRENTWOOD.
Lat/Long: 37°53'56" / 121°43'58"
UTM: Zone-10 N4195170 E611415
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 27 Qtr XX
Meridian: M
Elevation: 260 ft

Occurrence No. 461 — Map Index: 41851
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, 0.9 MILE SOUTH OF JUNCTION OF BRIONES VALLEY ROAD AND CONCORD AVENUE, ~3 MILES SW OF BRENTWOOD.
Lat/Long: 37°53'50" / 121°43'34"
UTM: Zone-10 N4194986 E611988
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 26 Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 462 — Map Index: 41852
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, BRIONES VALLEY, SW END OF HIGH LEVEL MARSH CREEK RESERVOIR, 0.7 MILE SW OF DAM AND MARSH CREEK ROAD.
Lat/Long: 37°52'59" / 121°43'59"
UTM: Zone-10 N4193414 E611400
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 19.4 ac

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 200 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 463 — Map Index: 41855
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)*, ANTIOCH SOUTH (3712187/464A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, BRIONES VALLEY, 1.6 MILES WEST OF MARSH CREEK RESERVOIR DAM AND MARSH CREEK ROAD, ~4 MILES SW BRENTWOOD.
Lat/Long: 37°53'29" / 121°44'57"
UTM: Zone-10 N4194302 E609964
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 220 ft

Occurrence No. 464 — Map Index: 41854
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, BRIONES VALLEY, 1.2 MILES SW OF MARSH CREEK RESERVOIR DAM AND MARSH CREEK ROAD, ~4 MILES SW BRENTWOOD.
Lat/Long: 37°53'05" / 121°44'33"
UTM: Zone-10 N4193591 E610564
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 465 — Map Index: 41856
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, 0.9 MI NE CAMINO DIABLO & MARSH CREEK RD, 0.8 MILE W OF WALNUT BLVD & PIPELINE, ~3.5 MILES S OF BRENTWOOD.
Lat/Long: 37°52'59" / 121°42'37"
UTM: Zone-10 N4193445 E613402
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 36 Qtr XX
Meridian: M
Elevation: 230 ft

AMBYSTOMA CALIFORNIENSE (cont.)
CALIFORNIA TIGER SALAMANDER — Element Code: AAAAA01147

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G2G3	CDFG Status: SC
State: None	State: S2S3	

Occurrence No. 466 — Map Index: 41857

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: COWELL RANCH, 1.2 MILES NE CAMINO DIABLO & MARSH CREEK ROAD, 0.5 MILE W WALNUT BLVD & PIPELINE, ~3.3 MILES S BRENTWOOD.
Lat/Long: 37°53'02" / 121°42'11"
UTM: Zone-10 N4193525 E614030
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 11.4 ac

—Dates Last Seen—
Element: 1993-09-10
Site: 1993-09-10

Township: 01N
Range: 02E
Section: 36 Qtr XX
Meridian: M
Elevation: 160 ft

BUTEO SWAINSONI (NESTING)
SWAINSON'S HAWK — Element Code: ABNKC19070

Status		NDDB Element Ranks		Other Lists	
Federal:	None	Global:	G4	CDFG Status:	
State:	Threatened	State:	S2		

Occurrence No. 818 — Map Index: 42991

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH SIDE OF SAND CREEK, 0.5 MILE NORTH OF THE END OF SAN JOSE AVENUE, 2.5 MILES WNW OF BRENTWOOD.
Lat/Long: 37°56'47" / 121°44'33"
UTM: Zone-10 N4200416 E610487
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 2000-05-12
Site: 2000-05-12

Township: 01N
Range: 02E
Section: 10 Qtr SE
Meridian: M
Elevation: 135 ft

ATHENE CUNICULARIA (BURROW SITES)
BURROWING OWL

Element Code: ABNSB10010

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T2	CDFG Status: SC
State: None	State: S2	

Occurrence No. 244 Map Index: 33631
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH SIDE OF BALFOUR ROAD, 1.5 MILES WEST OF BRENTWOOD.
Lat/Long: 37°55'30" / 121°44'12"
UTM: Zone-10 N4198049 E611028
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile

—Dates Last Seen—
Element: 1996-12-16
Site: 1996-12-16

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 150 ft

Occurrence No. 338 Map Index: 41890
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 3 MILES WEST OF BRENTWOOD.
Lat/Long: 37°56'22" / 121°44'44"
UTM: Zone-10 N4199650 E610210
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1999-11-09
Site: 1999-11-09

Township: 01N
Range: 02E
Section: 15 Qtr NE
Meridian: M
Elevation: 200 ft

AGELAIUS TRICOLOR (NESTING COLONY)
TRICOLORED BLACKBIRD — Element Code: ABPBXB0020

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	CDFG Status: SC
State: None	State: S3	

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 267 Map Index: 24001
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1989-05-11
Site: 1989-05-11

Township:
Range:
Section: Qtr
Meridian:
Elevation:

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX

Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

CLEMMYS MARMORATA
WESTERN POND TURTLE

Element Code: ARAAD02030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status: SC
State: None	State: S3	

Occurrence No. 131 Map Index: 24001

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: MARSH CREEK RESERVOIR AND THE MOUTH OF MARSH CREEK; EASTERN REGION OF BRIONES VALLEY; SSW OF BRENTWOOD.

Dates Last Seen
Element: 1993-03-08
Site: 1993-03-08

Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

Township:
Range:
Section: Qtr
Meridian:
Elevation:

ALKALI MEADOW

Element Code: CTT45310CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 6 Map Index: 10789

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.
Lat/Long: 37°51'40" / 121°42'19"
UTM: Zone-10 N4190983 E613892
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 180 ft

ALKALI SEEP

Element Code: CTT45320CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 3 Map Index: 10789

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.
Lat/Long: 37°51'40" / 121°42'19"
UTM: Zone-10 N4190983 E613892
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 180 ft

CISMONTANE ALKALI MARSH

Element Code: CTT52310CA

Status		NDDB Element Ranks		Other Lists
Federal:	None	Global:	G1	
State:	None	State:	S1.1	

Occurrence No. 3 Map Index: 10789

Occ Rank:	Unknown	—Dates Last Seen—	
Origin:	Natural/Native occurrence	Element:	1986-06-XX
Presence:	Presumed Extant	Site:	1986-06-XX
Trend:	Unknown		
Quad Summary:	BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)		
County Summary:	CONTRA COSTA		
SNA Summary:	Lower Kellogg Valley		
Owner/Manager:	PVT		
Location:	LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.		
Lat/Long:	37°51'40" / 121°42'19"	Township:	01S
UTM:	Zone-10 N4190983 E613892	Range:	02E
Mapping Precision:	NON-SPECIFIC	Section:	12 Qtr XX
Symbol Type:	POINT	Meridian:	M
Radius:	1 mile	Elevation:	180 ft

BRANCHINECTA LYNCHI
VERNAL POOL FAIRY SHRIMP — Element Code: ICBRA03030

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G2G3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 216 — Map Index: 41673
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: COWELL RANCH, 0.5 MILE NNE OF NORTH END OF MARSH CREEK RES. DAM, 0.5 MILE WEST OF ORCHARD LANE AND MARSH CREEK ROAD.
Lat/Long: 37°53'51" / 121°43'12"
UTM: Zone-10 N4195031 E612524
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 20.7 ac

—Dates Last Seen—
Element: 1997-01-09
Site: 1997-01-09

Township: 01N
Range: 02E
Section: 26 Qtr XX
Meridian: M
Elevation: 140 ft

Occurrence No. 217 — Map Index: 41674
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: COWELL RANCH, 0.6 MILE NNW OF NORTH END OF MARSH CREEK RES. DAM, 1 MILE WNW OF ORCHARD LANE AND MARSH CREEK ROAD.
Lat/Long: 37°54'04" / 121°43'46"
UTM: Zone-10 N4195425 E611700
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.3 ac

—Dates Last Seen—
Element: 1993-03-04
Site: 1993-03-04

Township: 01N
Range: 02E
Section: 26 Qtr XX
Meridian: M
Elevation: 240 ft

Occurrence No. 224 — Map Index: 41966
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: COWELL RANCH, BRIONES VALLEY, 0.8 MILES WEST OF GAGING STATION AT MARSH CREEK RESERVOIR DAM, 3.7 MILES SW OF BRENTWOOD.
Lat/Long: 37°53'30" / 121°44'26"
UTM: Zone-10 N4194342 E610727
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1997-01-09
Site: 1997-01-09

Township: 01N
Range: 02E
Section: 34 Qtr XX
Meridian: M
Elevation: 210 ft

Brentwood Location Summary Report

HYGROTUS CURVIPES
CURVED-FOOT HYGROTUS DIVING BEETLE — Element Code: IICOL38030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G1	CDFG Status:
State: None	State: S1	

Occurrence No. 1 — Map Index: 25566

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)*, JERSEY ISLAND (3812116/480C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: CITY OF OAKLEY
Location: OAKLEY.
Lat/Long: 37°59'46" / 121°42'40"
UTM: Zone-10 N4205970 E613163
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 3/5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 02N
Range: 02E
Section: 25 Qtr NW
Meridian: M
Elevation: 25 ft

LYTTA MOLESTA
MOLESTAN BLISTER BEETLE — Element Code: IICOL4C030

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2	CDFG Status:
State: None	State: S2	

Occurrence No. 3 — Map Index: 10815
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: BRENTWOOD.
Lat/Long: 37°56'10" / 121°41'52"
UTM: Zone-10 N4199320 E614435
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 19XX-XX-XX
Site: 19XX-XX-XX

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 71 ft

Occurrence No. 4 — Map Index: 10706
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)*, ANTIOCH SOUTH (3712187/464A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 3 MILES SOUTHWEST OF BRENTWOOD.
Lat/Long: 37°53'47" / 121°44'30"
UTM: Zone-10 N4194860 E610639
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 19XX-XX-XX
Site: 19XX-XX-XX

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 400 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 8 — Map Index: 31487
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 1.3 MILES WNW OF THE JUNCTION OF MARSH CREEK ROAD AND CAMINO DIABLO, SOUTH OF BRIONES VALLEY.
Lat/Long: 37°52'50" / 121°44'42"
UTM: Zone-10 N4193088 E610380
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 3.7 ac

—Dates Last Seen—
Element: 1994-09-15
Site: 1994-09-15

Township: 01S
Range: 02E
Section: 03 Qtr NW
Meridian: M
Elevation: 250 ft

Occurrence No. 9 — Map Index: 31488
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 0.7 MILE WNW OF THE JUNCTION OF MARSH CREK ROAD AND CAMINO DIABLO, SOUTH OF BRIONES VALLEY.
Lat/Long: 37°52'41" / 121°44'06"
UTM: Zone-10 N4192830 E611256
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 15.1 ac

—Dates Last Seen—
Element: 1994-09-15
Site: 1994-09-15

Township: 01S
Range: 02E
Section: 03 Qtr NE
Meridian: M
Elevation: 300 ft

Occurrence No. 10 — Map Index: 31485
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 0.75 MILE WEST OF THE JUNCTION OF CONCORD ROAD AND BRIONES VALLEY ROAD, ABOUT 3 MILES SOUTHWEST OF BRENTWOOD.
Lat/Long: 37°54'27" / 121°44'24"
UTM: Zone-10 N4196091 E610768
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 18.4 ac

—Dates Last Seen—
Element: 1994-09-15
Site: 1994-09-15

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 200 ft

BLEPHARIZONIA PLUMOSA SSP PLUMOSA (cont.)
BIG TARPLANT — Element Code: PDAST1C011

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 11 — Map Index: 31486

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 0.5 MILE EAST OF MARSH CREEK ROAD AND 0.75 MILE NORTH OF CAMINO DIABLO, EAST OF BRIONES VALLEY.
Lat/Long: 37°53'16" / 121°42'46"
UTM: Zone-10 N4193951 E613186
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 21.2 ac

Dates Last Seen
Element: 1994-09-15
Site: 1994-09-15

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 300 ft

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 6 — Map Index: 10914

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
SNA Summary:
County Summary: CONTRA COSTA
Owner/Manager: PVT
Location: BYRON.
Lat/Long: 37°52'06" / 121°38'11"
UTM: Zone-10 N4191877 E619941
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1889-03-24
Site: 1979-XX-XX

Township: 01S
Range: 03E
Section: 03 Qtr XX
Meridian: M
Elevation: 25 ft

ATRIPLEX JOAQUINIANA
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 43 — Map Index: 28778
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT-COWELL RANCH
Location: E END OF BRIONES VALLEY, ABOUT 0.8 MI WSW OF MARSH CREEK RESERVOIR.
Lat/Long: 37°53'11" / 121°44'32"
UTM: Zone-10 N4193752 E610613
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 16.0 ac

Dates Last Seen:
Element: 1994-08-04
Site: 1994-08-04

Township: 01N
Range: 02E
Section: 34 Qtr SE
Meridian: M
Elevation: 200 ft

Occurrence No. 44 — Map Index: 28777
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT-COWELL RANCH
Location: APPROX. 1.1 MI N OF MARSH CREEK RESERVOIR, 0.5 MI DUE W OF CONCORD AVE CROSSING OF MARSH CREEK.
Lat/Long: 37°54'15" / 121°43'28"
UTM: Zone-10 N4195736 E612147
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen:
Element: 1993-XX-XX
Site: 1993-XX-XX

Township: 01N
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 170 ft

Brentwood Location Summary Report

ESCHSCHOLZIA RHOMBIPETALA
DIAMOND-PETALED CALIFORNIA POPPY — Element Code: PDPAP0A0D0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G1	CNPS List: 1A
State: None	State: S1.1	R-E-D Code: *

Occurrence No. 4 — Map Index: 36880

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, MIDWAY (3712165/445A), ALTAMONT (3712166/445B), CLIFTON COURT FOREBAY (3712175/463D),
SNA Summary: WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA, SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: HILLS SOUTH OF BYRON.
Lat/Long: 37°48'17" / 121°38'25"
UTM: Zone-10 N4184813 E619707
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 01S
Range: 03E
Section: 34 Qtr XX
Meridian: M
Elevation: 100 ft

California Department of Fish and Game
Natural Diversity Data Base

Holt Location Summary Report

BUTEO SWAINSONI (NESTING)
SWAINSON'S HAWK — Element Code: ABNKC19070

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CDFG Status:
State: Threatened	State: S2	

Occurrence No. 308 — Map Index: 17280
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ROBERTS ISLAND, JUST EAST OF INLAND DRIVE, 0.5 MI NORTH OF MACDONALD ROAD, WEST OF STOCKTON.
Lat/Long: 37°57'49" / 121°24'11"
UTM: Zone-10 N4202788 E640278
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1990-05-31
Site: 1990-05-31

Township: 01N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

Occurrence No. 585 — Map Index: 23638
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: STOCKTON WEST (3712183/462A)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SOUTH SIDE OF HWY 4, BETWEEN MAYBECK ROAD AND WOODSBORO ROAD, STOCKTON.
Lat/Long: 37°55'26" / 121°22'13"
UTM: Zone-10 N4198406 E643235
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile

—Dates Last Seen—
Element: 1991-XX-XX
Site: 1991-XX-XX

Township: 01N
Range: 05E
Section: 24 Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 698 — Map Index: 38807
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, 1.3 MILES SE OF UNION POINT, 14 MILES EAST OF BRENTWOOD.
Lat/Long: 37°52'53" / 121°28'03"
UTM: Zone-10 N4193568 E634767
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1998-04-14
Site: 1998-04-14

Township: 01S
Range: 05E
Section: 06 Qtr XX
Meridian: M
Elevation: -5

Holt Location Summary Report

COASTAL AND VALLEY FRESHWATER MARSH

Element Code: CTT52410CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 22 Map Index: 11153

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: ISLANDS IN MIDDLE RIV, E OF BACON, WOODARD & VICTORIA ISLANDS.
Lat/Long: 37°54'52" / 121°30'51"
UTM: Zone-10 N4197173 E630619
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 475.5 ac

—Dates Last Seen—
Element: 1987-09-12
Site: 1987-09-12

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 3 ft

Holt Location Summary Report

LILAEOPSIS MASONII
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 20 — Map Index: 11385

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary: Fourteen Mile Slough
Owner/Manager: UNKNOWN
Location: N SIDE SAN JOAQUIN RIVER AT CONFLUENCE OF FOURTEEN MILE SLOUGH, BETWEEN MORRISON & WALTERS ISLANDS.
Lat/Long: 37°59'48" / 121°25'10"
UTM: Zone-10 N4206418 E638783
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1981-08-28
Site: 1981-08-28

Township: 02N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation:

Holt Location Summary Report

LATHYRUS JEPSONII VAR JEPSONII
DELTA TULE PEA — Element Code: PDFAB250D2

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G5T2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 9 — Map Index: 11519

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: STOCKTON WEST (3712183/462A)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: DOD-NAVY
Location: ROUGH & READY ISLAND.
Lat/Long: 37°57'01" / 121°21'40"
UTM: Zone-10 N4201359 E643995
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1903-XX-XX
Site: 1903-XX-XX

Township: 01N
Range: 06E
Section: XX Qtr XX
Meridian: M
Elevation:

Holt Location Summary Report

HIBISCUS LASIOCARPUS
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 3 — Map Index: 11136
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)*, HOLT (3712184/462B)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ALONG MIDDLE RIVER BETWEEN THE MOKELUMNE AQUEDUCT AND NORTH CANAL, AND ALONG WOODWARD/NORTH VICTORIA CANALS.
Lat/Long: 37°54'33" / 121°30'29"
UTM: Zone-10 N4196586 E631157
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 509.6 ac
Dates Last Seen — Element: 1994-11-09 — Site: 1994-11-09
Township: 01N
Range: 04E
Section: 22 Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 12 — Map Index: 11399
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)*, TERMINOUS (3812114/479C)
County Summary: SAN JOAQUIN
SNA Summary: Fourteen Mile Slough
Owner/Manager: PVT
Location: MORRISON ISL IN SAN JOAQUIN RIV AT FOURTEEN MI SLOUGH, W OF STOCKTON.
Lat/Long: 37°59'51" / 121°24'49"
UTM: Zone-10 N4206519 E639292
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile
Dates Last Seen — Element: 1980-08-28 — Site: 1980-08-28
Township: 02N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation:

Occurrence No. 30 — Map Index: 11339
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TERMINOUS (3812114/479C)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary: Hog Island
Owner/Manager: PVT
Location: S END OF HOG ISLAND, SAN JOAQUIN RIVER.
Lat/Long: 38°00'03" / 121°26'45"
UTM: Zone-10 N4206843 E636459
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 14.0 ac
Dates Last Seen — Element: 1980-08-28 — Site: 1980-08-28
Township: 02N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 15 ft

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 31 — Map Index: 11432
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: TERMINOUS (3812114/479C)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary: Fourteen Mile Slough
Owner/Manager: PVT
Location: FOURTEEN MILE SLOUGH, 2.5 AIR MI E OF HOG ISLAND.
Lat/Long: 38°00'20" / 121°23'42"
UTM: Zone-10 N4207441 E640916
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 109.3 ac
Dates Last Seen — Element: 1980-08-28 — Site: 1980-08-28
Township: 02N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation:

Occurrence No. 75 — Map Index: 11161
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Quad Summary: CLIFTON COURT FOREBAY (3712175/463D)*, HOLT (3712184/462B), WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: ALONG VICTORIA AND NORTH CANAL, NE OF CLIFTON COURT FOREBAY.
Lat/Long: 37°52'32" / 121°31'10"
UTM: Zone-10 N4192847 E630209
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 294.1 ac
Dates Last Seen — Element: 1987-09-12 — Site: 1987-09-12
Township: 01S
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation:

Occurrence No. 81 — Map Index: 11282
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, APPROX 1.25 MI W OF TRACY BLVD BRIDGE.
Lat/Long: 37°53'08" / 121°28'34"
UTM: Zone-10 N4194006 E634008
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile
Dates Last Seen — Element: 1986-07-29 — Site: 1986-07-29
Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 2 ft

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 82 — Map Index: 11324
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, E OF TRACY BRIDGE.
Lat/Long: 37°53'07" / 121°26'52"
UTM: Zone-10 N4194001 E636503
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 42.0 ac

—Dates Last Seen—
Element: 1986-08-05
Site: 1986-08-05

Township: 01N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 3 ft

Occurrence No. 83 — Map Index: 11368
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER S OF THE POCKET, APPROX 2 AIRMI E OF TRACY BLVD BRIDGE.
Lat/Long: 37°53'28" / 121°25'33"
UTM: Zone-10 N4194681 E638425
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 29.9 ac

—Dates Last Seen—
Element: 1986-08-22
Site: 1986-08-22

Township: 02N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 2 ft

Holt Location Summary Report

CAREX COMOSA
BRISTLY SEDGE — Element Code: PMCYP032Y0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CNPS List: 2
State: None	State: S1.1	R-E-D Code: 3-3-1

Occurrence No. 3 — Map Index: 35192

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SAN JOAQUIN DELTA NEAR HOLT.
Lat/Long: 37°56'06" / 121°25'27"
UTM: Zone-10 N4199555 E638487
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1928-09-30
Site: 1928-09-30

Township: 01N
Range: 05E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

ALKALI MEADOW

Element Code: CTT45310CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 2 Map Index: 10829
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, BETW CAMINO DIABLO & VASCO ROAD ABOUT 1 MI SE OF THEIR INTERSECTION.
Lat/Long: 37°51'28" / 121°41'20"
UTM: Zone-10 N4190639 E615339
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 03E
Section: 07 Qtr SW
Meridian: M
Elevation: 200 ft

Occurrence No. 3 Map Index: 10900
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, S OF BRUSHY CREEK.
Lat/Long: 37°48'55" / 121°38'31"
UTM: Zone-10 N4185983 E619538
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 03E
Section: 28 Qtr SW
Meridian: M
Elevation: 140 ft

Occurrence No. 4 Map Index: 10923
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, ABOUT 0.5 MILE WEST OF BYRON HOT SPRINGS ROAD LESS THAN 1MILE NORTH OF CCA/ALA COUNTY LINE.
Lat/Long: 37°48'38" / 121°37'47"
UTM: Zone-10 N4185475 E620621
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 03E
Section: 27 Qtr S
Meridian: M
Elevation: 200 ft

ALKALI MEADOW (cont.)

Element Code: CTT45310CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 5 Map Index: 10917

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary: Holey Road North
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, ABOUT 0.5 MI S OF BYRON HOT SPRINGS, JUST N OF ARMSTRONG RD.
Lat/Long: 37°50'29" / 121°37'59"
UTM: Zone-10 N4188892 E620277
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 03E
Section: 15 Qtr SW
Meridian: M
Elevation: 180 ft

Occurrence No. 6 Map Index: 10789

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.
Lat/Long: 37°51'40" / 121°42'19"
UTM: Zone-10 N4190983 E613892
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 180 ft

ALKALI SEEP

Element Code: CTT45320CA

Status		NDDB Element Ranks		Other Lists
Federal:	None	Global:	G3	
State:	None	State:	S2.1	

Occurrence No. 3 Map Index: 10789

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.
Lat/Long: 37°51'40" / 121°42'19"
UTM: Zone-10 N4190983 E613892
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 180 ft

Byron Hot Springs Location Summary Report

CISMONTANE ALKALI MARSH

Element Code: CTT52310CA

Status		NDDB Element Ranks		Other Lists
Federal:	None	Global:	G1	
State:	None	State:	S1.1	

Occurrence No. 3 Map Index: 10789

—Dates Last Seen—
Element: 1986-06-XX
Site: 1986-06-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, BRENTWOOD (3712186/463B)
County Summary: CONTRA COSTA
SNA Summary: Lower Kellogg Valley
Owner/Manager: PVT
Location: LOS VAQUEROS SITE, KELLOGG CR DRAINAGE.
Lat/Long: 37°51'40" / 121°42'19"
UTM: Zone-10 N4190983 E613892
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 180 ft

BRANCHINECTA LONGIANTENNA
LONGHORN FAIRY SHRIMP — Element Code: ICBRA03020

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CDFG Status:
State: None	State: S1	

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 2 Map Index: 17232
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary: Los Vaqueros
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1982-04-24
Site: 1982-04-24

Township:
Range:
Section: Qtr
Meridian:
Elevation:

*** SENSITIVE *** *** SENSITIVE ***

Occurrence No. 3 Map Index: 17236
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, ALTAMONT (3712166/445B)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager:
Location: *SENSITIVE* Location information suppressed.
Lat/Long: /
UTM:
Mapping Precision:
Symbol Type:
Radius:

—Dates Last Seen—
Element: 1937-XX-XX
Site: 1937-XX-XX

Township:
Range:
Section: Qtr
Meridian:
Elevation:

Byron Hot Springs Location Summary Report

BRANCHINECTA LYNCHI
VERNAL POOL FAIRY SHRIMP — Element Code: ICBRA03030

Status	NDDB Element Ranks	Other Lists
Federal: Threatened	Global: G2G3	CDFG Status:
State: None	State: S2S3	

Occurrence No. 219 — Map Index: 41752

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

Dates Last Seen
Element: 1997-02-10
Site: 1997-02-10

Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D)
County Summary: CONTRA COSTA
Owner/Manager: COUNTY, UNKNOWN
Location: BOUNDED BY ARMSTRONG ROAD ON W & N, AND BYRON HOTS SPRINGS ROAD ON E, 0.6 TO 2.6 MILES S OF BYRON HOT SPRINGS.
Lat/Long: 37°49'26" / 121°37'52"
UTM: Zone-10 N4186953 E620456
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 1,262.3 ac

Township: 01S
Range: 03E
Section: 22 Qtr XX
Meridian: M
Elevation: 100 ft

HYGROTUS CURVIPES
CURVED-FOOT HYGROTUS DIVING BEETLE — Element Code: IICOL38030

Status		NDDB Element Ranks		Other Lists	
Federal:	None	Global:	G1	CDFG Status:	
State:	None	State:	S1		

Occurrence No. 2 — Map Index: 39146

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: SMALL POND, 3.5 MILES NORTH OF BRUSHY PEAK, AND 4.2 MILES SW OF BYRON HOT SPRING, 1.6 MILES EAST OF VASCO ROAD.
Lat/Long: 37°49'06" / 121°41'58"
UTM: Zone-10 N4186238 E614477
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1990-06-28
Site: 1990-06-28

Township: 01S
Range: 02E
Section: 25 Qtr NE
Meridian: M
Elevation: 630 ft

Byron Hot Springs Location Summary Report

LASTHENIA CONJUGENS
CONTRA COSTA GOLDFIELDS — Element Code: PDAST5L040

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G1	CNPS List: 1B
State: None	State: S1.1	R-E-D Code: 3-3-3

Occurrence No. 12 — Map Index: 20684

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary: Holey Road North
Owner/Manager: PVT
Location: BYRON HOT SPRINGS.
Lat/Long: 37°50'55" / 121°37'58"
UTM: Zone-10 N4189690 E620302
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile

—Dates Last Seen—
Element: 1884-04-XX
Site: 1988-XX-XX

Township: 01S
Range: 03E
Section: 15 Qtr NW
Meridian: M
Elevation: 75 ft

Byron Hot Springs Location Summary Report

SENECIO APHANACTIS
RAYLESS RAGWORT — Element Code: PDAST8H060

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3?	CNPS List: 2
State: None	State: S1.2	R-E-D Code: 3-2-1

Occurrence No. 16 — Map Index: 20684

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary: Holey Road North
Owner/Manager: UNKNOWN
Location: EAST OF MT DIABLO, NEAR BYRON HOT SPRINGS.
Lat/Long: 37°50'55" / 121°37'58"
UTM: Zone-10 N4189690 E620302
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile

—Dates Last Seen—
Element: 1888-03-XX
Site: 1888-03-XX

Township: 01S
Range: 03E
Section: 15 Qtr NW
Meridian: M
Elevation: 75 ft

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 6 — Map Index: 10914
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
SNA Summary:
County Summary: CONTRA COSTA
Owner/Manager: PVT
Location: BYRON.
Lat/Long: 37°52'06" / 121°38'11"
UTM: Zone-10 N4191877 E619941
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1889-03-24
Site: 1979-XX-XX

Township: 01S
Range: 03E
Section: 03 Qtr XX
Meridian: M
Elevation: 25 ft

Occurrence No. 7 — Map Index: 10925
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: BYRON HOT SPRINGS.
Lat/Long: 37°50'53" / 121°37'51"
UTM: Zone-10 N4189634 E620462
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1936-03-19
Site: 1981-XX-XX

Township: 01S
Range: 03E
Section: 15 Qtr NE
Meridian: M
Elevation: 60 ft

Occurrence No. 11 — Map Index: 36869
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, MIDWAY (3712165/445A), LIVERMORE (3712167/446A), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D)
SNA Summary:
County Summary: ALAMEDA
Owner/Manager: UNKNOWN
Location: BY RAILROAD EAST OF LIVERMORE.
Lat/Long: 37°42'02" / 121°42'55"
UTM: Zone-10 N4173164 E613259
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: 1897-03-XX
Site: 1897-03-XX

Township: 03S
Range: 02E
Section: 02 Qtr XX
Meridian: M
Elevation: 540 ft

ATRIPLEX CORDULATA
HEARTSCALE — Element Code: PDCHE040B0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2?	CNPS List: 1B
State: None	State: S2.2?	R-E-D Code: 2-2-3

Occurrence No. 48 — Map Index: 31361
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 2.25-2.5 MI SSW OF BYRON HOT SPRINGS, JUST S OF ARMSTRONG ROAD (WHERE RD MAKES SHARP TURN TO THE WEST).
Lat/Long: 37°48'53" / 121°38'33"
UTM: Zone-10 N4185915 E619493
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 12.2 ac

Dates Last Seen:
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: 28 Qtr SE
Meridian: M
Elevation: 100 ft

Occurrence No. 49 — Map Index: 24326
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 0.9 AIRMI NW OF BYRON HOT SPRINGS TO 1.2 AIRMI SW OF BYRON HOT SPRINGS. ALONG DRAINAGE THROUGH SECTION 16.
Lat/Long: 37°50'54" / 121°38'51"
UTM: Zone-10 N4189657 E618989
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 53.8 ac

Dates Last Seen:
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: 16 Qtr NW
Meridian: M
Elevation: 100 ft

Occurrence No. 50 — Map Index: 31358
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: S OF ENTRANCE TO BYRON HOT SPRINGS, W SIDE OF BYRON HOT SPRINGS ROAD, N OF ARMSTRONG ROAD.
Lat/Long: 37°50'35" / 121°37'31"
UTM: Zone-10 N4189073 E620970
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 32.7 ac

Dates Last Seen:
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: 15 Qtr SE
Meridian: M
Elevation: 40 ft

ATRIPLEX CORDULATA (cont.)
HEARTSCALE — Element Code: PDCHE040B0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2?	CNPS List: 1B
State: None	State: S2.2?	R-E-D Code: 2-2-3

Occurrence No. 51 — Map Index: 31359
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: APPROX. 1.9 AIRMI SW OF BYRON HOT SPRINGS. 1.1 AIRMI SW OF 90 DEGREE BEND IN ARMSTRONG ROAD, ON E SIDE OF DIRT ROAD.
Lat/Long: 37°49'39" / 121°39'21"
UTM: Zone-10 N4187318 E618299
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 3.2 ac

—Dates Last Seen—
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: 21 Qtr SW
Meridian: M
Elevation: 120 ft

Occurrence No. 52 — Map Index: 31360
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 2.4 AIRMI SW OF BYRON HOT SPRINGS, ON WEST SIDE OF DIRT ROAD, JUST SOUTH OF WHERE POWERLINE CROSSES OVER DIRT ROAD.
Lat/Long: 37°49'23" / 121°39'46"
UTM: Zone-10 N4186834 E617698
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 3.6 ac

—Dates Last Seen—
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 140 ft

ATRIPLEX JOAQUINIANA
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 5 — Map Index: 20669
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: ABOUT 1 MILE NORTH OF CONTRA COSTA/ALAMEDA COUNTY LINE, ABOUT 0.5 MILE WEST OF BYRON HOT SPRINGS ROAD.
Lat/Long: 37°48'40" / 121°38'04"
UTM: Zone-10 N4185536 E620216
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-04-14
Site: 1989-04-14

Township: 01S
Range: 03E
Section: 27 Qtr SW
Meridian: M
Elevation: 120 ft

Occurrence No. 6 — Map Index: 20668
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: BRUSHY CREEK, W OF ARMSTRONG ROAD.
Lat/Long: 37°49'04" / 121°39'33"
UTM: Zone-10 N4186232 E618027
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-03-30
Site: 1989-03-30

Township: 01S
Range: 03E
Section: 28 Qtr W
Meridian: M
Elevation: 200 ft

Occurrence No. 7 — Map Index: 20667
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: BRUSHY CREEK, 0.8-1.3 AIRMI N OF CONTRA COSTA/ALAMEDA COUNTY LINE.
Lat/Long: 37°48'10" / 121°40'26"
UTM: Zone-10 N4184558 E616735
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 16.6 ac

—Dates Last Seen—
Element: 1989-03-31
Site: 1989-03-31

Township: 01S
Range: 03E
Section: 32 Qtr NW
Meridian: M
Elevation: 300 ft

ATRIPLEX JOAQUINIANA (cont.)
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 8 — Map Index: 20673
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT?
Location: SW OF BYRON HOT SPRINGS, ABOUT 0.4 MILE N OF ARMSTRONG ROAD.
Lat/Long: 37°50'41" / 121°38'27"
UTM: Zone-10 N4189266 E619580
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.9 ac

—Dates Last Seen—
Element: 1989-03-29
Site: 1989-03-29

Township: 01S
Range: 03E
Section: 15 Qtr SW
Meridian: M
Elevation: 90 ft

Occurrence No. 9 — Map Index: 20671
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG ARMSTRONG ROAD, S OF AREA WHERE ROAD BENDS EASTWARD, W OF PIPELINE. CORNER OF AIRPORT PARCEL.
Lat/Long: 37°50'11" / 121°38'25"
UTM: Zone-10 N4188317 E619639
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 8.3 ac

—Dates Last Seen—
Element: 1989-03-30
Site: 1989-03-30

Township: 01S
Range: 03E
Section: 22 Qtr NW
Meridian: M
Elevation: 70 ft

Occurrence No. 10 — Map Index: 20672
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: SOUTH OF BYRON HOT SPRINGS; ALONG HORIZONTAL PORTION OF ARMSTRONG ROAD, ABOUT 0.7 MI E OF PIPELINE ALONG RD.
Lat/Long: 37°50'19" / 121°37'44"
UTM: Zone-10 N4188575 E620654
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 10.8 ac

—Dates Last Seen—
Element: 1989-03-28
Site: 1989-03-28

Township: 01S
Range: 03E
Section: 22 Qtr NE
Meridian: M
Elevation: 50 ft

ATRIPLEX JOAQUINIANA (cont.)
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 11 — Map Index: 20670
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: JUST S OF CURVE ON ARMSTRONG ROAD, ABOUT 0.4 MI S OF OCCURRENCE #9.
Lat/Long: 37°49'45" / 121°38'25"
UTM: Zone-10 N4187537 E619668
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 198X-09-30
Site: 198X-09-30

Township: 01S
Range: 03E
Section: 22 Qtr NW
Meridian: M
Elevation: 100 ft

Occurrence No. 12 — Map Index: 20674
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: LOS VAQUEROS RESERVOIR, ABOUT 2 MI E OF VASCO RD ON THE "VAQUEROS FARMS" PROPERTY. AROUND EDGE OF SPILLWAY 214 ON TOPO.
Lat/Long: 37°50'27" / 121°41'38"
UTM: Zone-10 N4188743 E614932
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 15.7 ac

—Dates Last Seen—
Element: 1988-03-28
Site: 1988-03-28

Township: 01S
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 220 ft

Occurrence No. 13 — Map Index: 20676
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 0.2-0.3 MI E OF VASCO ROAD, S OF CAMINO VAQUEROS ROAD.
Lat/Long: 37°51'23" / 121°41'22"
UTM: Zone-10 N4190497 E615286
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 13.5 ac

—Dates Last Seen—
Element: 1988-03-31
Site: 1988-03-31

Township: 01S
Range: 03E
Section: 07 Qtr SW
Meridian: M
Elevation: 200 ft

ATRIPLEX JOAQUINIANA (cont.)
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 14 — Map Index: 20666
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 0.3 MI E OF BRUSHY CREEK, 0.4 MI N OF CONTRA COSTA/ALAMEDA COUNTY LINE.
Lat/Long: 37°47'45" / 121°40'06"
UTM: Zone-10 N4183793 E617256
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-04-20
Site: 1989-04-20

Township: 01S
Range: 03E
Section: 32 Qtr SW
Meridian: M
Elevation: 450 ft

Occurrence No. 29 — Map Index: 20677
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK WATERSHED; W AND N OF VASCO ROAD.
Lat/Long: 37°51'57" / 121°42'56"
UTM: Zone-10 N4191511 E612989
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 108.9 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 02E
Section: 12 Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 30 — Map Index: 20678
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK WATERSHED; ABOUT 0.9 MI S OF MARSH CREEK ROAD, ABOUT 1.3 MI W OF VASCO ROAD.
Lat/Long: 37°51'41" / 121°43'19"
UTM: Zone-10 N4191012 E612430
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 5.0 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 02E
Section: 11 Qtr NE
Meridian: M
Elevation: 200 ft

ATRIPLEX JOAQUINIANA (cont.)
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 31 — Map Index: 20675
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK WATERSHED, ABOUT 0.7 MI DUE N OF RESERVOIR, ABOUT 0.3 MI E OF VASCO ROAD.
Lat/Long: 37°50'59" / 121°41'24"
UTM: Zone-10 N4189741 E615250
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.4 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 03E
Section: 18 Qtr NW
Meridian: M
Elevation: 200 ft

Occurrence No. 32 — Map Index: 20665
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: ALAMEDA, CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK; 0.1-0.6 MI N OF CONTRA COSTA/ALAMEDA COUNTY LINE, E OF VASCO RD.
Lat/Long: 37°46'36" / 121°43'54"
UTM: Zone-10 N4181578 E611705
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 30.1 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 02S
Range: 02E
Section: XX Qtr XX
Meridian: M
Elevation: 800 ft

ATRIPLEX DEPRESSA
BRITTLESCALE — Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 1 — Map Index: 24326
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 0.9 AIRMI NW OF BYRON HOT SPRINGS TO 1.5 AIRMI SW OF BYRON HOT SPRINGS. ALONG DRAINAGE THROUGH SECTION 16.
Lat/Long: 37°50'54" / 121°38'51"
UTM: Zone-10 N4189657 E618989
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 53.8 ac
Dates Last Seen — Element: 1994-07-08 — Site: 1994-07-08
Township: 01S
Range: 03E
Section: 16 Qtr NW
Meridian: M
Elevation: 100 ft

Occurrence No. 2 — Map Index: 24327
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: ABOUT 0.5 MI SE OF BYRON HOT SPRINGS, 0.3 MI N OF ARMSTRONG RD, 0.4 MI ENE OF OLD WINDMILL.
Lat/Long: 37°50'32" / 121°37'39"
UTM: Zone-10 N4189002 E620762
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 6.7 ac
Dates Last Seen — Element: 1989-06-19 — Site: 1989-06-19
Township: 01S
Range: 03E
Section: 15 Qtr SE
Meridian: M
Elevation: 80 ft

Occurrence No. 3 — Map Index: 24328
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: BYRON AIRPORT, 1 MI SW OF BYRON HOT SPRINGS.
Lat/Long: 37°50'05" / 121°38'22"
UTM: Zone-10 N4188135 E619721
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1989-06-19 — Site: 1989-06-19
Township: 01S
Range: 03E
Section: 22 Qtr NW
Meridian: M
Elevation: 90 ft

ATRIPLEX DEPRESSA (cont.)
BRITTLESCALE — Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 4 — Map Index: 24329
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 2 AIRMI SW OF BYRON HOT SPRINGS, 1.2 MI SW OF RIGHT ANGLE OF ARMSTRONG RD.
Lat/Long: 37°49'40" / 121°39'29"
UTM: Zone-10 N4187361 E618094
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.9 ac

Dates Last Seen:
Element: 1989-06-20
Site: 1989-06-20

Township: 01S
Range: 03E
Section: 21 Qtr SW
Meridian: M
Elevation: 140 ft

Occurrence No. 6 — Map Index: 24330
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: ALTAMONT (3712166/445B)*, BYRON HOT SPRINGS (3712176/463C)
County Summary: ALAMEDA
SNA Summary:
Owner/Manager: PVT
Location: 3/4-1 1/4 MI N OF FRICK LAKE, BOTH SIDES OF LAUGHLIN RD.
Lat/Long: 37°45'01" / 121°42'27"
UTM: Zone-10 N4178694 E613856
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.1 ac

Dates Last Seen:
Element: 1989-05-26
Site: 1989-05-26

Township: 02S
Range: 02E
Section: 24 Qtr NW
Meridian: M
Elevation: 750 ft

Occurrence No. 30 — Map Index: 24686
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK WATERSHED; ABOUT 0.8 MI S OF MARSH CREEK ROAD, 0.2-0.4 MI E OF POWERLINES ON TOPO.
Lat/Long: 37°51'45" / 121°43'17"
UTM: Zone-10 N4191129 E612466
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 11.5 ac

Dates Last Seen:
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 02E
Section: 11 Qtr NE
Meridian: M
Elevation: 200 ft

ATRIPLEX DEPRESSA (cont.)
BRITTLESCALE — Element Code: PDCHE042L0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2Q	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 31 — Map Index: 24687
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: KELLOGG CREEK WATERSHED; 0.5-0.7 MI N OF VASCO ROAD.
Lat/Long: 37°51'20" / 121°42'53"
UTM: Zone-10 N4190364 E613059
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 8.7 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 02E
Section: 11 Qtr SE
Meridian: M
Elevation: 275 ft

Occurrence No. 32 — Map Index: 24684
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: LOS VAQUEROS RESERVOIR, WEST SIDE OF SPILLWAY AND SOUTH OF DAM.
Lat/Long: 37°50'12" / 121°41'16"
UTM: Zone-10 N4188307 E615462
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 5.9 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01S
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 200 ft

Occurrence No. 43 — Map Index: 31361
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: 2.25-2.5 MI SSW OF BYRON HOT SPRINGS, JUST S OF ARMSTRONG ROAD (WHERE RD MAKES SHARP TURN TO THE WEST).
Lat/Long: 37°48'53" / 121°38'33"
UTM: Zone-10 N4185915 E619493
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 12.2 ac

—Dates Last Seen—
Element: 1994-07-08
Site: 1994-07-08

Township: 01S
Range: 03E
Section: 28 Qtr SE
Meridian: M
Elevation: 100 ft

Byron Hot Springs Location Summary Report

ASTRAGALUS TENER VAR TENER
ALKALI MILK-VETCH — Element Code: PDFAB0F8R1

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G2T1	CNPS List: 1B
State: None	State: S1.2	R-E-D Code: 3-2-3

Occurrence No. 9 — Map Index: 24685

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D)
County Summary: CONTRA COSTA
Owner/Manager: UNKNOWN
Location: 3 MILES SOUTH OF BYRON, NEAR BYRON HOT SPRINGS.
Lat/Long: 37°50'13" / 121°37'53"
UTM: Zone-10 N4188402 E620433
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1957-04-04
Site: 1957-04-04

Township: 01S
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 60 ft

Byron Hot Springs Location Summary Report

ESCHSCHOLZIA RHOMBIPETALA
DIAMOND-PETALED CALIFORNIA POPPY — Element Code: PDPAP0A0D0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G1	CNPS List: 1A
State: None	State: S1.1	R-E-D Code: *

Occurrence No. 4 — Map Index: 36880

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, MIDWAY (3712165/445A), ALTAMONT (3712166/445B), CLIFTON COURT FOREBAY (3712175/463D),
SNA Summary: WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA, SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: HILLS SOUTH OF BYRON.
Lat/Long: 37°48'17" / 121°38'25"
UTM: Zone-10 N4184813 E619707
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Township: 01S
Range: 03E
Section: 34 Qtr XX
Meridian: M
Elevation: 100 ft

Byron Hot Springs Location Summary Report

DELPHINIUM RECURVATUM
RECURVED LARKSPUR

Element Code: PDRAN0B1J0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 1-2-3

Occurrence No. 7 Map Index: 10936

Dates Last Seen
Element: 1945-03-23
Site: 1945-03-23

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: CLIFTON COURT FOREBAY (3712175/463D)*, BYRON HOT SPRINGS (3712176/463C)
County Summary: CONTRA COSTA
Owner/Manager: PVT
Location: 0.5 MI W OF TRACY-BYRON RD, ON RD TO BYRON HOT SPRINGS, ABOUT 1.6 MI SSE OF BYRON.
Lat/Long: 37°50'42" / 121°37'25"
UTM: Zone-10 N4189304 E621103
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

Township: 01S
Range: 03E
Section: 15 Qtr XX
Meridian: M
Elevation: 40 ft

California Department of Fish and Game
Natural Diversity Data Base

Woodward Island Location Summary Report

LATERALLUS JAMAICENSIS COTURNICULUS
CALIFORNIA BLACK RAIL — Element Code: ABNME03041

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CDFG Status:
State: Threatened	State: S1	

Occurrence No. 92 — Map Index: 11167
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, APPROX 1.1 MI S OF EMPIRE CUT, 25 FT S OF BACON ISLAND BRIDGE.
Lat/Long: 37°57'15" / 121°31'37"
UTM: Zone-10 N4201547 E629417
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1988-04-27
Site: 1988-04-27

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

Occurrence No. 93 — Map Index: 11165
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: MID-CHANNEL ISLANDS IN MIDDLE (SAN JOAQUIN) RIVER, APPROX 8 MI E OF BRENTWOOD.
Lat/Long: 37°55'50" / 121°31'37"
UTM: Zone-10 N4198927 E629458
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1988-05-26
Site: 1988-05-26

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 94 — Map Index: 11179
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: MID-CHANNEL ISLANDS IN MIDDLE (SAN JOAQUIN) RIVER, 0.25 MI NW OF WOODWARD ISLAND FERRY.
Lat/Long: 37°55'18" / 121°31'15"
UTM: Zone-10 N4197949 E630012
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1988-05-26
Site: 1988-05-26

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

LATERALLUS JAMAICENSIS COTURNICULUS (cont.)
CALIFORNIA BLACK RAIL — Element Code: ABNME03041

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4T1	CDFG Status:
State: Threatened	State: S1	

Occurrence No. 95 — Map Index: 21412 — Dates Last Seen: Element: 1992-06-05; Site: 1992-06-05
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: STATE LANDS
Location: "OLD RIVER" IN-CHANNEL ISLAND, ON THE EAST SIDE OF HOLLAND TRACT, 8 MI NNE OF BYRON.
Lat/Long: 37°59'08" / 121°34'48" — Township: 02N
UTM: Zone-10 N4204955 E624692 — Range: 03E
Mapping Precision: NON-SPECIFIC — Section: XX Qtr XX
Symbol Type: POLYGON — Meridian: M
Area: 385.0 ac — Elevation: 10 ft

Occurrence No. 96 — Map Index: 22552 — Dates Last Seen: Element: 1992-05-13; Site: 1992-05-13
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: STATE
Location: BERM ISLAND IN OLD RIVER, JUST EAST OF PALM TRACT, 4.5 MILES NORTH OF OLD RIVER/HIGHWAY 4 INTERSECTION.
Lat/Long: 37°57'19" / 121°34'05" — Township: 01N
UTM: Zone-10 N4201626 E625814 — Range: 03E
Mapping Precision: NON-SPECIFIC — Section: XX Qtr XX
Symbol Type: POLYGON — Meridian: M
Area: 114.7 ac — Elevation: 0

Occurrence No. 97 — Map Index: 22880 — Dates Last Seen: Element: 1992-05-13; Site: 1992-05-13
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: STATE LANDS
Location: "OLD RIVER" BERM ISLAND, ON THE EAST SIDE OF PALM TRACT AND SOUTH OF FAY ISLAND, 7 MI NNE OF BYRON.
Lat/Long: 37°56'35" / 121°33'37" — Township: 01N
UTM: Zone-10 N4200264 E626504 — Range: 03E
Mapping Precision: NON-SPECIFIC — Section: XX Qtr XX
Symbol Type: POLYGON — Meridian: M
Area: 99.8 ac — Elevation: 0

LATERALLUS JAMAICENSIS COTURNICULUS (cont.)
CALIFORNIA BLACK RAIL — Element Code: ABNME03041

Status		NDDB Element Ranks		Other Lists	
Federal:	None	Global:	G4T1	CDFG Status:	
State:	Threatened	State:	S1		

Occurrence No. 98 — Map Index: 21245

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: STATE
Location: MIDDLE RIVER, JUST WEST OF MILDRED ISLAND, 6.5 MILES NORTH OF MIDDLE RIVER/HIGHWAY 4 INTERSECTION.
Lat/Long: 37°59'02" / 121°31'49"
UTM: Zone-10 N4204849 E629068
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 60.3 ac

—Dates Last Seen—
Element: 1992-04-23
Site: 1992-04-23

Township: 02N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

VULPES MACROTIS MUTICA
SAN JOAQUIN KIT FOX — Element Code: AMAJA03041

Status	NDDB Element Ranks	Other Lists
Federal: Endangered	Global: G4T2T3	CDFG Status:
State: Threatened	State: S2S3	

Occurrence No. 17 — Map Index: 23600

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: 1992-08-92
Site: 1992-08-92

Quad Summary: SOLYO (3712153/444D)*, VOLTA (3712018/403C), INGOMAR (3712028/403B), SAN LUIS DAM (3712111/404D), PACHECO PASS

SNA Summary: (3712112/404C), HOWARD RANCH (3712121/404A), CREVISON PEAK (3712122/404B), NEWMAN (3712131/424D), ORESTIMBA PEAK (3712132/424C), CROWS LANDING (3712141/424A), PATTERSON (3712142/424B), COPPER MTN. (3712143/425A), BRUSH LAKE (3712151/443D), WESTLEY (3712152/443C), LONE TREE CREEK (3712154/444C), CEDAR MTN. (3712155/445D), VERNALIS (3712163/444A), TRACY (3712164/444B), MIDWAY (3712165/445A), ALTAMONT (3712166/445B), LIVERMORE (3712167/446A), DUBLIN (3712168/446B), UNION ISLAND (3712174/462C), CLIFTON COURT FOREBAY (3712175/463D), BYRON HOT SPRINGS (3712176/463C), TASSAJARA (3712177/464D), DIABLO (3712178/464C), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B), ANTIOCH SOUTH (3712187/464A), CLAYTON (3712188/464B)

County Summary: ALAMEDA, CONTRA COSTA, MERCED, SAN JOAQUIN, STANISLAUS

Owner/Manager: UNKNOWN

Location: NORTHWEST SAN JOAQUIN VALLEY; NORTH TO ANTIOCH AND SOUTH TO HIGHWAY 152.

Lat/Long: 37°31'47" / 121°17'33"
UTM: Zone-10 N4154791 E650887
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 374,080.4 ac

Township: 06S
Range: 07E
Section: XX Qtr XX
Meridian: M
Elevation: 700 ft

COASTAL AND VALLEY FRESHWATER MARSH

Element Code: CTT52410CA

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G3	
State: None	State: S2.1	

Occurrence No. 21 Map Index: 11218
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)*, BOULDIN ISLAND (3812115/480D)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT, OTHERS
Location: LATHAM SLOUGH, (3 MI SE OF FRANKS TRACT SRA BETW MCDONALD & MILDRED ISLANDS).
Lat/Long: 37°59'36" / 121°30'34"
UTM: Zone-10 N4205907 E630895
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 192.5 ac

—Dates Last Seen—
Element: 1976-09-XX
Site: 1976-09-XX

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 22 Map Index: 11153
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)*, HOLT (3712184/462B)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: ISLANDS IN MIDDLE RIV, E OF BACON, WOODARD & VICTORIA ISLANDS.
Lat/Long: 37°54'52" / 121°30'51"
UTM: Zone-10 N4197173 E630619
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 475.5 ac

—Dates Last Seen—
Element: 1987-09-12
Site: 1987-09-12

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 3 ft

Occurrence No. 23 Map Index: 11075
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BOULDIN ISLAND (3812115/480D)*, WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: OLD RIVER CHANNEL NEXT TO CONNECTION SLOUGH (ADJ TO LITTLE MANDEVILLE ISL).
Lat/Long: 38°00'11" / 121°34'17"
UTM: Zone-10 N4206914 E625429
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 948.5 ac

—Dates Last Seen—
Element: 1977-01-XX
Site: 1977-01-XX

Township: 02N
Range: 04W
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

LILAEOPSIS MASONII
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 29 — Map Index: 11072
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: IN OLD RIVER, ON SOUTH END OF TULE ISLAND IMMEDIATELY NORTH OF FAY ISLAND.
Lat/Long: 37°57'12" / 121°33'49"
UTM: Zone-10 N4201416 E626204
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 12.7 ac

—Dates Last Seen—
Element: 1989-08-12
Site: 1989-08-12

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 30 — Map Index: 11152
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: PVT
Location: ON TIDAL FLAT IN MIDDLE RIVER, AT THE MOUTH OF EMPIRE CUT.
Lat/Long: 37°58'11" / 121°32'01"
UTM: Zone-10 N4203262 E628807
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1986-08-08
Site: 1986-08-08

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 6 ft

Occurrence No. 47 — Map Index: 11162
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: NORTHEAST EDGE OF WOODWARD ISLAND. MIDDLE RIVER APPROX. 0.3 MILE SOUTH OF JUNCTION WITH MOKELUMNE AQUEDUCT.
Lat/Long: 37°55'59" / 121°31'42"
UTM: Zone-10 N4199203 E629332
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: 1987-09-09
Site: 1987-09-09

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 48 — Map Index: 11198
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: SE EDGE OF WOODWARD ISLAND & ASSOC ISLANDS, MIDDLE RIVER AT JUNCTION W/WOODWARD CANAL.
Lat/Long: 37°55'09" / 121°30'59"
UTM: Zone-10 N4197692 E630399
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 4.1 ac

Dates Last Seen — Element: 1987-09-09; Site: 1987-09-09

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 1 ft

Occurrence No. 49 — Map Index: 11216
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: UNKNOWN
Location: NORTHEAST OF VICTORIA ISLAND ON ISLANDS IN MIDDLE RIVER, APPROX. 0.75 MILES SOUTHEAST OF JUNCTION WITH WOODWARD CANAL.
Lat/Long: 37°54'32" / 121°30'31"
UTM: Zone-10 N4196563 E631102
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 2.8 ac

Dates Last Seen — Element: 1987-09-09; Site: 1987-09-09

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 1 ft

Occurrence No. 50 — Map Index: 11050
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: OLD RIVER, NW EDGE OF VICTORIA ISLAND.
Lat/Long: 37°54'05" / 121°34'02"
UTM: Zone-10 N4195627 E625975
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 10.4 ac

Dates Last Seen — Element: 1987-09-12; Site: 1987-09-12

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 76 — Map Index: 22578
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: OLD RIVER, EASTERN SHORE OF ISLAND APPROX. 0.4 MILE SOUTH OF RHODE ISLAND.
Lat/Long: 37°59'37" / 121°34'35"
UTM: Zone-10 N4205868 E625005
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1989-08-12 — Site: 1989-08-12
Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 77 — Map Index: 22579
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: OLD RIVER, SOUTHERN TIP OF ISLAND APPROX. 0.5 MILE NORTH OF ROCK SLOUGH.
Lat/Long: 37°58'38" / 121°34'44"
UTM: Zone-10 N4204046 E624806
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1989-08-12 — Site: 1989-08-12
Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 78 — Map Index: 22580
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: OLD RIVER, SOUTHWESTERN SHORE OF ISLAND WHICH IS 0.7 MILE NORTHEAST OF INDIAN SLOUGH.
Lat/Long: 37°55'17" / 121°33'23"
UTM: Zone-10 N4197880 E626883
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters
Dates Last Seen — Element: 1989-08-12 — Site: 1989-08-12
Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 103 — Map Index: 23101
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND IN SAND MOUND SLOUGH, 2.2 KM (1.5 MI) NORTH OF ROCK SLOUGH.
Lat/Long: 37°59'55" / 121°37'19"
UTM: Zone-10 N4206361 E620990
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-16
Site: 1992-06-16

Township: 02N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 104 — Map Index: 23102
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: 2 SMALL ISLANDS IN ROCK SLOUGH, ADJACENT TO THE NORTHEAST CORNER OF PALM TRACT.
Lat/Long: 37°58'21" / 121°35'32"
UTM: Zone-10 N4203492 E623656
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.5 ac

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 02N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 105 — Map Index: 23103
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: LONG ISLAND IN ROCK SLOUGH NORTH OF PALM TRACT.
Lat/Long: 37°58'19" / 121°35'07"
UTM: Zone-10 N4203443 E624257
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 106 — Map Index: 23104
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND AT CONFLUENCE OF ROCK SLOUGH AND OLD RIVER, SOUTHWEST CORNER OF HOLLAND TRACT.
Lat/Long: 37°58'24" / 121°34'43"
UTM: Zone-10 N4203607 E624847
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1992-06-09; Site: 1992-06-09
Township: 02N; Range: 04E; Section: XX Qtr XX; Meridian: M; Elevation: 0

Occurrence No. 107 — Map Index: 23100
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: SMALL ISLAND AT CONFLUENCE OF 2 UNNAMED SLOUGHS, SOUTHEAST CORNER OF VEALE TRACT.
Lat/Long: 37°57'15" / 121°36'24"
UTM: Zone-10 N4201426 E622419
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1992-06-09; Site: 1992-06-09
Township: 01N; Range: 03E; Section: XX Qtr XX; Meridian: M; Elevation: 0

Occurrence No. 108 — Map Index: 23099
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: SPIT OF LAND ALONG UNNAMED SLOUGH WEST OF WERNER.
Lat/Long: 37°56'25" / 121°36'37"
UTM: Zone-10 N4199895 E622107
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1992-06-09; Site: 1992-06-09
Township: 01N; Range: 03E; Section: XX Qtr XX; Meridian: M; Elevation: 0

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 109 — Map Index: 23105
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND IN OLD RIVER IMMEDIATELY SOUTH OF FAY ISLAND.
Lat/Long: 37°56'46" / 121°33'36"
UTM: Zone-10 N4200604 E626520
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 110 — Map Index: 23106
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND IN OLD RIVER, 0.6 KM (0.4 MI) SOUTH OF MOKELUMNE AQUEDUCT.
Lat/Long: 37°55'56" / 121°33'24"
UTM: Zone-10 N4199086 E626843
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 111 — Map Index: 23107
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SMALL NARROW ISLAND IN OLD RIVER, 1.2 KM (0.7 MI) SOUTH OF MOKELUMNE AQUEDUCT.
Lat/Long: 37°55'36" / 121°33'30"
UTM: Zone-10 N4198453 E626708
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-05-20
Site: 1992-05-20

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

LILAEOPSIS MASONII (cont.)
MASON'S LILAEOPSIS — Element Code: PDAPI19030

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G3	CNPS List: 1B
State: Rare	State: S3.2	R-E-D Code: 2-2-3

Occurrence No. 112 — Map Index: 23108

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: SMALL NARROW ISLAND IN OLD RIVER JUST NORTH OF CONFLUENCE OF INDIAN SLOUGH.
Lat/Long: 37°55'13" / 121°33'38"
UTM: Zone-10 N4197730 E626531
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-08
Site: 1992-06-08

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

ASTER LENTUS
SUISUN MARSH ASTER — Element Code: PDAST0T540

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 13 — Map Index: 11018
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: NEAR CONFLUENCE OF ROCK SLOUGH AND OLD RIVER.
Lat/Long: 37°58'31" / 121°34'36"
UTM: Zone-10 N4203821 E625010
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 2.6 ac

—Dates Last Seen—
Element: 1989-08-12
Site: 1989-08-12

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

Occurrence No. 39 — Map Index: 21861
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary: Old River Islands
Owner/Manager: UNKNOWN
Location: OLD RIVER, APPROX. 0.3 MILE NE OF HOLLAND TRACT GAUGING STATION.
Lat/Long: 37°59'39" / 121°34'35"
UTM: Zone-10 N4205903 E625005
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-08-12
Site: 1989-08-12

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 0

TROPIDOCARPUM CAPPARIDEUM
CAPER-FRUITED TROPIDOCARPUM — Element Code: PDBRA2R010

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: GH	CNPS List: 1A
State: None	State: SH	R-E-D Code: *

Occurrence No. 6 — Map Index: 10914
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, CLIFTON COURT FOREBAY (3712175/463D), WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
SNA Summary:
County Summary: CONTRA COSTA
Owner/Manager: PVT
Location: BYRON.
Lat/Long: 37°52'06" / 121°38'11"
UTM: Zone-10 N4191877 E619941
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1 mile

—Dates Last Seen—
Element: 1889-03-24
Site: 1979-XX-XX

Township: 01S
Range: 03E
Section: 03 Qtr XX
Meridian: M
Elevation: 25 ft

Occurrence No. 9 — Map Index: 11042
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: HWY 4 AT OLD RIVER.
Lat/Long: 37°53'29" / 121°34'13"
UTM: Zone-10 N4194522 E625717
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 1/5 mile

—Dates Last Seen—
Element: XXXX-XX-XX
Site: 1981-XX-XX

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 5 ft

ATRIPLEX JOAQUINIANA
SAN JOAQUIN SALTBUSH — Element Code: PDCHE041F3

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G2	CNPS List: 1B
State: None	State: S2.1	R-E-D Code: 2-2-3

Occurrence No. 47 — Map Index: 28781

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: BETWEEN POINT OF TIMBER ROAD AND STATE ROUTE 4; 0.8-1.0 MI N OF JCT SR 4 AND BIXLER RD.
Lat/Long: 37°54'08" / 121°37'15"
UTM: Zone-10 N4195664 E621260
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 6.5 ac

—Dates Last Seen—
Element: 1994-08-07
Site: 1994-08-07

Township: 01N
Range: 03E
Section: 26 Qtr SW
Meridian: M
Elevation: 10 ft

LATHYRUS JEPSONII VAR JEPSONII
DELTA TULE PEA — Element Code: PDFAB250D2

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G5T2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 16 — Map Index: 11166
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: PVT
Location: EAST BANK OF TULE ISLAND IN MIDDLE RIVER, HALF WAY BETWEEN EMPIRE CUT AND BACON ISLAND BRIDGE.
Lat/Long: 37°57'36" / 121°31'44"
UTM: Zone-10 N4202201 E629235
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1987-09-09 — Site: 1987-09-09
Township: 01N — Range: 04E — Section: XX Qtr XX — Meridian: M — Elevation: 12 ft

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Occurrence No. 43 — Map Index: 25053
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MARSHY AREA IN MIDDLE RIVER, 1 KM (0.6 MI) SOUTHEAST OF NORTH VICTORIA CANAL.
Lat/Long: 37°54'28" / 121°30'39"
UTM: Zone-10 N4196431 E630921
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1987-10-18 — Site: 1987-10-18
Township: 01N — Range: 04E — Section: XX Qtr XX — Meridian: M — Elevation: 0

Occurrence No. 44 — Map Index: 25052
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, SHORE OF UPPER JONES TRACT OPPOSITE THE MOUTH OF NORTH VICTORIA CANAL
Lat/Long: 37°54'51" / 121°30'44"
UTM: Zone-10 N4197134 E630771
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

Dates Last Seen — Element: 1987-10-18 — Site: 1987-10-18
Township: 01N — Range: 04E — Section: XX Qtr XX — Meridian: M — Elevation: 0

LATHYRUS JEPSONII VAR JEPSONII (cont.)
DELTA TULE PEA — Element Code: PDFAB250D2

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G5T2	CNPS List: 1B
State: None	State: S2.2	R-E-D Code: 2-2-3

Occurrence No. 45 — Map Index: 25051
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, 200 M SOUTHEAST OF WOODWARD ISLAND FERRY ALONG THE SHORE OF UPPER JONES TRACT.
Lat/Long: 37°55'09" / 121°30'49"
UTM: Zone-10 N4197674 E630646
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1987-18-10
Site: 1987-10-18

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 46 — Map Index: 25050
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER, NORTH SHORE OF ISLAND LOCATED 1 KM (0.6 MI) SOUTH OF THE ATCHISON, TOPEKA, AND SANTA FE RAILROAD TRACKS.
Lat/Long: 37°55'50" / 121°31'46"
UTM: Zone-10 N4198938 E629228
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1987-10-18
Site: 1987-10-18

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Woodward Island Location Summary Report

SCUTELLARIA GALERICULATA
MARSH SKULLCAP — Element Code: PDLAM1U0J0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G5	CNPS List: 2
State: None	State: S2.2?	R-E-D Code: 2-2-1

Occurrence No. 1 — Map Index: 28054

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: MIDDLE RIVER BETWEEN VICTORIA ISLAND AND UPPER JONES TRACT.
Lat/Long: 37°54'28" / 121°30'35"
UTM: Zone-10 N4196431 E631023
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 2/5 mile

Dates Last Seen
Element: 1978-08-22
Site: 1978-08-22

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

HIBISCUS LASIOCARPUS
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 1 — Map Index: 10974
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: NEAR CONFLUENCE INDIAN SLOUGH & WERNER DREDGER CUT, N OF DISCOVERY BAY DEVELOPMENT.
Lat/Long: 37°55'02" / 121°35'56"
UTM: Zone-10 N4197344 E623150
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 38.0 ac
Dates Last Seen — Element: 1980-09-07 — Site: 1980-09-07
Township: 01N
Range: 03E
Section: 24 Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 2 — Map Index: 10989
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: INDIAN SLOUGH AT WEST END OF SAINT MARY'S BAY, ALONG THE NORTHWEST LEVEE BANK.
Lat/Long: 37°55'14" / 121°35'28"
UTM: Zone-10 N4197730 E623840
Mapping Precision: NON-SPECIFIC
Symbol Type: POLYGON
Area: 21.2 ac
Dates Last Seen — Element: 1980-09-07 — Site: 1980-09-07
Township: 01N
Range: 03E
Section: 24 Qtr NE
Meridian: M
Elevation: 0

Occurrence No. 3 — Map Index: 11136
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)*, HOLT (3712184/462B)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: ALONG MIDDLE RIVER BETWEEN THE MOKELUMNE AQUEDUCT AND NORTH CANAL, AND ALONG WOODWARD/NORTH VICTORIA CANALS.
Lat/Long: 37°54'33" / 121°30'29"
UTM: Zone-10 N4196586 E631157
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 509.6 ac
Dates Last Seen — Element: 1994-11-09 — Site: 1994-11-09
Township: 01N
Range: 04E
Section: 22 Qtr XX
Meridian: M
Elevation: 0

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 4 — Map Index: 25056
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: PVT
Location: ALONG OLD RIVER AT THE HWY 4 BRIDGE CROSSING, W SHORE ABOUT 75 YDS W OF BRIDGE.
Lat/Long: 37°53'29" / 121°34'13"
UTM: Zone-10 N4194515 E625726
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1980-09-07
Site: 1980-09-07

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 14 — Map Index: 11170
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: PVT
Location: MIDDLE RIVER FROM MOKELUMNE AQUEDUCT NORTH TO ABOUT 0.5 MI SOUTH OF EMPIRE CUT.
Lat/Long: 37°57'08" / 121°31'30"
UTM: Zone-10 N4201337 E629589
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 147.1 ac

—Dates Last Seen—
Element: 1988-XX-XX
Site: 1988-XX-XX

Township: 01N
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation:

Occurrence No. 15 — Map Index: 11169
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: PVT
Location: 0.4 MI WSW OF MILDRED ISL FERRY. BETW BACON ISL, LOWER JONESTRACT & MILDRED ISL.
Lat/Long: 37°58'12" / 121°31'34"
UTM: Zone-10 N4203313 E629459
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 14.5 ac

—Dates Last Seen—
Element: 1980-08-28
Site: 1980-08-28

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 16 — Map Index: 11210
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: CONFLUENCE OF EMPIRE CUT & LATHAM SLOUGH.
Lat/Long: 37°58'21" / 121°30'39"
UTM: Zone-10 N4203615 E630808
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1980-08-28
Site: 1980-08-28

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

Occurrence No. 17 — Map Index: 11209
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: PVT
Location: LATHAM SLOUGH ABOUT 0.5 MI N OF CONFLUENCE W/ EMPIRE CUT.
Lat/Long: 37°58'43" / 121°30'44"
UTM: Zone-10 N4204286 E630670
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1980-08-28
Site: 1980-08-28

Township: 02N
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 10 ft

Occurrence No. 18 — Map Index: 11086
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: OLD RIVER ABOUT 0.7 AIR MILE ENE OF CONFLUENCE WITH INDIAN SLOUGH.
Lat/Long: 37°55'16" / 121°33'17"
UTM: Zone-10 N4197845 E627031
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 23.5 ac

—Dates Last Seen—
Element: 1992-07-24
Site: 1992-07-24

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 19 — Map Index: 11088
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: OLD RIVER ONE AIR MILE NORTHEAST OF CONFLUENCE WITH INDIAN SLOUGH.
Lat/Long: 37°55'56" / 121°33'26"
UTM: Zone-10 N4199072 E626800
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 22.2 ac

—Dates Last Seen—
Element: 1992-05-20
Site: 1992-05-20

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 20 — Map Index: 11077
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: UNKNOWN, PVT
Location: OLD RIVER JUST NORTH OF MOKELUMNE AQUEDUCT, SOUTH OF FAY ISLAND.
Lat/Long: 37°56'34" / 121°33'40"
UTM: Zone-10 N4200224 E626429
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 58.2 ac

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 21 — Map Index: 11065
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: UNKNOWN, PVT
Location: OLD RIVER, JUST NORTH OF FAY ISLAND.
Lat/Long: 37°57'17" / 121°34'05"
UTM: Zone-10 N4201552 E625795
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 30.2 ac

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 22 — Map Index: 11030
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: OLD RIVER, JUST NORTH OF CONFLUENCE WITH ROCK SLOUGH.
Lat/Long: 37°58'42" / 121°34'33"
UTM: Zone-10 N4204156 E625079
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 56.5 ac

—Dates Last Seen—
Element: 1989-08-12
Site: 1989-08-12

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 23 — Map Index: 11029
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary: Old River Islands
Owner/Manager: UNKNOWN, PVT, STATE LANDS
Location: OLD RIVER JUST SOUTH OF RHODE ISLAND.
Lat/Long: 37°59'29" / 121°34'38"
UTM: Zone-10 N4205613 E624928
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 69.9 ac

—Dates Last Seen—
Element: 1992-06-05
Site: 1992-06-05

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 34 — Map Index: 11026
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: BOULDIN ISLAND (3812115/480D)*, WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary: Old River Islands
Owner/Manager: PVT
Location: RHODE ISLAND, W SIDE, BETW HOLLAND TRACT & BACON ISLAND.
Lat/Long: 38°00'02" / 121°34'43"
UTM: Zone-10 N4206618 E624809
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1980-08-28
Site: 1980-08-28

Township: 99X
Range: 99X
Section: XX Qtr XX
Meridian: M
Elevation: 20 ft

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW — Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 75 — Map Index: 11161
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Quad Summary: CLIFTON COURT FOREBAY (3712175/463D)*, HOLT (3712184/462B), WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: ALONG VICTORIA AND NORTH CANAL, NE OF CLIFTON COURT FOREBAY.
Lat/Long: 37°52'32" / 121°31'10"
UTM: Zone-10 N4192847 E630209
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 294.1 ac

—Dates Last Seen—
Element: 1987-09-12
Site: 1987-09-12

Township: 01S
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation:

Occurrence No. 93 — Map Index: 23101
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND IN SANDMOUND SLOUGH, 2.2 KM (1.5 MI) NORTH OF ROCK SLOUGH.
Lat/Long: 37°59'55" / 121°37'19"
UTM: Zone-10 N4206361 E620990
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-16
Site: 1992-06-16

Township: 02N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 94 — Map Index: 23103
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: LONG ISLAND IN ROCK SLOUGH NORTH OF PALM TRACT.
Lat/Long: 37°58'19" / 121°35'07"
UTM: Zone-10 N4203443 E624257
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

HIBISCUS LASIOCARPUS (cont.)
ROSE-MALLOW
Element Code: PDMAL0H0Q0

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4	CNPS List: 2
State: None	State: S2.2	R-E-D Code: 2-2-1

Occurrence No. 95 Map Index: 25054
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA
SNA Summary:
Owner/Manager: UNKNOWN
Location: ISLAND IN UNNAMED SLOUGH JUST NORTH OF WERNER.
Lat/Long: 37°56'34" / 121°36'32"
UTM: Zone-10 N4200187 E622233
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1992-06-09
Site: 1992-06-09

Township: 01N
Range: 03E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 96 Map Index: 25055
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: WEST SHORE OF BACON ISLAND ALONG OLD RIVER, ABOUT 3.5 KM (2 MI) NORTH OF THE ATCHISON TOPEKA & SANTA FE RAILROAD TRACKS.
Lat/Long: 37°58'14" / 121°34'15"
UTM: Zone-10 N4203297 E625525
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1989-08-12
Site: 1989-08-12

Township: 01N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 0

Occurrence No. 124 Map Index: 37632
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: CONTRA COSTA, SAN JOAQUIN
SNA Summary:
Owner/Manager: UNKNOWN
Location: NORTHWEST SIDE OF VICTORIA ISLAND ALONG OLD RIVER, ABOUT 1 MILE NORTH OF HIGHWAY 4.
Lat/Long: 37°54'16" / 121°34'14"
UTM: Zone-10 N4195961 E625680
Mapping Precision: SPECIFIC
Symbol Type: POLYGON
Area: 9.4 ac

—Dates Last Seen—
Element: 1994-11-09
Site: 1994-11-09

Township: 01N
Range: 04E
Section: 30 Qtr XX
Meridian: M
Elevation: 0

Woodward Island Location Summary Report

ESCHSCHOLZIA RHOMBIPETALA
DIAMOND-PETALED CALIFORNIA POPPY — Element Code: PDPAP0A0D0

Status	NDDB Element Ranks	Other Lists
Federal: Species of Concern	Global: G1	CNPS List: 1A
State: None	State: S1.1	R-E-D Code: *

Occurrence No. 4 — Map Index: 36880

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown

—Dates Last Seen—
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Quad Summary: BYRON HOT SPRINGS (3712176/463C)*, MIDWAY (3712165/445A), ALTAMONT (3712166/445B), CLIFTON COURT FOREBAY (3712175/463D),
SNA Summary: WOODWARD ISLAND (3712185/463A), BRENTWOOD (3712186/463B)
County Summary: ALAMEDA, CONTRA COSTA, SAN JOAQUIN
Owner/Manager: UNKNOWN
Location: HILLS SOUTH OF BYRON.
Lat/Long: 37°48'17" / 121°38'25"
UTM: Zone-10 N4184813 E619707
Mapping Precision: NON-SPECIFIC
Symbol Type: POINT
Radius: 5 mile

Township: 01S
Range: 03E
Section: 34 Qtr XX
Meridian: M
Elevation: 100 ft

Woodward Island Location Summary Report

LIMOSELLA SUBULATA
DELTA MUDWORT

Element Code: PDSCR10050

Status	NDDB Element Ranks	Other Lists
Federal: None	Global: G4?	CNPS List: 2
State: None	State: S2.1	R-E-D Code: 2-3-1

Occurrence No. 1 Map Index: 11152

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Quad Summary: WOODWARD ISLAND (3712185/463A)
County Summary: SAN JOAQUIN
SNA Summary: Middle River Islands
Owner/Manager: PVT
Location: TIDAL FLAT; IN MIDDLE RIVER, AT THE MOUTH OF EMPIRE CUT IN THE DELTA.
Lat/Long: 37°58'11" / 121°32'01"
UTM: Zone-10 N4203262 E628807
Mapping Precision: SPECIFIC
Symbol Type: POINT
Radius: 80 meters

—Dates Last Seen—
Element: 1986-08-08
Site: 1986-08-08

Township: 02N
Range: 04E
Section: XX Qtr XX
Meridian: M
Elevation: 6 ft

Appendix 8.2B
California Native Plant Society List of Special-Status Plant Species for EAEC Project Area

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Altamont Quad

AMSINCKIA LUNARIS
"bent-flowered fiddleneck" Family: Boraginaceae

Life Form: Annual herb Blooms: March-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, Colusa, Lake, Marin, Napa, Santa Cruz, Shasta[?],Siskiyou [?], San Mateo, Sonoma

Quads: Davenport (408C), Ano Nuevo (409D), Altamont (445B), San Francisco South (448B), Montara Mountain (448C), San Mateo (448D), Briones Valley (465B), Oakland East (465C), Las Trampas Ridge (465D), San Geronimo (484C), Point Reyes NE (485A), Tomales (485B), Santa Rosa (501B), Aetna Springs (516B), Whispering Pines (533C), Middletown (533D), Highland Springs (534B), Leesville (547B), Wilbur Springs (547C), Hough Springs (548A), Upper Lake (549B), Lakeport (549C), St. John Mtn. (564B)

Habitat: Coastal bluff scrub, Cismontane woodland, Valley and foothill grassland

Elevation: 3-500 m.

Notes: Many collections old; current status information needed. Does plant occur in SHA and SIS counties? Threatened by development.

ASTRAGALUS TENER VAR. TENER
"alkali milk-vetch" Family: Fabaceae

Life Form: Annual herb Blooms: March-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa [extirpated], Merced, Monterey [extirpated], Napa, San Benito [extirpated], Santa Clara [extirpated], San Francisco [extirpated], San Joaquin [extirpated], Solano, Sonoma [extirpated], Stanislaus [extirpated], Yolo

Quads: Salinas (365B) [extirpated], San Felipe (385B) [extirpated], Hollister (385C) [extirpated], San Luis Ranch (403A), Hatch (423B) [extirpated],

Gustine (423C), Stevinson (423D), Crows Landing (424A) [extirpated], Milpitas (427B), Mountain View (428A) [extirpated], Altamont (445B) [extirpated], Hayward (447A) [extirpated], San Leandro (447B) [extirpated], Newark (447D) [extirpated], Stockton West (462A) [extirpated], Byron Hot Springs (463C) [extirpated], Walnut Creek (465A) [extirpated], Oakland East (465C) [extirpated], Richmond (466A) [extirpated], San Francisco North (466C) [extirpated], Oakland West (466D) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Petaluma (484B) [extirpated], Saxon (497B), Dixon (498A) [extirpated], Elmira (498C), Dozier (498D), Fairfield North (499D) [extirpated], Napa (500D) [extirpated], Grays Bend (513B), Davis (513C), Woodland (514A) [extirpated], Merritt (514D) [extirpated]

Habitat: Playas, Valley and foothill grassland (adobe clay), Vernal pools / alkaline

Elevation: 1-60 m.

Notes: Last collection in Bay Area from 1959. Threatened by habitat destruction, especially agricultural conversion, and protected only at Jepson Prairie Preserve, SOL Co. See Proceedings of the American Academy of Arts and Sciences 6:206 (1864) for original description, and Systematic Botany 17(3):367-379 (1992) for distributional information.

ATRIPLEX CORDULATA
"heartscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Butte, Fresno, Glenn, King, Kern, Madera, Merced, San Joaquin [extirpated], Solano, Stanislaus [extirpated], Tulare, Yolo [extirpated]

Quads: Millux (215B), Mouth Of Kern (216A), Maricopa (216C), Lokern (242A), West Elk Hills (242D), Wasco NW (264B), Sausalito School (287B), Delano East (287C), Pixley (288A), Alpaugh (288B), Allensworth (288C), Delano West (288D), Goshen (334C), Kerman (359A) [extirpated], Jamesan (359B), Tranquillity (360A), Gravelly Ford (380C) [extirpated], Firebaugh NE (381A) [extirpated], Poso Farm (381B), Mendota Dam (381D), El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], San Luis Ranch (403A), Ingomar (403B) [extirpated], Volta (403C) [extirpated], Los Banos (403D), Arena (422C), Gustine (423C), Stevinson (423D), Crows Landing (424A) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Birds Landing (481A), Honker Bay (481C), Antioch North (481D), Dozier (498D), Davis (513C) [extirpated], Pennington (561D), Logandale (562B)

Habitat: Chenopod scrub, Meadows, Valley and foothill grassland (sandy) / saline or alkaline

Elevation: 1-375 m.

Notes: Need quads for KNG and SJQ counties. Similar to A. coronata var. coronata.

ATRIPLEX DEPRESSA
"brittlescale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: May-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Stanislaus [extirpated], Tulare, Yolo

Quads: Lost Hills NE (265A), Allensworth (288C), Traver (334B) [extirpated], Laton (335B) [extirpated], Raisin (358C) [extirpated], Kerman (359A), Jamesan (359B), Helm (359D) [extirpated], Tranquillity (360A), Firebaugh NE (381A) [extirpated], El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], Sandy Mush (402A), Hatch (423B) [extirpated], Stevinson (423D), Crows Landing (424A) [extirpated], Ripon (443B) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Denverton (481B), Antioch North (481D), Dozier (498D), Grays Bend (513B), Davis (513C), Woodland (514A) [extirpated], Colusa (546A), Arbuckle (546D), Manor Slough (547A), Pennington (561D), Logandale (562B), Moulton Weir (562D), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland, Vernal pools / alkaline, clay

Elevation: 1-320 m.

Notes: Threatened by development, grazing, and trampling. Closely related to A. minuscula and A. parishii; a synonym of the latter in A California Flora (1959) by P. Munz. See Pittonia 2:304 (1892) for original description.

ATRIPLEX JOAQUINIANA
"San Joaquin spearscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], Yolo

Quads: Hepsedam Peak (340D), San Felipe (385B) [extirpated], Hollister (385C),

San Luis Ranch (403A), Ingomar (403B), Gilroy (406D) [extirpated], Gustine (423C), Milpitas (427B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Woodward Island (463A), Brentwood (463B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B) [extirpated], Diablo (464C) [extirpated], Las Trampas Ridge (465D) [extirpated], Rio Vista (480B) [extirpated], Jersey Island (480C) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Elmira (498C) [extirpated], Dozier (498D), Fairfield North (499D), Napa (500D), Clarksville (511A), Grays Bend (513B), Davis (513C), Dunnigan (530B) [extirpated], Manor Slough (547A), Wilbur Springs (547C), Logandale (562B), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-320 m.

Notes: Need historical quads for TUL Co. Threatened by grazing, agriculture, and development. See Proceedings of the Biological Society of Washington 17:99 (1904) for original description.

BALSAMORHIZA MACROLEPIS VAR. MACROLEPIS
"big-scale balsamroot" Family: Asteraceae

Life Form: Perennial herb Blooms: March-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status
Counties: Alameda, Butte, Colusa, Lake, Mariposa, Napa, Placer, Santa Clara, Solano, Tehama

Quads: Gilroy (406D), El Capitan (437B), Buckingham Mtn. (438D), Altamont (445B),Livermore (446A), Hayward (447A), Oakland East (465C), Cordelia (482B), Mt. George (499C), Pilot Hill (527D), Lincoln (528A), Roseville (528D), Wilbur Springs (547C), Hough Springs (548A), Brush Creek (575A), Riley Ridge (596B), Devils Parade Ground (608C), Ono 15' SE (630D)

Habitat: Chaparral, Cismontane woodland, Valley and foothill grassland / sometimes serpentinite

Elevation: 90-1,400 m.

Notes: See Annals of the Missouri Botanical Garden 22:132 (1935) for original description.

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

CORDYLANTHUS MOLLIS SSP. HISPIDUS
"hispid bird's-beak" Family: Scrophulariaceae

Life Form: Annual herb, hemiparasitic Blooms: June-September

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Kern, Merced, Placer, Solano

Quads: Coal Oil Canyon (215D), Dos Palos (382B), Delta Ranch (402C), San Luis Ranch (403A), Ingomar (403B), Volta (403C), Los Banos (403D), Gustine (423C), Altamont (445B), Denverton (481B), Roseville (528D)

Habitat: Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-155 m.
Notes: Apparently extirpated from much of the lower San Joaquin Valley. Threatened by agricultural conversion, development, and grazing. See Brittonia 25:135-158 (1973) for revised nomenclature.

CORDYLANTHUS PALMATUS
"palmate-bracted bird's-beak" Family: Scrophulariaceae

Life Form: Annual herb, hemiparasitic Blooms: May-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [CE] State listed as Endangered (05/84)

Federal: [FE] Federally listed as Endangered (07/01/86)

Counties: Alameda, Colusa, Fresno, Madera, San Joaquin [extirpated], Yolo

Quads: Kerman (359A) [extirpated], Tranquillity (360A), Firebaugh NE (381A) [extirpated], Poso Farm (381B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Grays Bend (513B), Grimes (545C) [extirpated], Colusa (546A), Arbuckle (546D), Moulton Weir (562D)

Habitat: Chenopod scrub, Valley and foothill grassland (alkaline)

Elevation: 5-155 m.

Notes: Known from only nine occurrences. Plants from GLE Co. are introduced (562B). Threatened by agriculture, urbanization, vehicles, altered hydrology, grazing, and industrial development. Conservation research ongoing. See Bulletin of the Torrey Botanical Club 45:399-423 (1918) for original description, Fremontia 17(1):20-23 (1989) for information on Springtown Alkali Sink occurrence (ALA Co.), and Environmental Management 17:115-127 (1993) for population biology.

DEINANDRA BACIGALUPI
"Livermore tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: June-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda

Quads: Altamont (445B)

Habitat: Meadows (alkaline)

Elevation: 150-185 m.

Notes: Known from only two occurrences near Livermore. Needs field surveys. Potentially threatened by development. Not in The Jepson Manual. See Madrono 46(1):55 (1999) for original description.

ERIOGONUM TRUNCATUM
"Mt. Diablo buckwheat" Family: Polygonaceae

Life Form: Annual herb Blooms: April-November

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda [extirpated], Contra Costa [extirpated], Solano [extirpated]

Quads: Midway (445A) [extirpated], Altamont (445B) [extirpated], Antioch South (464A) [extirpated], Clayton (464B) [extirpated], Diablo (464C) [extirpated], Antioch North (481D) [extirpated], Fairfield South (482A) [extirpated]

Habitat: Chaparral, Coastal scrub, Valley and foothill grassland / sandy

Elevation: 105-600 m.

Notes: Recent attempts to rediscover this plant have been unsuccessful. Much habitat eliminated by grazing and urbanization. See Proceedings of the American Academy of Arts and Sciences 8:173 (1870) for original description, and Phytologia 66(4):375-376 (1989) for taxonomic treatment.

ERODIUM MACROPHYLLUM
"round-leaved filaree" Family: Geraniaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Isl. (SBA Co.), San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma [?], Stanislaus, Tehama, Ventura, Yolo, Baja California, Oregon, Utah, and other states

Quads: Otay Mesa (10C), El Cajon Mtn. (21A), Sage (67C), Romoland (68B), Bachelor Mtn. (68D), Perris (85C), Lake Mathews (86C), Malibu Beach (112C), Lake Hughes (162B), Figueroa Mtn. (168B), Los Olivos (169A), Pleito Hills (190A), Hurricane Deck (193D), Pine Mountain (262D), Estrella (269A), Garza Peak (291B), Idria (339B), San Benito Mtn. (339C), Tumey Hills (361C), Llanada (362C), Panoche Pass (363A), San Benito (363D), Ingomar (403B), Patterson (424B), Westley (443C), Tracy (444B), Midway (445A), Altamont (445B), Union Island (462C), Brentwood (463B), Antioch South (464A), Clayton (464B), Oakland East (465C), Las Trampas Ridge (465D), Antioch North (481D), Winters (514C), Jericho Valley (532C), Arbuckle (546D), Salt Canyon (547D), Nelson (577D), Willows (578C)

Habitat: Cismontane woodland, Valley and foothill grassland / clay

Elevation: 15-1,200 m.

Notes: Most collections historical; need information on current distribution. Does plant occur in SON Co.? Need quads for LAS, MNT, SMT, TEH, and VEN counties. Threatened by urbanization and non-native plants. See Boisseira 20:1-154 (1972) for taxonomic treatment.

MYOSURUS MINIMUS SSP. APUS
"little mousetail" Family: Ranunculaceae

Life Form: Annual herb Blooms: March-June

CNPS List: [3] More information is needed. R-E-D: 2-3-2

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Butte, Contra Costa, Colusa, Kern, Riverside, San Bernardino, San Diego, Solano, Stanislaus, Tulare, Baja California, Oregon

Quads: Dulzura (10A), Jamul Mountains (10B), Otay Mesa (10C), Imperial Beach (11D), Del Mar (22B), La Mesa (22D), San Pasqual (34C), Winchester (68A), Romoland (68B), Murrieta (68C), Lake Elsinore (69A), Wildomar (69D), Riverside East (86A), Steele Peak (86D), Lucerne Valley (131B), Pixley (288A), Hatch (423B), Crows Landing (424A), Altamont (445B), Clifton Court Forebay (463D), Antioch South (464A), Dozier (498D), Pennington (561D), Maxwell (562C)

Habitat: Valley and foothill grassland, Vernal pools (alkaline)

Elevation: 20-640 m.

Notes: Move to List 1B? Need quads for KRN Co. Reduced by vernal pool habitat loss; threatened by vehicles, grazing, development, and agriculture. Taxonomic problems; distinguishing between this taxon and M. sessilis (= M. minimus ssp. apus var. sessiliflorus in A California Flora (1959) by P. Munz) is difficult; are both rare? May be a stabilized hybrid between M. minimus and M. sessilis, at least in the Central Valley; see Evolution 13:151-174 (1959) for details. See M. minimus in The Jepson Manual. See Bulletin of the California Academy of Sciences 1:277 (1885) for original description, and Aliso 2(4):396 (1952) for revised nomenclature.

PLAGIOBOTHRYS GLABER
"hairless popcorn-flower" Family: Boraginaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda [extirpated], Merced [extirpated], Marin [extirpated], San Benito [extirpated], Santa Clara [extirpated]

Quads: Los Banos Valley (384A) [extirpated], San Felipe (385B) [extirpated], Hollister (385C) [extirpated], Los Gatos (407B) [extirpated], San Jose West (427C) [extirpated], San Jose East (427D) [extirpated], Altamont (445B) [extirpated], Hayward (447A) [extirpated], Newark (447D) [extirpated], San Rafael (467A) [extirpated]

Habitat: Meadows (alkaline), Marshes and Swamps (coastal salt)

Elevation: 15-180 m.

Notes: Possibly relocated near Antioch; identification uncertain. All collections since 1930's located in the Hollister area; plant should also be looked for there. Possibly a variety of P. stipitatus. See Proceedings of the American Academy of Arts and Sciences 17:227 (1882) for original description.

TRIFOLIUM DEPAUPERATUM VAR. HYDROPHILUM
"saline clover" Family: Fabaceae

Life Form: Annual herb Blooms: April-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Colusa [?], Monterey, Napa, San Benito, Santa Clara, San Luis Obispo, San Mateo, Solano, Sonoma

Quads: San Luis Obispo (246C), San Felipe (385B), Hollister (385C), Chittenden (386A), Prunedale (386C), Moss Landing (387D), Altamont (445B), Livermore (446A), San Mateo (448D), Oakland East (465C), Oakland West (466D), Denverton (481B), Sears Point (483B), Elmira (498C), Fairfield North (499D), Napa (500D) [extirpated], Santa Rosa (501B), Sebastopol (502A) [extirpated], Camp Meeker (502B), Calistoga (517D)

Habitat: Marshes and Swamps, Valley and foothill grassland (mesic, alkaline), Vernal pools

Elevation: 0-300 m.

Notes: Many sites likely extirpated; need current information on rarity and endangerment. Need quads for COL Co. Threatened by development. See Manual of the Botany of the Region of San Francisco Bay, p.100 (1894) for original description, and Brittonia 32(1):55 (1980) for revised nomenclature.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A) [extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay

(463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Brentwood Quad

ATRIPLEX JOAQUINIANA
"San Joaquin spearscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], Yolo

Quads: Hepsedam Peak (340D), San Felipe (385B) [extirpated], Hollister (385C), San Luis Ranch (403A), Ingomar (403B), Gilroy (406D) [extirpated], Gustine (423C), Milpitas (427B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Woodward Island (463A), Brentwood (463B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B) [extirpated], Diablo (464C) [extirpated], Las Trampas Ridge (465D) [extirpated], Rio Vista (480B) [extirpated], Jersey Island (480C) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Elmira (498C) [extirpated], Dozier (498D), Fairfield North (499D), Napa (500D), Clarksville (511A), Grays Bend (513B), Davis (513C), Dunnigan (530B) [extirpated], Manor Slough (547A), Wilbur Springs (547C), Logandale (562B), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-320 m.

Notes: Need historical quads for TUL Co. Threatened by grazing, agriculture, and development. See Proceedings of the Biological Society of Washington 17:99 (1904) for original description.

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

ERODIUM MACROPHYLLUM
"round-leaved filaree" Family: Geraniaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Isl. (SBA Co.), San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma [?], Stanislaus, Tehama, Ventura, Yolo, Baja California, Oregon, Utah, and other states

Quads: Otay Mesa (10C), El Cajon Mtn. (21A), Sage (67C), Romoland (68B), Bachelor Mtn. (68D), Perris (85C), Lake Mathews (86C), Malibu Beach (112C), Lake Hughes (162B), Figueroa Mtn. (168B), Los Olivos (169A), Pleito Hills (190A), Hurricane Deck (193D), Pine Mountain (262D), Estrella (269A), Garza Peak (291B), Idria (339B), San Benito Mtn. (339C), Tumey Hills (361C), Llanada (362C), Panoche Pass (363A), San Benito (363D), Ingomar (403B), Patterson (424B), Westley (443C), Tracy (444B), Midway (445A), Altamont (445B), Union Island (462C), Brentwood (463B), Antioch South (464A), Clayton (464B), Oakland East (465C), Las Trampas Ridge (465D), Antioch North (481D), Winters (514C), Jericho Valley (532C), Arbuckle (546D), Salt Canyon (547D), Nelson (577D), Willows (578C)

Habitat: Cismontane woodland, Valley and foothill grassland / clay

Elevation: 15-1,200 m.

Notes: Most collections historical; need information on current distribution. Does plant occur in SON Co.? Need quads for LAS, MNT, SMT, TEH, and VEN counties. Threatened by urbanization and non-native plants. See Boisseira 20:1-154 (1972) for taxonomic treatment.

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Byron Hot Springs Quad

ASTRAGALUS TENER VAR. TENER
"alkali milk-vetch" Family: Fabaceae

Life Form: Annual herb Blooms: March-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa [extirpated], Merced, Monterey [extirpated], Napa, San Benito [extirpated], Santa Clara [extirpated], San Francisco [extirpated], San Joaquin [extirpated], Solano, Sonoma [extirpated], Stanislaus [extirpated], Yolo

Quads: Salinas (365B) [extirpated], San Felipe (385B) [extirpated], Hollister (385C) [extirpated], San Luis Ranch (403A), Hatch (423B) [extirpated], Gustine (423C), Stevinson (423D), Crows Landing (424A) [extirpated], Milpitas (427B), Mountain View (428A) [extirpated], Altamont (445B) [extirpated], Hayward (447A) [extirpated], San Leandro (447B) [extirpated], Newark (447D) [extirpated], Stockton West (462A) [extirpated], Byron Hot Springs (463C) [extirpated], Walnut Creek (465A) [extirpated], Oakland East (465C) [extirpated], Richmond (466A) [extirpated], San Francisco North (466C) [extirpated], Oakland West (466D) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Petaluma (484B) [extirpated], Saxon (497B), Dixon (498A) [extirpated], Elmira (498C), Dozier (498D), Fairfield North (499D) [extirpated], Napa (500D) [extirpated], Grays Bend (513B), Davis (513C), Woodland (514A) [extirpated], Merritt (514D) [extirpated]

Habitat: Playas, Valley and foothill grassland (adobe clay), Vernal pools / alkaline

Elevation: 1-60 m.

Notes: Last collection in Bay Area from 1959. Threatened by habitat destruction, especially agricultural conversion, and protected only at Jepson Prairie Preserve, SOL Co. See Proceedings of the American Academy of Arts and Sciences 6:206 (1864) for original description, and Systematic Botany 17(3):367-379 (1992) for distributional information.

ATRIPLEX CORDULATA
"heartscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Butte, Fresno, Glenn, King, Kern, Madera, Merced, San Joaquin [extirpated], Solano, Stanislaus [extirpated], Tulare, Yolo [extirpated]

Quads: Millux (215B), Mouth Of Kern (216A), Maricopa (216C), Lokern (242A), West Elk Hills (242D), Wasco NW (264B), Sausalito School (287B), Delano East (287C), Pixley (288A), Alpaugh (288B), Allensworth (288C), Delano West (288D), Goshen (334C), Kerman (359A) [extirpated], Jamesan (359B), Tranquillity (360A), Gravelly Ford (380C) [extirpated], Firebaugh NE (381A) [extirpated], Poso Farm (381B), Mendota Dam (381D), El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], San Luis Ranch (403A), Ingomar (403B) [extirpated], Volta (403C) [extirpated], Los Banos (403D), Arena (422C), Gustine (423C), Stevinson (423D), Crows Landing (424A) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Birds Landing (481A), Honker Bay (481C), Antioch North (481D), Dozier (498D), Davis (513C) [extirpated], Pennington (561D), Logandale (562B)

Habitat: Chenopod scrub, Meadows, Valley and foothill grassland (sandy) / saline or alkaline

Elevation: 1-375 m.

Notes: Need quads for KNG and SJQ counties. Similar to A. coronata var. coronata.

ATRIPLEX DEPRESSA
"brittlescale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: May-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Stanislaus [extirpated], Tulare, Yolo

Quads: Lost Hills NE (265A), Allensworth (288C), Traver (334B) [extirpated], Laton (335B) [extirpated], Raisin (358C) [extirpated], Kerman (359A), Jamesan (359B), Helm (359D) [extirpated], Tranquillity (360A), Firebaugh NE (381A) [extirpated], El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], Sandy Mush (402A), Hatch (423B) [extirpated], Stevinson (423D), Crows Landing (424A) [extirpated], Ripon (443B) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Denverton (481B), Antioch North (481D), Dozier (498D), Grays Bend (513B), Davis (513C), Woodland (514A) [extirpated], Colusa (546A), Arbuckle (546D), Manor Slough (547A), Pennington (561D), Logandale (562B), Moulton Weir (562D), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland, Vernal pools / alkaline, clay

Elevation: 1-320 m.

Notes: Threatened by development, grazing, and trampling. Closely related to A. minuscula and A. parishii; a synonym of the latter in A California Flora (1959) by P. Munz. See Pittonia 2:304 (1892) for original description.

ATRIPLEX JOAQUINIANA
"San Joaquin spearscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], Yolo

Quads: Hepsedam Peak (340D), San Felipe (385B) [extirpated], Hollister (385C), San Luis Ranch (403A), Ingomar (403B), Gilroy (406D) [extirpated], Gustine (423C), Milpitas (427B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Woodward Island (463A), Brentwood (463B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B) [extirpated], Diablo (464C) [extirpated], Las Trampas Ridge (465D) [extirpated], Rio Vista (480B) [extirpated], Jersey Island (480C) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Elmira (498C) [extirpated], Dozier (498D), Fairfield North (499D), Napa (500D), Clarksville (511A), Grays Bend (513B), Davis (513C), Dunnigan (530B) [extirpated], Manor Slough (547A), Wilbur Springs (547C), Logandale (562B), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-320 m.

Notes: Need historical quads for TUL Co. Threatened by grazing, agriculture, and development. See Proceedings of the Biological Society of Washington 17:99 (1904) for original description.

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

DELPHINIUM RECURVATUM
"recurved larkspur" Family: Ranunculaceae

Life Form: Perennial herb Blooms: March-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status
Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa [extirpated], Fresno, King, Kern, Merced, Monterey, San Luis Obispo, Solano, Tulare

Quads: Panorama Hills (217B), Wells Ranch (217C), Painted Rock (218A), Chimineas Ranch (218B), Caliente Mtn. (218D), Stevens (240C), Gosford (240D), East Elk Hills (241C), Tupman (241D), West Elk Hills (242D), Simmler (243C), McKittrick Summit (243D), Pond (264A), Wasco (264D), Lost Hills NE (265A), Lost Hills NW (265B), Semitropic (265D), Sawtooth Ridge (267A), Sausalito School (287B), Pixley (288A), Delano West (288D), Avenal Gap (290C), Garza Peak (291B), Pyramid Hills (291D), The Dark Hole (292A), Cairns Corner (310B), Guernsey (312B), Guijarral Hills (314B), Curry Mountain (315C), Priest Valley (316B) [extirpated], San Lucas (318A), Domengine Ranch (338D), Pinalito Canyon (341D), Jamesan (359B), Helm (359D), Ortigalita Peak NW (383B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Allendale (498B), Salt Canyon (547D) [extirpated]

Habitat: Chenopod scrub, Cismontane woodland, Valley and foothill grassland / alkaline

Elevation: 3-750 m.

Notes: Many historical occurrences; need current information on status. Much habitat converted to agriculture; also threatened by grazing. Abundant on Carrizo Plain in 1995.

ESCHSCHOLZIA RHOMBIPETALA
"diamond-petaled California poppy" Family: Papaveraceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa [extirpated], Colusa [extirpated], San Luis Obispo, Stanislaus [extirpated]

Quads: Las Yeguas Ranch (243B) [extirpated], Simmler (243C), La Panza (244C) [? (extirpated)], Patterson (424B) [extirpated], Westley (443C) [extirpated], Midway (445A), Byron Hot Springs (463C) [extirpated], Antioch South (464A) [extirpated], Antioch North (481D) [extirpated], Sites (563D) [extirpated]

Habitat: Valley and foothill grassland (alkaline, clay)

Elevation: 0-975 m.

Notes: Rediscovered on Carrizo Plain by David Keil in 1992; not seen in 1995 surveys. Also found in at Lawrence Livermore Laboratory, ALA Co. in 1997. Historical occurrence for SJQ Co. from literature lacks documentation; occurrence from La Panza, SLO Co. (244C) probably misidentified E. lemmonii ssp. lemmonii. Threatened by agriculture and grazing.

HELIANTHELLA CASTANEA
"Diablo helianthella" Family: Asteraceae

Life Form: Perennial herb Blooms: April-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Marin [extirpated], San Francisco [extirpated], San Mateo

Quads: Cedar Mtn. (445D), Dublin (446B), Hayward (447A), San Francisco South (448B), Byron Hot Springs (463C), Antioch South (464A), Clayton (464B), Diablo (464C), Tassajara (464D), Walnut Creek (465A), Briones Valley (465B), Oakland East (465C) [extirpated], Las Trampas Ridge (465D), Richmond (466A), San Rafael (467A) [extirpated], Benicia (482C), Mare Island (483D)
Habitat: Broadleafed upland forest, Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland, Valley and foothill grassland

Elevation: 60-1,300 m.

Notes: Threatened by urbanization, grazing, and fire suppression.

LASTHENIA CONJUGENS
"Contra Costa goldfields" Family: Asteraceae

Life Form: Annual herb Blooms: March-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [FE] Federally listed as Endangered (06/18/97)

Counties: Alameda, Contra Costa, Mendocino [extirpated], Monterey, Napa, Santa Barbara [extirpated], Santa Clara [extirpated], Solano

Quads: Carpinteria (142A) [extirpated], Goleta (143A) [extirpated], Seaside (366D), Milpitas (427B), San Jose East (427D) [extirpated], Newark (447D) [extirpated], Byron Hot Springs (463C) [extirpated], Walnut Creek (465A) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Benicia (482C), Cuttings Wharf (483A), Elmira (498C), Capell Valley (499B) [extirpated], Mt. George (499C) [extirpated], Fairfield North (499D), Napa (500D), Calistoga (517D) [extirpated], Point Arena (537B) [extirpated]

Habitat: Cismontane woodland, Playas (alkaline), Valley and foothill grassland, Vernal pools / mesic

Elevation: 0-470 m.

Notes: Known from approximately twelve occurrences. Many historical occurrences extirpated by development and agriculture; also threatened by overgrazing and non-native plants. See Pittonia 1:221 (1888) for original description.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A) [extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay (463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Clifton Court Quad

ATRIPLEX CORDULATA
"heartscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Butte, Fresno, Glenn, King, Kern, Madera, Merced, San Joaquin [extirpated], Solano, Stanislaus [extirpated], Tulare, Yolo [extirpated]

Quads: Millux (215B), Mouth Of Kern (216A), Maricopa (216C), Lokern (242A), West Elk Hills (242D), Wasco NW (264B), Sausalito School (287B), Delano East (287C), Pixley (288A), Alpaugh (288B), Allensworth (288C), Delano West (288D), Goshen (334C), Kerman (359A) [extirpated], Jamesan (359B), Tranquillity (360A), Gravelly Ford (380C) [extirpated], Firebaugh NE (381A) [extirpated], Poso Farm (381B), Mendota Dam (381D), El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], San Luis Ranch (403A), Ingomar (403B) [extirpated], Volta (403C) [extirpated], Los Banos (403D), Arena (422C), Gustine (423C), Stevinson (423D), Crows Landing (424A) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Birds Landing (481A), Honker Bay (481C), Antioch North (481D), Dozier (498D), Davis (513C) [extirpated], Pennington (561D), Logandale (562B)

Habitat: Chenopod scrub, Meadows, Valley and foothill grassland (sandy) / saline or alkaline

Elevation: 1-375 m.

Notes: Need quads for KNG and SJQ counties. Similar to A. coronata var. coronata.

ATRIPLEX DEPRESSA
"brittlescale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: May-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Stanislaus [extirpated], Tulare, Yolo

Quads: Lost Hills NE (265A), Allensworth (288C), Traver (334B) [extirpated], Laton (335B) [extirpated], Raisin (358C) [extirpated], Kerman (359A), Jamesan (359B), Helm (359D) [extirpated], Tranquillity (360A), Firebaugh NE (381A) [extirpated], El Nido (401B) [extirpated], Chowchilla (401D) [extirpated], Sandy Mush (402A), Hatch (423B) [extirpated], Stevinson (423D), Crows Landing (424A) [extirpated], Ripon (443B) [extirpated], Altamont (445B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Denverton (481B), Antioch North (481D), Dozier (498D), Grays Bend (513B), Davis (513C), Woodland (514A) [extirpated], Colusa (546A), Arbuckle (546D), Manor Slough (547A), Pennington (561D), Logandale (562B), Moulton Weir (562D), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland, Vernal pools / alkaline, clay

Elevation: 1-320 m.

Notes: Threatened by development, grazing, and trampling. Closely related to A. minuscula and A. parishii; a synonym of the latter in A California Flora (1959) by P. Munz. See Pittonia 2:304 (1892) for original description.

ATRIPLEX JOAQUINIANA
"San Joaquin spearscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], Yolo

Quads: Hepsedam Peak (340D), San Felipe (385B) [extirpated], Hollister (385C), San Luis Ranch (403A), Ingomar (403B), Gilroy (406D) [extirpated], Gustine (423C), Milpitas (427B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Woodward Island (463A), Brentwood (463B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B) [extirpated], Diablo (464C) [extirpated], Las Trampas Ridge (465D) [extirpated], Rio Vista (480B) [extirpated], Jersey Island (480C) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Elmira (498C) [extirpated], Dozier (498D), Fairfield North (499D), Napa (500D), Clarksville (511A), Grays Bend (513B), Davis (513C), Dunnigan (530B) [extirpated], Manor Slough (547A), Wilbur Springs (547C), Logandale (562B), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-320 m.

Notes: Need historical quads for TUL Co. Threatened by grazing, agriculture, and development. See Proceedings of the Biological Society of Washington 17:99 (1904) for original description.

DELPHINIUM RECURVATUM
"recurved larkspur" Family: Ranunculaceae

Life Form: Perennial herb Blooms: March-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa [extirpated], Fresno, King, Kern, Merced, Monterey, San Luis Obispo, Solano, Tulare

Quads: Panorama Hills (217B), Wells Ranch (217C), Painted Rock (218A), Chimineas Ranch (218B), Caliente Mtn. (218D), Stevens (240C), Gosford (240D), East Elk Hills (241C), Tupman (241D), West Elk Hills (242D), Simmler (243C), McKittrick Summit (243D), Pond (264A), Wasco (264D), Lost Hills NE (265A), Lost Hills NW (265B), Semitropic (265D), Sawtooth Ridge (267A), Sausalito School (287B), Pixley (288A), Delano West (288D), Avenal Gap (290C), Garza Peak (291B), Pyramid Hills (291D), The Dark Hole (292A), Cairns Corner (310B), Guernsey (312B), Guijarral Hills (314B), Curry Mountain (315C), Priest Valley (316B) [extirpated], San Lucas (318A), Domengine Ranch (338D), Pinalito Canyon (341D), Jamesan (359B), Helm (359D), Ortigalita Peak NW (383B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Allendale (498B), Salt Canyon (547D) [extirpated]

Habitat: Chenopod scrub, Cismontane woodland, Valley and foothill grassland / alkaline

Elevation: 3-750 m.

Notes: Many historical occurrences; need current information on status. Much habitat converted to agriculture; also threatened by grazing. Abundant on Carrizo Plain in 1995.

HIBISCUS LASIOCARPUS
"rose-mallow" Family: Malvaceae

Life Form: Perennial herb (rhizomatous), emergent Blooms: June-September

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, widespread outside of California

Quads: Stockton West (462A), Holt (462B), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Bruceville (496C), Courtland (497D), Sacramento West (513D), Sutter Causeway (529B), Knights Landing (529C), Gilsizer Slough (544C), Sutter Buttes (545A), Meridian (545B), Tisdale Weir (545D), West Of Biggs (561A), Butte City (561B), Sanborn Slough (561C), Pennington (561D), Hamlin Canyon (576B), Shippee (576C), Ord Ferry (577B), Llano Seco (577C), Nelson (577D), Paradise West (592C)

Habitat: Marshes and Swamps (freshwater)

Elevation: 0-120 m.

Notes: Most occurrences are very small. Seriously threatened by development, agriculture, recreation, and channelization of the Sacramento River and its tributaries. Widespread but also threatened in eastern NA. CA plants apparently unique in rhizomatous-stoloniferous propagation.

LILAEOPSIS MASONII
"Mason's lilaeopsis" Family: Apiaceae

Life Form: Perennial herb (rhizomatous) Blooms: April-November

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [CR] State listed as Rare (11/79)

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, San Joaquin, Solano

Quads: Holt (462B), Union Island (462C), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Mare Island (483D), Bruceville (496C), Liberty Island (497C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (brackish or freshwater), Riparian scrub

Elevation: 0-10 m.

Notes: Locally common in Suisun Bay. Threatened by erosion, channel stabilization, development, flood control projects, recreation, agriculture, shading resulting from marsh succession, and competition with non-native Eichhornia crassipes. Many populations ephemeral, exploiting newly deposited or exposed sediments. Development of comprehensive management plan difficult due to large number of poorly coordinated planning efforts. Collection from Chicken Ranch Beach, MRN Co. (485D) is probably L. occidentalis. See Madrono 24(2):81 (1977) for original description.

LIMOSELLA SUBULATA
"delta mudwort" Family: Scrophulariaceae

Life Form: Perennial herb (stoloniferous) Blooms: May-August

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Contra Costa, Sacramento, San Joaquin, Solano, Oregon, widespread outside of California

Quads: Stockton West (462A), Woodward Island (463A), Clifton Court Forebay (463D), Terminous (479C), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Honker Bay (481C), Antioch North (481D), Dozier (498D)

Habitat: Marshes and Swamps

Elevation: 0-3 m.

Notes: Known in CA from several occurrences in the Delta; occurrence at Pt. Reyes NS, MRN Co. (485C) needs verification. Also found on the Atlantic Coast, where threatened by habitat destruction. Native to CA, although The Jepson Manual states otherwise.

MYOSURUS MINIMUS SSP. APUS
"little mousetail" Family: Ranunculaceae

Life Form: Annual herb Blooms: March-June

CNPS List: [3] More information is needed. R-E-D: 2-3-2

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Butte, Contra Costa, Colusa, Kern, Riverside, San Bernardino, San Diego, Solano, Stanislaus, Tulare, Baja California, Oregon

Quads: Dulzura (10A), Jamul Mountains (10B), Otay Mesa (10C), Imperial Beach (11D), Del Mar (22B), La Mesa (22D), San Pasqual (34C), Winchester (68A), Romoland (68B), Murrieta (68C), Lake Elsinore (69A), Wildomar (69D), Riverside East (86A), Steele Peak (86D), Lucerne Valley (131B), Pixley (288A), Hatch (423B), Crows Landing (424A), Altamont (445B), Clifton Court Forebay (463D), Antioch South (464A), Dozier (498D), Pennington (561D), Maxwell (562C)

Habitat: Valley and foothill grassland, Vernal pools (alkaline)

Elevation: 20-640 m.

Notes: Move to List 1B? Need quads for KRN Co. Reduced by vernal pool habitat loss; threatened by vehicles, grazing, development, and agriculture.

Taxonomic problems; distinguishing between this taxon and M. sessilis (= M. minimus ssp. apus var. sessiliflorus in A California Flora (1959) by P. Munz) is difficult; are both rare? May be a stabilized hybrid between M. minimus and M. sessilis, at least in the Central Valley; see Evolution 13:151-174 (1959) for details. See M. minimus in The Jepson Manual. See Bulletin of the California Academy of Sciences 1:277 (1885) for original description, and Aliso 2(4):396 (1952) for revised nomenclature.

SENECIO APHANACTIS
"rayless ragwort" Family: Asteraceae

Life Form: Annual herb Blooms: January-April

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 3-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, Fresno, Los Angeles, Merced, Orange, Riverside, Santa Barbara, Santa Clara, Santa Catalina Isl. (LAX Co.), Santa Cruz Isl. (SBA Co.), San Diego, San Luis Obispo, Solano, Santa Rosa Isl. (SBA Co.), Ventura, Baja California

Quads: Jamul Mountains (10B), Riverside West (86B) [?], San Dimas (109D), Newbury Park (113B), Camarillo (114A), Santa Ynez (169D), San Luis Obispo (246C), Shedd Canyon (268C), Charleston School (383A), San Jose East (427D), Midway (445A), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B), Mare Island (483D), Santa Cruz Island A (SCZA), Santa Cruz Island B (SCZB), Santa Rosa Island North (SRON)

Habitat: Chaparral, Cismontane woodland, Coastal scrub / alkaline

Elevation: 15-800 m.

Notes: Rare in LAX, ORA, and RIV counties. Need quads for RIV Co. and SCT Isl. Not seen on SCZ Isl. between 1934 and 1991. See Pittonia 1:220 (1888) for original description, and North American Flora II 10:50-139 (1978) for taxonomic treatment.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A)

[extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay (463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

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Full Data Report for the Selected Plants
Holt Quad

CAREX COMOSA
"bristly sedge" Family: Cyperaceae

Life Form: Perennial herb (rhizomatous) Blooms: May-September

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 3-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Contra Costa, Lake, San Bernardino [extirpated], Santa Cruz [extirpated], San Francisco [extirpated], Shasta, San Joaquin, Sonoma, Idaho, Oregon [extirpated], Washington, widespread outside of California

Quads: San Bernardino South (107D) [? (extirpated)], Laurel (407C) [extirpated], Felton (408D) [? (extirpated)], Holt (462B), Bouldin Island (480D), Bodega Head (503D), Guerneville (518C), Cow Mountain (550A), Fall River Mills (678C)

Habitat: Coastal prairie, Marshes and Swamps (lake margins), Valley and foothill grassland

Elevation: 0-425 m.

Notes: Location, rarity, and endangerment information needed; need historical quads for SFO Co. Fairly widely distributed, but apparently rarely collected. Threatened by marsh drainage. Endangered in ID, endangered in OR, and state-listed as Sensitive in WA.

HIBISCUS LASIOCARPUS
"rose-mallow" Family: Malvaceae

Life Form: Perennial herb (rhizomatous), emergent Blooms: June-September

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, widespread outside of California

Quads: Stockton West (462A), Holt (462B), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Bruceville (496C), Courtland (497D), Sacramento West (513D), Sutter Causeway (529B), Knights Landing (529C), Gilsizer Slough (544C), Sutter Buttes (545A),

Meridian (545B), Tisdale Weir (545D), West Of Biggs (561A), Butte City (561B), Sanborn Slough (561C), Pennington (561D), Hamlin Canyon (576B), Shippee (576C), Ord Ferry (577B), Llano Seco (577C), Nelson (577D), Paradise West (592C)

Habitat: Marshes and Swamps (freshwater)

Elevation: 0-120 m.

Notes: Most occurrences are very small. Seriously threatened by development, agriculture, recreation, and channelization of the Sacramento River and its tributaries. Widespread but also threatened in eastern NA. CA plants apparently unique in rhizomatous-stoloniferous propagation.

LATHYRUS JEPSONII VAR. JEPSONII
"Delta tule pea" Family: Fabaceae

Life Form: Perennial herb Blooms: May-September

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, Santa Clara [extirpated], San Joaquin, Solano

Quads: Calaveras Reservoir (427A) [extirpated], Mountain View (428A) [extirpated], Palo Alto (428B) [extirpated], Niles (446C), Stockton West (462A), Holt (462B), Woodward Island (463A), Walnut Creek (465A) [extirpated], Briones Valley (465B) [extirpated], Thornton (479B), Terminous (479C), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Bruceville (496C), Liberty Island (497C), Courtland (497D), Elmira (498C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (freshwater and brackish)

Elevation: 0-4 m.

Notes: Most populations small. Threatened by agriculture, water diversions, and erosion. See Pittonia 2:158 (1890) for original description.

LILAEOPSIS MASONII
"Mason's lilaeopsis" Family: Apiaceae

Life Form: Perennial herb (rhizomatous) Blooms: April-November

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [CR] State listed as Rare (11/79)

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, San Joaquin, Solano

Quads: Holt (462B), Union Island (462C), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Mare Island (483D), Bruceville (496C), Liberty Island (497C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (brackish or freshwater), Riparian scrub

Elevation: 0-10 m.

Notes: Locally common in Suisun Bay. Threatened by erosion, channel stabilization, development, flood control projects, recreation, agriculture, shading resulting from marsh succession, and competition with non-native Eichhornia crassipes. Many populations ephemeral, exploiting newly deposited or exposed sediments. Development of comprehensive management plan difficult due to large number of poorly coordinated planning efforts. Collection from Chicken Ranch Beach, MRN Co. (485D) is probably L. occidentalis. See Madrono 24(2):81 (1977) for original description.

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Full Data Report for the Selected Plants
Midway Quad

AMSINCKIA GRANDIFLORA
"large-flowered fiddleneck" Family: Boraginaceae

Life Form: Annual herb Blooms: April-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [CE] State listed as Endangered (04/82)

Federal: [FE] Federally listed as Endangered (05/08/85)

Counties: Alameda, Contra Costa, San Joaquin

Quads: Tracy (444B), Lone Tree Creek (444C), Midway (445A), Antioch South (464A), Tassajara (464D)

Habitat: Cismontane woodland, Valley and foothill grassland

Elevation: 275-305 m.

Notes: Known from only three natural occurrences. Reduced by agriculture, development, and grazing; currently threatened by non-native plants and possibly by altered fire frequency. Recent reintroductions have occurred (444C, 464A, 464D) as part of State and Federal recovery work, but most declining as of 1994. USFWS has designated critical habitat. See Botany of California 1:525 (1876) for original description, and Conservation Biology 7(3):510-526 (1993) for population biology.

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

CAULANTHUS COULTERI VAR. LEMMONII
"Lemmon's jewelflower" Family: Brassicaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda [extirpated], Fresno, King, Kern, Monterey, Santa Barbara, San Benito, San Joaquin, San Luis Obispo, Stanislaus, Ventura

Quads: Rancho Nuevo Creek (166B), Pleito Hills (190A), Ballinger Canyon (191B), New Cuyama (192B), Salisbury Potrero (192C), Wells Ranch (217C), Painted Rock (218A), McKittrick Summit (243D), La Panza NE (244A), La Panza Ranch (244B), La Panza (244C), Camatta Ranch (245A), Pozo Summit (245D), Sawtooth Ridge (267A), Orchard Peak (267B), Holland Canyon (267C), Cholame

(268A), Paso Robles (269B), Templeton (269C), Adelaida (270A), Garza Peak (291B), Tent Hills (291C), Cholame Valley (292D), Ranchito Canyon (293D), Tierra Redonda Mountain (294C), Williams Hill (295A), Monarch Peak (317A), Lillis Ranch (338B), Ciervo Mtn. (339A), Paraiso Springs (342D), Patterson (424B), Midway (445A), Cedar Mtn. (445D)

Habitat: Pinyon and juniper woodland, Valley and foothill grassland

Elevation: 80-1,220 m.

Notes: Need quads for SBT Co. Threatened by development. See Proceedings of the American Academy of Arts and Sciences 23:261 (1888) for original description, and Aliso 4(3):503 (1960) for revised nomenclature.

ERIOGONUM TRUNCATUM
"Mt. Diablo buckwheat" Family: Polygonaceae

Life Form: Annual herb Blooms: April-November

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda [extirpated], Contra Costa [extirpated], Solano [extirpated]

Quads: Midway (445A) [extirpated], Altamont (445B) [extirpated], Antioch South (464A) [extirpated], Clayton (464B) [extirpated], Diablo (464C)

[extirpated], Antioch North (481D) [extirpated], Fairfield South (482A) [extirpated]

Habitat: Chaparral, Coastal scrub, Valley and foothill grassland / sandy

Elevation: 105-600 m.

Notes: Recent attempts to rediscover this plant have been unsuccessful. Much habitat eliminated by grazing and urbanization. See Proceedings of the American Academy of Arts and Sciences 8:173 (1870) for original description, and Phytologia 66(4):375-376 (1989) for taxonomic treatment.

ERODIUM MACROPHYLLUM
"round-leaved filaree" Family: Geraniaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Isl. (SBA Co.), San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma [?], Stanislaus, Tehama, Ventura, Yolo, Baja California, Oregon, Utah, and other states

Quads: Otay Mesa (10C), El Cajon Mtn. (21A), Sage (67C), Romoland (68B), Bachelor Mtn. (68D), Perris (85C), Lake Mathews (86C), Malibu Beach (112C), Lake Hughes (162B), Figueroa Mtn. (168B), Los Olivos (169A), Pleito Hills (190A), Hurricane Deck (193D), Pine Mountain (262D), Estrella (269A), Garza Peak (291B), Idria (339B), San Benito Mtn. (339C), Tumey Hills (361C), Llanada (362C), Panoche Pass (363A), San Benito (363D), Ingomar (403B), Patterson (424B), Westley (443C), Tracy (444B), Midway (445A), Altamont (445B), Union Island (462C), Brentwood (463B), Antioch South (464A), Clayton (464B), Oakland East (465C), Las Trampas Ridge (465D), Antioch North (481D), Winters (514C), Jericho Valley (532C), Arbuckle (546D), Salt Canyon (547D), Nelson (577D), Willows (578C)

Habitat: Cismontane woodland, Valley and foothill grassland / clay

Elevation: 15-1,200 m.

Notes: Most collections historical; need information on current distribution. Does plant occur in SON Co.? Need quads for LAS, MNT, SMT, TEH, and VEN counties. Threatened by urbanization and non-native plants. See Boisseira 20:1-154 (1972) for taxonomic treatment.

ESCHSCHOLZIA RHOMBIPETALA
"diamond-petaled California poppy" Family: Papaveraceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa [extirpated], Colusa [extirpated], San Luis Obispo, Stanislaus [extirpated]

Quads: Las Yeguas Ranch (243B) [extirpated], Simmler (243C), La Panza (244C) [? (extirpated)], Patterson (424B) [extirpated], Westley (443C) [extirpated], Midway (445A), Byron Hot Springs (463C) [extirpated], Antioch South (464A) [extirpated], Antioch North (481D) [extirpated], Sites (563D) [extirpated]

Habitat: Valley and foothill grassland (alkaline, clay)

Elevation: 0-975 m.

Notes: Rediscovered on Carrizo Plain by David Keil in 1992; not seen in 1995 surveys. Also found in at Lawrence Livermore Laboratory, ALA Co. in 1997. Historical occurrence for SJQ Co. from literature lacks documentation; occurrence from La Panza, SLO Co. (244C) probably misidentified E. lemmonii ssp. lemmonii. Threatened by agriculture and grazing.

MADIA RADIATA
"showy madia" Family: Asteraceae

Life Form: Annual herb Blooms: March-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Contra Costa [extirpated], Fresno, King [extirpated], Kern, Monterey [extirpated], Santa Barbara [extirpated], San Benito, San Joaquin [extirpated], San Luis Obispo

Quads: Cuyama (192A) [extirpated], Chimineas Ranch (218B), La Panza NE (244A), Camatta Ranch (245A), Orchard Peak (267B) [extirpated], Packwood Creek (267D), Cholame (268A), Garza Peak (291B) [extirpated], Tent Hills (291C), The Dark Hole (292A) [extirpated], Parkfield (292B) [extirpated], Cholame Valley (292D), Kreyenhagen Hills (315D) [extirpated], Smith Mountain (316D) [extirpated], Lillis Ranch (338B) [extirpated], Joaquin Rocks (338C), Idria (339B), Santa Rita Peak (339D) [extirpated], Hernandez Reservoir (340A), Tumey Hills (361C), Panoche (362D), Lone Tree Creek (444C) [extirpated], Solyo (444D) [extirpated], Midway (445A) [extirpated], Antioch South (464A) [extirpated], Antioch North (481D) [extirpated]

Habitat: Cismontane woodland, Valley and foothill grassland

Elevation: 25-900 m.

Notes: Occurrences scattered. Most collections old; field work needed. Threatened by grazing and non-native plants.

SENECIO APHANACTIS
"rayless ragwort" Family: Asteraceae

Life Form: Annual herb Blooms: January-April

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 3-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, Fresno, Los Angeles, Merced, Orange, Riverside, Santa Barbara, Santa Clara, Santa Catalina Isl. (LAX Co.), Santa Cruz Isl. (SBA Co.), San Diego, San Luis Obispo, Solano, Santa Rosa Isl. (SBA Co.), Ventura, Baja California

Quads: Jamul Mountains (10B), Riverside West (86B) [?], San Dimas (109D), Newbury Park (113B), Camarillo (114A), Santa Ynez (169D), San Luis Obispo (246C), Shedd Canyon (268C), Charleston School (383A), San Jose East (427D), Midway (445A), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B), Mare Island (483D), Santa Cruz Island A (SCZA), Santa Cruz Island B (SCZB), Santa Rosa Island North (SRON)

Habitat: Chaparral, Cismontane woodland, Coastal scrub / alkaline

Elevation: 15-800 m.

Notes: Rare in LAX, ORA, and RIV counties. Need quads for RIV Co. and SCT Isl. Not seen on SCZ Isl. between 1934 and 1991. See Pittonia 1:220 (1888) for original description, and North American Flora II 10:50-139 (1978) for taxonomic treatment.

TRIFOLIUM AMOENUM
"showy Indian clover" Family: Fabaceae

Life Form: Annual herb Blooms: April-June

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [FE] Federally listed as Endangered (10/22/97)

Counties: Alameda [extirpated], Mendocino [extirpated], Marin, Napa [extirpated], Santa Clara [extirpated], Solano [extirpated], Sonoma [?]

Quads: Gilroy (406D) [extirpated], Midway (445A) [extirpated], San Quentin (466B) [extirpated], Bolinas (467B) [extirpated], Cuttings Wharf (483A) [extirpated], Petaluma (484B) [extirpated], Drakes Bay (485C) [extirpated], Inverness (485D) [extirpated], Elmira (498C) [extirpated], Napa (500D) [extirpated], Kenwood (501A) [extirpated], Santa Rosa (501B) [extirpated], Cotati (501C) [extirpated], Sebastopol (502A) [extirpated], Camp Meeker (502B) [extirpated], Valley Ford (502C), Duncans Mills (503A) [possibly extirpated], Burbeck (567B) [extirpated], Laughlin Range (567D) [extirpated]

Habitat: Coastal bluff scrub, Valley and foothill grassland (sometimes serpentinite)

Elevation: 5-415 m.

Notes: Rediscovered in 1993 by P. Conners near Occidental; only one plant found, and subsequent surveys in 1994-1995 unsuccessful. Occurrence (502C) discovered in 1996. Historical habitat lost to urbanization and agriculture. See Flora Franciscana, p. 27 (1891) by E. Greene for original description, and Fremontia 22(2):3-7 (1994) for account of rediscovery.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A) [extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay (463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

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Full Data Report for the Selected Plants
Tracy Quad

AMSINCKIA GRANDIFLORA
"large-flowered fiddleneck" Family: Boraginaceae

Life Form: Annual herb Blooms: April-May

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [CE] State listed as Endangered (04/82)

Federal: [FE] Federally listed as Endangered (05/08/85)

Counties: Alameda, Contra Costa, San Joaquin

Quads: Tracy (444B), Lone Tree Creek (444C), Midway (445A), Antioch South (464A), Tassajara (464D)

Habitat: Cismontane woodland, Valley and foothill grassland

Elevation: 275-305 m.

Notes: Known from only three natural occurrences. Reduced by agriculture, development, and grazing; currently threatened by non-native plants and possibly by altered fire frequency. Recent reintroductions have occurred (444C, 464A, 464D) as part of State and Federal recovery work, but most declining as of 1994. USFWS has designated critical habitat. See Botany of California 1:525 (1876) for original description, and Conservation Biology 7(3):510-526 (1993) for population biology.

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

ERODIUM MACROPHYLLUM
"round-leaved filaree" Family: Geraniaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Isl. (SBA Co.), San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma [?], Stanislaus, Tehama, Ventura, Yolo, Baja California, Oregon, Utah, and other states

Quads: Otay Mesa (10C), El Cajon Mtn. (21A), Sage (67C), Romoland (68B), Bachelor Mtn. (68D), Perris (85C), Lake Mathews (86C), Malibu Beach (112C), Lake Hughes (162B), Figueroa Mtn. (168B), Los Olivos (169A), Pleito Hills (190A), Hurricane Deck (193D), Pine Mountain (262D), Estrella (269A), Garza Peak (291B), Idria (339B), San Benito Mtn. (339C), Tumey Hills (361C), Llanada (362C), Panoche Pass (363A), San Benito (363D), Ingomar (403B), Patterson (424B), Westley (443C), Tracy (444B), Midway (445A), Altamont (445B), Union Island (462C), Brentwood (463B), Antioch South (464A), Clayton (464B), Oakland East (465C), Las Trampas Ridge (465D), Antioch North (481D), Winters (514C), Jericho Valley (532C), Arbuckle (546D), Salt Canyon (547D), Nelson (577D), Willows (578C)

Habitat: Cismontane woodland, Valley and foothill grassland / clay

Elevation: 15-1,200 m.

Notes: Most collections historical; need information on current distribution. Does plant occur in SON Co.? Need quads for LAS, MNT, SMT, TEH, and VEN counties. Threatened by urbanization and non-native plants. See Boisseira 20:1-154 (1972) for taxonomic treatment.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A) [extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay (463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Union Island Quad

BLEPHARIZONIA PLUMOSA SSP. PLUMOSA
"big tarplant" Family: Asteraceae

Life Form: Annual herb Blooms: July-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 3-3-3

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Contra Costa, San Joaquin [extirpated], Stanislaus [extirpated], Solano [extirpated]

Quads: Westley (443C) [extirpated], Tracy (444B), Midway (445A), Altamont (445B), Livermore (446A), Union Island (462C) [extirpated], Brentwood (463B), Byron Hot Springs (463C), Antioch South (464A), Walnut Creek (465A) [possibly extirpated], Honker Bay (481C) [possibly extirpated], Antioch North (481D) [possibly extirpated]

Habitat: Valley and foothill grassland

Elevation: 30-505 m.

Notes: Need historical quads for SOL Co. Historical occurrences probably extirpated by agriculture and non-native plants; also threatened by residential development. See Proceedings of the California Academy of Sciences I 5:49 (1873) for original description.

ERODIUM MACROPHYLLUM
"round-leaved filaree" Family: Geraniaceae

Life Form: Annual herb Blooms: March-May

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, King, Kern, Lake, Lassen, Los Angeles, Merced, Monterey, Napa, Riverside, Santa Barbara, San Benito, Santa Cruz Isl. (SBA Co.), San Diego, San Joaquin, San Luis Obispo, San Mateo, Solano, Sonoma [?], Stanislaus, Tehama, Ventura, Yolo, Baja California, Oregon, Utah, and other states

Quads: Otay Mesa (10C), El Cajon Mtn. (21A), Sage (67C), Romoland (68B), Bachelor Mtn. (68D), Perris (85C), Lake Mathews (86C), Malibu Beach (112C), Lake Hughes (162B), Figueroa Mtn. (168B), Los Olivos (169A), Pleito Hills

(190A), Hurricane Deck (193D), Pine Mountain (262D), Estrella (269A), Garza Peak (291B), Idria (339B), San Benito Mtn. (339C), Tumey Hills (361C), Llanada (362C), Panoche Pass (363A), San Benito (363D), Ingomar (403B), Patterson (424B), Westley (443C), Tracy (444B), Midway (445A), Altamont (445B), Union Island (462C), Brentwood (463B), Antioch South (464A), Clayton (464B), Oakland East (465C), Las Trampas Ridge (465D), Antioch North (481D), Winters (514C), Jericho Valley (532C), Arbuckle (546D), Salt Canyon (547D), Nelson (577D), Willows (578C)

Habitat: Cismontane woodland, Valley and foothill grassland / clay

Elevation: 15-1,200 m.

Notes: Most collections historical; need information on current distribution. Does plant occur in SON Co.? Need quads for LAS, MNT, SMT, TEH, and VEN counties. Threatened by urbanization and non-native plants. See Boisseira 20:1-154 (1972) for taxonomic treatment.

LILAEOPSIS MASONII
"Mason's lilaeopsis" Family: Apiaceae

Life Form: Perennial herb (rhizomatous) Blooms: April-November

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [CR] State listed as Rare (11/79)

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, San Joaquin, Solano

Quads: Holt (462B), Union Island (462C), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Mare Island (483D), Bruceville (496C), Liberty Island (497C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (brackish or freshwater), Riparian scrub

Elevation: 0-10 m.

Notes: Locally common in Suisun Bay. Threatened by erosion, channel stabilization, development, flood control projects, recreation, agriculture, shading resulting from marsh succession, and competition with non-native Eichhornia crassipes. Many populations ephemeral, exploiting newly deposited or exposed sediments. Development of comprehensive management plan difficult due to large number of poorly coordinated planning efforts. Collection from Chicken Ranch Beach, MRN Co. (485D) is probably L. occidentalis. See Madrono 24(2):81 (1977) for original description.

California Native Plant Society's
Inventory of Rare and Endangered Vascular Plants of California

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Full Data Report for the Selected Plants
Woodward Island Quad

ASTER LENTUS
"Suisun Marsh aster" Family: Asteraceae

Life Form: Perennial herb (rhizomatous) Blooms: May-November

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Contra Costa, Napa, Sacramento, San Joaquin, Solano

Quads: Woodward Island (463A), Terminous (479C), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Cordelia (482B), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Mare Island (483D), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (brackish and freshwater)

Elevation: 0-3 m.

Notes: Seriously threatened by marsh habitat alteration and loss. Intergrades into A. chilensis. USFWS uses the name A. chilensis var. lentus. See Manual of the Botany of the Region of San Francisco Bay, p. 180 (1894) by E. Greene for original description.

ATRIPLEX JOAQUINIANA
"San Joaquin spearscale" Family: Chenopodiaceae

Life Form: Annual herb Blooms: April-October

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Colusa, Glenn, Merced, Monterey, Napa, Sacramento, San Benito, Santa Clara [extirpated], San Joaquin [extirpated], Solano, Tulare [extirpated], Yolo

Quads: Hepsedam Peak (340D), San Felipe (385B) [extirpated], Hollister (385C), San Luis Ranch (403A), Ingomar (403B), Gilroy (406D) [extirpated], Gustine (423C), Milpitas (427B), Altamont (445B), Livermore (446A), Stockton West (462A) [extirpated], Woodward Island (463A), Brentwood (463B), Byron Hot Springs (463C), Clifton Court Forebay (463D), Antioch South (464A), Clayton (464B) [extirpated], Diablo (464C) [extirpated], Las Trampas Ridge

(465D) [extirpated], Rio Vista (480B) [extirpated], Jersey Island (480C) [extirpated], Denverton (481B), Antioch North (481D), Fairfield South (482A), Cuttings Wharf (483A), Elmira (498C) [extirpated], Dozier (498D), Fairfield North (499D), Napa (500D), Clarksville (511A), Grays Bend (513B), Davis (513C), Dunnigan (530B) [extirpated], Manor Slough (547A), Wilbur Springs (547C), Logandale (562B), Stonyford (564A), Willows (578C) [extirpated]

Habitat: Chenopod scrub, Meadows, Playas, Valley and foothill grassland / alkaline

Elevation: 1-320 m.

Notes: Need historical quads for TUL Co. Threatened by grazing, agriculture, and development. See Proceedings of the Biological Society of Washington 17:99 (1904) for original description.

HIBISCUS LASIOCARPUS
"rose-mallow" Family: Malvaceae

Life Form: Perennial herb (rhizomatous), emergent Blooms: June-September

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, widespread outside of California

Quads: Stockton West (462A), Holt (462B), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Bruceville (496C), Courtland (497D), Sacramento West (513D), Sutter Causeway (529B), Knights Landing (529C), Gilsizer Slough (544C), Sutter Buttes (545A), Meridian (545B), Tisdale Weir (545D), West Of Biggs (561A), Butte City (561B), Sanborn Slough (561C), Pennington (561D), Hamlin Canyon (576B), Shippee (576C), Ord Ferry (577B), Llano Seco (577C), Nelson (577D), Paradise West (592C)

Habitat: Marshes and Swamps (freshwater)

Elevation: 0-120 m.

Notes: Most occurrences are very small. Seriously threatened by development, agriculture, recreation, and channelization of the Sacramento River and its tributaries. Widespread but also threatened in eastern NA. CA plants apparently unique in rhizomatous-stoloniferous propagation.

LATHYRUS JEPSONII VAR. JEPSONII
"Delta tule pea" Family: Fabaceae

Life Form: Perennial herb Blooms: May-September

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-2-3

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, Santa Clara [extirpated], San Joaquin, Solano

Quads: Calaveras Reservoir (427A) [extirpated], Mountain View (428A) [extirpated], Palo Alto (428B) [extirpated], Niles (446C), Stockton West (462A), Holt (462B), Woodward Island (463A), Walnut Creek (465A) [extirpated], Briones Valley (465B) [extirpated], Thornton (479B), Terminous (479C), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Bruceville (496C), Liberty Island (497C), Courtland (497D), Elmira (498C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (freshwater and brackish)

Elevation: 0-4 m.

Notes: Most populations small. Threatened by agriculture, water diversions, and erosion. See Pittonia 2:158 (1890) for original description.

LILAEOPSIS MASONII
"Mason's lilaeopsis" Family: Apiaceae

Life Form: Perennial herb (rhizomatous) Blooms: April-November

CNPS List: [1B] R/T/E in CA and elsewhere R-E-D: 2-3-3

State: [CR] State listed as Rare (11/79)

Federal: [SOC] Species of Concern

Counties: Alameda, Contra Costa, Napa, Sacramento, San Joaquin, Solano

Quads: Holt (462B), Union Island (462C), Woodward Island (463A), Clifton Court Forebay (463D), Thornton (479B), Terminous (479C), Isleton (480A), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Denverton (481B), Honker Bay (481C), Antioch North (481D), Fairfield South (482A), Benicia (482C), Vine Hill (482D), Cuttings Wharf (483A), Mare Island (483D), Bruceville (496C), Liberty Island (497C), Dozier (498D), Napa (500D)

Habitat: Marshes and Swamps (brackish or freshwater), Riparian scrub

Elevation: 0-10 m.

Notes: Locally common in Suisun Bay. Threatened by erosion, channel stabilization, development, flood control projects, recreation, agriculture, shading resulting from marsh succession, and competition with non-native Eichhornia crassipes. Many populations ephemeral, exploiting newly deposited or exposed sediments. Development of comprehensive management plan difficult due to large number of poorly coordinated planning efforts. Collection from Chicken Ranch Beach, MRN Co. (485D) is

probably L. occidentalis. See Madrono 24(2):81 (1977) for original description.

LIMOSELLA SUBULATA
"delta mudwort" Family: Scrophulariaceae

Life Form: Perennial herb (stoloniferous) Blooms: May-August

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-3-1

State: [None] No state status

Federal: [None] No federal status

Counties: Contra Costa, Sacramento, San Joaquin, Solano, Oregon, widespread outside of California

Quads: Stockton West (462A), Woodward Island (463A), Clifton Court Forebay (463D), Terminous (479C), Rio Vista (480B), Jersey Island (480C), Bouldin Island (480D), Honker Bay (481C), Antioch North (481D), Dozier (498D)

Habitat: Marshes and Swamps

Elevation: 0-3 m.

Notes: Known in CA from several occurrences in the Delta; occurrence at Pt. Reyes NS, MRN Co. (485C) needs verification. Also found on the Atlantic Coast, where threatened by habitat destruction. Native to CA, although The Jepson Manual states otherwise.

SCUTELLARIA GALERICULATA
"marsh skullcap" Family: Lamiaceae

Life Form: Perennial herb (rhizomatous) Blooms: June-September

CNPS List: [2] R/T/E in CA, but more common elsewhere R-E-D: 2-2-1

State: [None] No state status

Federal: [None] No federal status

Counties: El Dorado, Lassen, Modoc, Nevada, Placer, Plumas, Shasta, San Joaquin,

Siskiyou [?], Oregon, widespread outside of California

Quads: Woodward Island (463A), Bouldin Island (480D), Emerald Bay (523A), Homewood (538C), Truckee (554C), Blairsden (588D), Antelope Lake (604A), Chester (624C), Big Swamp (677A), Fall River Mills (678C), Pittville (678D), Bray (714B), Beaver Mtn. (726B), Steele Swamp (727B)

Habitat: Lower montane coniferous forest, Meadows (mesic), Marshes and Swamps

Elevation: 0-2,100 m.
Notes: Is SIS Co. occurrence a misidentification? Occurrences from the Delta in SJQ Co. need further study.

TROPIDOCARPUM CAPPARIDEUM
"caper-fruited tropidocarpum" Family: Brassicaceae

Life Form: Annual herb Blooms: March-April

CNPS List: [1A] Presumed extinct in California R-E-D: *

State: [None] No state status

Federal: [SOC] Species of Concern

Counties: Alameda [extirpated], Contra Costa [extirpated], Glenn [extirpated], Monterey [extirpated], Santa Clara [extirpated], San Joaquin [extirpated]

Quads: Cosio Knob (318C) [extirpated], Palo Alto (428B) [extirpated], Cupertino (428D) [extirpated], Tracy (444B) [extirpated], Midway (445A) [extirpated], Altamont (445B) [extirpated], Woodward Island (463A) [extirpated], Byron Hot Springs (463C) [extirpated], Clifton Court Forebay (463D) [extirpated], Clayton (464B) [extirpated], Willows (578C) [extirpated]

Habitat: Valley and foothill grassland (alkaline hills)

Elevation: 1-455 m.

Notes: Attempts to rediscover this plant have been unsuccessful.

Appendix 8.2C
United States Fish and Wildlife Service List of Special-Status Species for EAEC Project Area

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

January 19, 2001

In Response Refer To:
SWR-01-SA-0001:MCV

E.J. Koford
Senior Biologist
CH2MHILL
2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

Dear E.J. Koford:

This is in response to your letter of December 11, 2000 requesting a list of all special status species that may be present in or near the proposed Calpine East Altamont Energy Center Project, Alameda County. Your letter states that this project, a 1,100-megawatt natural-gas-fired, combined-cycle power plant with a 230-kilovolt switching station, is intended to augment energy supplies to the Bay Area, Tracy, and throughout California. In addition, your letter requests comments or concerns the National Marine Fisheries Service (NMFS) has regarding the project, and its effects on endangered, threatened, or species of concern.

NMFS believes that the following species may be effected by the proposed action:

- Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), endangered
- Central Valley spring-run chinook salmon (*O. tshawytscha*), threatened
- Central Valley steelhead (*O. mykiss*), threatened
- Central Valley fall/late fall-run chinook salmon (*O. tshawytscha*), candidate

Your letter states that water for onsite needs, including cooling, and process makeup, would be supplied by the Byron-Bethany Irrigation District from their diversion on the Delta-Mendota Canal. The diversion of Delta water may have some consequential effects on listed salmonids, and NMFS believes these effects should be evaluated in future assessments of the project's effects. In addition, an additional 1,100-megawatts of available power, enough to supply approximately 1 million homes, may induce additional growth within the Bay Area and outlying areas. Such growth would result in additional effects to sensitive species through land conversion, added strain on limited resources, etc.

Based on the map provided, we are unable to determine if the proposed 1.8 miles of new natural gas pipeline will cross any waterways. If this is the case, disturbance of these areas should be evaluated, as well as the effects of runoff and pollution created by the facility in terms of direct, indirect, interrelated, inter-dependant, and cumulative effects.

We appreciate your interest in the conservation of listed species and their habitat, and look forward to working with you in the future. If you have any questions regarding this response, please contact Ms. Martha Volkoff in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814. Ms. Volkoff may be reached by telephone at (916) 930-3600 or by FAX at (916) 930-3629.

Sincerely,

for Rebecca Lent, Ph.D.
Regional Administrator

cc: Mr. Tom Lagerquist, Calpine, 620 Coolidge Drive, Suite 200, Folsom, California 95630

STATE OF CALIFORNIA - THE RESOURCES AGENCY

Gray Davis, *Governor*

DEPARTMENT OF FISH AND GAME
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

January 16, 2001

Mr. E. J. Koford
CH2M Hill
2485 Natomas Park Drive, Suite 600
Sacramento, California 95833-2937

Dear Mr. Koford:

Calpine East Altamont Energy Center Project
Consultation for Potential Biological Resources Impacts
Alameda County

Department of Fish and Game personnel have reviewed your request for information regarding listed species and species of concern in the vicinity of the proposed East Altamont Energy Center. The Department is trustee agency for fish and wildlife resources of the State of California. The Department is also a responsible agency and issues permits for impacts to State listed threatened or endangered species and impacts to creeks. If your project will impact listed species or creeks, close coordination with the Department will assist in developing adequate mitigation and issuance of final permits and approvals for the project.

The listed species and species of concern most likely to be affected by the proposed project are San Joaquin kit fox (*Vulpes macrotis mutica*), California tiger salamander (*Ambystoma californiense*), burrowing owl (*Athene cunicularia*), and California red-legged frog (*Rana aurora draytonii*). The site and adjacent areas should be surveyed and evaluated for the presence of these species or potential habitat. A number of areas in close proximity to the proposed facility have been set aside and managed as habitat for these species.

Additionally, the following species and habitats may occur in the project area: Swainson's hawk (*Buteo swainsoni*), white-tailed kite (*Elanus leucurus*), vernal pool fairy shrimp (*Branchinecta lynchii*), California horned lark (*Eremophila alpestris actia*), western pond turtle (*Clemmys marmorata*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), recurved larkspur (*Delphinium recurvatum*), diamond petaled poppy (*Eschscholzia rhombipetala*), rose-mallow (*Hibiscus lasiocarpus*),

Mason's lilaeopsis (*Lilaeopsis masonii*), Ferris's milk-vetch (*Astragalus tener* var. *ferrisiae*), alkali milk-vetch (*Astragalus tener* var. *tener*), San Joaquin saltbush (*Atriplex joaquiniana*), heartscale (*Atriplex cordulata*), caper-fruited tropidocarpum (*Tropidocarpum capparideum*), valley sink scrub, northern claypan vernal pool, and alkali meadow.

Surveys should be conducted for any rare, threatened or endangered species which may exist on site. Federal candidate species, wildlife listed as species of special concern, and plants listed by the California Native Plant Society (CNPS) should be included. The Department's California Natural Diversity Database (CNDDB) should be consulted for any known site-specific occurrences and for a list of species found in the general area. A report from the CNDDB which lists no findings for the project site does not indicate these species do not exist there, only that no information is in the file. Consequently, a negative result from a CNDDB search must not replace the requisite surveys.

Surveys for sensitive species, particularly plants, should be conducted at the proper time of year. Impacts to these species and their habitats should be avoided. Impacts which are unavoidable should be identified and appropriate mitigation provided.

It is the policy of this Department that a project should cause no net loss of either wetland acreage or wetland or riparian habitat value. The Department recommends a minimum 100-foot buffer be established to protect wetlands and riparian habitat. The buffer should be measured outward from the edge of any wetland or riparian area. Unavoidable impacts to wetlands or riparian habitat should be identified and mitigation provided for in the document. Mitigation for lost wetlands must include the creation of new wetlands on at least a 1:1 basis. Loss of riparian vegetation, placement of rip rap or other bank hardening materials, channelizing, installation of culverts or outfalls, or encroachment of impervious surfaces into riparian areas are significant impacts and should be mitigated. The Department recommends that impacts be avoided as much as possible. Where these impacts cannot be avoided, mitigation such as on-site or off-site riparian enhancement, acquisition, and conservation should be provided.

If you have any questions, please contact Scott Wilson, Environmental Specialist, at (510) 245-2472; or Carl Wilcox, Habitat Conservation Manager, at (707) 944-5525.

Sincerely,

Robert W. Floerke
Regional Manager
Central Coast Region

Appendix 8.2D
Qualifications/Resumes of Field Surveyors

Russell T. Huddleston

Staff Biologist

Education

B.S., Biology, 1998

Relevant Experience

Mr. Huddleston is an experienced field biologist and plant ecologist with experience in plant community classification, habitat assessment, and performing rare plant inventories and monitoring. He has specific expertise in vernal pool ecosystems and restoration of native grasslands and has authored several scholarly papers on these topics.

Representative Projects

- **Pipeline/Transmission Line Alternatives Study, Teayawa Energy Center, Calpine Corporation, Riverside County, California.** Provided habitat mapping along several proposed pipeline and transmission line routing alternatives in the Coachella Valley. The approximately 40 miles of alternative utility alignments are associated with a proposed 600-MW generating facility. Habitat types included Sonoran Desert creosote scrub, alkali scrub, desert riparian areas, palm oases, and tamarisk woodlands.

- **Proposed Sewer Alignment, Vallejo Flood and Sanitation District, California.** Conducted preconstruction plant surveys for special- status species along a proposed sewer pipeline alignment. Habitat types included intertidal marsh, annual grasslands, wet meadows, riparian areas, and wetlands.

- **Wastewater Treatment Facility Survey, City of Sacramento, California.** Conducted a survey of the City's wastewater treatment facility for the presence of rose mallow, a plant species of concern.

- **Riley Street Extension, City of Folsom, California.** Conducted a survey and inventory of Valley elderberry shrubs as part of the Riley Street extension. This plant provides habitat for the Valley elderberry longhorn beetle, listed as a “threatened” species under the federal Endangered Species Act.

- **Field Biology, The Nature Conservancy, Southwestern Oregon.** Worked as a field biologist with The Nature Conservancy in southwestern Oregon. Involved with a diversity of habitats, including grasslands, oak savannas, vernal pools, and serpentine forests. Responsibilities included measuring and monitoring rare plant species and vegetation communities, habitat assessment, plant surveys, weed management, and habitat restoration.

Erik J. Koford

Senior Biologist / Project Manager

Education

M.S., Ecology, 1987
B.A., Zoology, 1977

Professional Registrations

Certified Wildlife Biologist: The Wildlife Society

Relevant Experience

Mr. Koford has more than 20 years of experience in preparing environmental permitting documents, wildlife and fisheries investigations, threatened and endangered species surveys, EIS / EIRs, water quality evaluations, and environmental regulatory compliance. He has assisting clients in satisfying the requirements of CEC, FERC, SMARA, CERCLA, RCRA, NEPA, and CEQA. Mr. Koford has expertise in the California and federal Endangered Species Acts and has performed endangered species field surveys in 18 states and countries.

Representative Projects

- **Application for Certification for East Altamont Energy Center, Tracy California.** Deputy project manager to prepare AFC for 1,100-MW natural-gas powered electricity center. Task leader for wildlife and water quality elements of the AFC and responsible for team coordination, budget tracking, and quality control.
- **Application for Certification for Natural Gas-fired Energy Facilities, Pacific Gas & Electric Company, San Mateo, Santa Clara, and San Francisco.** Deputy project manager responsible for preparing water, biology, soil and agricultural resources sections of three AFCs on an expedited schedule. Special legislation required preparation of the three documents in 15 days. As deputy PM, was responsible for proposal, costing, scheduling, team management and direction, as well as project execution within the required time.
- **Feasibility Analysis for Potential Cogeneration Sites, Nevada Calpine Corporation, Clark County and Washoe County, Nevada.** Project manager for identifying necessary permits and approvals under NEPA, UEPA, county, local, and tribal jurisdictions. Addressed potential water supply issues and constraints represented by the presence of state or federally listed endangered species. Also provided guidance on a strategic approach to permitting the proposed generating facilities.
- **EIR/EIS for Teayawa Energy Center, Riverside County, California.** Conducted biological analysis, including field surveys, agency consultations, and wetland determinations for proposed 600-MW generating facility site. Also investigated approximately 40 miles of alternative alignments for gas, water, and transmission lines.
- **Biological Constraints Analysis and Strategic Permitting Support for Three Potential Central Valley Generating Facility Sites, Calpine Corporation, Tracy, Lathrop, and Lodi, California.** Conducted biological constraints analysis and field surveys and provided permitting support for potential cogeneration facilities in the Central Valley.

The scope of the investigations included wetlands, endangered species, water quality, water supply, and compliance issues.

- **Storm Water Pollution Prevention Plan for DEC Generating Facility Construction, Calpine Corporation, Pittsburg, California.** Prepared SWPPP for project construction at the proposed Delta Energy Center cogeneration plant site and for gas, water, and transmission line alignments.

- **Application for Certification, Metcalf Energy Center Cogeneration Project, Calpine Corporation, San Jose, California.** Prepared responses to comments from the public and California Energy Commission (CEC) on biological and water quality issues addressed in the AFC, which was prepared for the CEC. Conducted supplemental environmental analyses for West End Access Road and utility alignments, water supply, erosion control, and drainage plans. Provided strategic advice and assistance on mitigation measures for Bay checkerspot butterfly and serpentine habitat.

- **Devil's Nose/Cross County Water-Power Project, FERC License Application, County Water Resources Agency, Amador County, California**. Conducted spotted owl and bald eagle surveys for impact analysis of proposed hydroelectric development. Provided location, mapping, and habitat quality verification for spotted owl habitat to replace habitat to be inundated by reservoir. Habitat verification consisted of review of aerial photographs, vegetation, and use maps and ground truthing.

- **Stockton Cogeneration Plant and Supplementary EIR, Air Products Corporation, Stockton, California**. Performed wildlife assessment and survey and project review for potential impacts to public health, water quality, and fish and wildlife resources resulting from cogeneration facility discharges. Primary author of SEIR. Analyzed fish, wildlife, and threatened and endangered species impact of cooling tower discharges for supplemental EIR. Involved field surveys, literature research, documentation, and toxics analysis.

- **Threatened and Endangered Species Surveys for New Transmission and Gas Line Corridors, Sacramento Municipal Utility District, Sacramento County, California.** Performed threatened and endangered species surveys of 80 miles of alternative new utility corridors in Sacramento and Yolo counties. Located occurrences of state-protected species, including giant garter snake, Swainson hawk, tri-colored blackbird, and vernal pool invertebrates (i.e., *Branchinecta*, *Linderiella*, and *Lepidurus*).

- **Wildlife and HEP Evaluations for Ramsey-French Meadow Hydroelectric Project, Northern California Power Agency, Upper Stanislaus River, Tuolumne County, California.** Performed wildlife and threatened and endangered species evaluations of proposed diversions, tunnel, storage reservoirs, and transmission lines for hydroelectric project. Prepared Initial Consultation Package, performed spotted owl, goshawk, and deer surveys, and facilitated HEP team agency meetings.

- **California-Oregon Transmission Project EIS/EIR, Transmission Agency of Northern California.** Performed threatened and endangered species evaluations for portions of 300-mile, 500-kV transmission line. Reviewed proposed transmission line routes for impacts on wildlife and threatened and endangered species (spotted owls, bald eagles, deer winter range) and sensitive habitats (vernal pools, wetlands).

Richard Dwerlkotte

Botanist, Plant Ecologist

KEA ENVIRONMENTAL, INC.

Summary

Sixteen years experience in forestry, botany
and plant ecology.

Expertise in rare plant surveys and plant community classification.

Employment History

KEA Environmental, Inc.
Sacramento, CA
1996-present, Botanist

Humboldt State University, Biological Sciences Department
Arcata, CA
1995-1996, Lecturer, Plant Ecology Lab

Klamath National Forest
Orleans, CA
1995, Crew Leader and Lead Botanist

Humboldt State University, Biological Sciences Department
Arcata, CA 1994-1995, Teaching Assistant,
Plant Taxonomy

Winzler & Kelly Consulting Engineers
Eureka, CA
1992, Botanist

BioSystems Analysis, Inc.
Santa Cruz, CA
1991-1992, Botanist

Plumas National Forest
Quincy, CA
1989-1990, Botanist

Humboldt State University Foundation
Arcata, CA
1990, Restoration Assistant

Tongass National Forest
Juneau, AK
1983-1985, Biological Technician

Education

B.S., Environmental Biology
Humboldt State University, 1990

Graduate Studies, Plant Ecology
Humboldt State University, 1993

Certification

1,400-hour Forestry Technician Program
Kenai Peninsula Community College,
Seward, AK

Richard Dwerlkotte has 16 years of experience in forestry, botany, and plant ecology. His diverse professional background includes private-sector consulting and employment with the U.S. Forest Service in the Plumas, Klamath, and Tongass national forests. Mr. Dwerlkotte has strong taxonomic abilities and has developed a solid understanding of vegetation types within the western United States.

Mr. Dwerlkotte regularly conducts special-status plant surveys, assesses project impacts, and develops mitigation plans. Recent examples include the special-status plant surveys, impact assessment, and mitigation planning for the Alturas Transmission Line Project between Alturas, California, and Reno, Nevada. His responsibilities as the revegetation specialist and restoration inspector on the Alturas project required extensive communication and negotiation with construction and agency personnel promoting a cooperative, proactive approach to ensure environmental compliance.

He has recently completed a large scale vegetation mapping project for a transmission line project between Nucla and Telluride, Colorado. Mr. Dwerlkotte has also completed a vegetation characterization and mapping project on 270,000 acres in the upper Sacramento River watershed. He has worked on the Ecological Classification Project and the Forest Inventory Assessment Program on the Klamath and portions of the Siskiyou and Shasta-Trinity national forests.

Mr. Dwerlkotte has collected data on forest insects and disease in Alaska; delineated wetlands in Guam; taught laboratory and field oriented plant ecology and plant taxonomy courses; conducted special-status plant surveys; compiled species lists; designed, conducted, and supervised mitigation for special-status plants and sensitive habitats; coordinated and conducted large field data collection efforts; and managed, conducted and documented construction monitoring and inspection activities. He also has acted as client liaison and facilitated reports for pipeline, power line, and road expansion projects in California and portions of Nevada, Utah, and Colorado.

Representative Projects

Alturas Intertie Transmission Line Project, California and Nevada - Managed reclamation and revegetation mitigation monitoring and inspection for this 165-mile-long transmission line corridor between Alturas, California and Reno, Nevada. Activities include inspections of performed contract specifications for recontouring, erosion control and revegetation; as revegetation specialist monitored the seed mixes applied to reclaimed areas within 26 different plant communities, including 12 sensitive community types to ensure environmental compliance. Also supervised construction phase mitigation monitoring and conducted preconstruction surveys for noxious weeds and special-status plants. *Sierra Pacific Power Company (1996-present)*

Skyline Road East, Skyline Road South, Skyline Road Extension Projects, Lassen County - Conducting biological technical studies including wetlands delineations, plant community characterization and mapping and documentation of special-status plant species surveys for three new road projects in and near Susanville, CA. *Hughes Environmental/County of Lassen (1999-present)*

County Road A-2, Lassen County - Conducted biological technical studies including wetlands delineations, plant community characterization and mapping and documentation of special-status plant species surveys for this road improvement project near Bieber, CA. *Hughes Environmental/County of Lassen (1999)*

County Road 56, Modoc County - Conducted plant community characterization and mapping and documentation of special-status plant species surveys and wetlands delineations for road improvement project near Alturas, CA. *Hughes Environmental/County of Modoc (1999)*

Tuscarora Gas Transmission Project, Oregon, California, Nevada - Conducted post-construction revegetation and special-status plant recovery monitoring. This include collecting vegetation transect data as well as censussing or sampling, special-status plant populations along a 229-mile gas pipeline route that extends from the CA / OR border to Tracy, NV. *Tuscarora Gas Transmission Company (1996-1998)*

Nucla-Telluride Transmission Line EIS, Colorado - Conducted botanical field surveys to characterize and map habitat types in 130 miles of alternative alignments, modifications to a five substations, 15 miles of distribution lines, and 10 miles of new access roads. Assessing impacts to biological resources, preparing biological sections of the draft EIS, and will respond to comments. *View Point West and Tri State Generation and Transmission Association (1998-1999)*

MAPCO Pipeline Project, Colorado, Utah - Supervised and conducted sensitive plant and noxious weed surveys and jurisdictional waters and wetland delineations for the Mid-America Pipeline Company's (MAPCO) proposed Rocky Mountain Loop. Surveys were conducted along approximately 200 miles of the proposed pipeline right-of-way, which is 200 feet wide, along approximately 30 miles of proposed access roads, and within 30 proposed offline facilities (e.g., pipe storage sites). *ENSR/MAPCO (1998)*

Appendix 8.2E
Outline of EAEC Biological Resources Mitigation Implementation Plan

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Appendix 8.3A
Confidential

Figure
8.3-4 Confidential

Appendix 8.3B
Proposed Native American Burial Protection Plan for the Calpine East Altamont Energy Center Construction Program

Proposed Native American Burial Protection Plan for the Calpine East Altamont Energy Center Construction Program

A. Statement of Purpose

The intent of this agreement is to protect Native American burials, isolated human remains, and associated grave objects from destruction during the construction of facilities associated with the Applicant's East Altamont Energy Center. A schematic plan is presented as Figure 8.3-5 of the AFC report.

This agreement applies specifically to the construction of facilities (access roads, pipelines, transmission lines, etc.) associated with the development of the East Altamont Energy Center near Tracy, in both San Joaquin and parts of Alameda and Contra Costa counties, California. Because there are no federal lands associated with this project, any and all discovered Native American burials, isolated human remains, and associated grave objects will be treated in accordance with the provisions of the State of California Public Resources Code Section 5097.98 and Health and Safety Code Section 7050.5.

The intent of this agreement is to fulfill the requirements for treatment of human remains that may be specified in any Memorandum of Agreement (MOA) among the California Energy Commission (CEC), the State Historic Preservation Officer (SHPO), the Native American Heritage Commission (NAHC), Alameda, Contra Costa, or San Joaquin counties (County), and any other parties concerning this project. Other parties might include state and/or federal agencies that may become involved as a result of project permitting or licensing. The Applicant will provide funding for the project and the CEC has been designated as the lead agency for regulatory compliance.

B. Description of Authority

The coordination of the procedures outlined within this agreement is the responsibility and under the authority of the CEC. As the lead agency for ensuring compliance with CEQA (and possibly the lead agency for compliance with Section 106 of the National Historic Preservation Act if federal agency participation occurs), the CEC is responsible for guaranteeing that the stipulations of this agreement are carried out.

Section 7050.5 of the California Health and Safety Code stipulates:

- (b) In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance to the site or any nearby area reasonably suspected to overlie adjacent remains until the County Coroner in accordance with Chapter 10 (commencing with Section 27460) of part 3 of Division 2 of Title 3 of the Government Code, or any other related provisions of law concerning investigation of the circumstances, manner, and cause of death, and the

recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or his or her authorized representative in the manner provided in Section 5097.98 of the Public Resources Code. The Coroner has made his/her determination within two working days from the time the person responsible for the excavation or his or her authorized representative, notifies the Coroner of the discovery or recognition of the human remains.

- If the Coroner determines that the remains are not subject to his or her authority and if the Coroner recognizes the human remains to be those of a Native American, or has reason to believe that they are those of a Native American, he or she shall contact, by telephone within 24 hours, the Native American Heritage Commission.

To ensure compliance with this State Law, the following procedures will apply.

C. Authority to Halt Construction

1. The construction contract will inform the contractor (and subcontractors) of the possibility of inadvertent discovery of human remains and will require them to avoid damage to such remains by immediately ceasing all disturbing activities at the find location. The Field Superintendent or equivalent will inform the construction crew regarding the procedures for protection of discovered human remains at the start of the project.

2. The construction Field Superintendent or his/her designate shall have the authority and responsibility to temporarily halt construction operations within 25 meters of the discovered remains if the location is not being monitored by the Applicant's archaeological consultant or Native American monitor. If the Applicant's archaeological consultant or Native American representative is monitoring the location, then the monitor will have the authority to halt construction within 25 meters of the find. The construction contractor or subcontractor, archaeologist or Native American monitor shall maintain a log of each work stoppage caused by the inadvertent discovery of potential or confirmed human remains, including the date and time that operations are halted and the date and time that authorized construction operations begin again.

D. Procedures When Skeletal Remains are Found

These procedures will be followed for all initial finds at known archaeological sites and in each case for isolated finds outside identified archaeological sites.

1. The archaeologist, Native American monitor, or construction crewmember (if the archaeologist or Native American Monitor is not present) shall inform the construction Field Superintendent that a work crew has been requested to stop work due to the discovery of human skeletal remains.

2. The Applicant shall offer the assistance of a project archaeologist to the Coroner to provide information about the discovery that will assist the Coroner in determining whether the remains are those of a deceased Native American. If the Coroner has reason to believe that the human remains are those of a deceased Native American, he/she is

required by law to contact the State of California Native American Heritage Commission (NAHC) by telephone within 24 hours of their determination.

3. Upon notice that the Coroner has determined that the remains are those of a deceased Native American, the project archaeologist will notify the following persons:

    A.

    B.

    C.

4. The archaeologist will contact the NAHC to verify that they have been contacted by the County Coroner and will arrange to receive recommendations from the Most Likely Descendents (MLDs) identified by the NAHC pursuant to Section 5097.98 (a) of the California Public Resources Code.

E. Protection While Awaiting Recommendations from Most Likely Descendents

Protection of Native American human burials shall be accomplished by: (1) keeping any discovery confidential; and (2) securing the discovery locality to prevent disturbance of remains and associated materials. Only those persons listed above in Section D will be notified of a find once it has been covered in place or moved in accordance with recommendations of the MLD. Methods to protect a find will include fencing, covering the remains with a protective material and culturally sterile soil or plywood, and if vandalism should be considered a threat, establish a 24-hour site security monitor.

F. Treatment as Recommended by Most Likely Descendents

Human remains will be treated in accordance with recommendations of the MLD identified by the NAHC. In general, the recommendations will follow those set forth below.

1. **Leave In Place**. If the gravesite is located in an area not subject to further disturbance, the remains will be left in place and covered with soil. This is the preferred treatment.

2. **Expose and Remove for Reburial**. If protection against disturbance during project construction or future development cannot be reasonably assured, remains may be removed for reburial with the MLD's consent. An archaeologist with osteological expertise will carefully and respectfully excavate the burial to expose in place the skeletal remains and any associated grave objects in the presence of a Native American monitor.

3. **Store Temporarily**. Each human burial with its associated grave objects will be stored together as a burial unit. A burial unit will be stored in a secure locked room at a location approved by the MLD.

4. **Laboratory Analysis**. There will be no viewing, handling, or analysis of stored burial units unless the MLD has recommended specific analyses.

5. **Reburial**. Human burials with their associated grave objects will be reburied at a location within the appropriate County.

G. Reporting

The reburial locality will be formally recorded as an "Archaeological Redeposit" with its confidential location shown on a USGS 7.5-minute map. A Burial Treatment Report will be compiled by the project archaeologist and will consist of a list of locations from which burials were removed, individual burials designations, the Archaeological Redeposit Record(s) documenting the reburial location, dates of excavation and reinternment, and individuals (with affiliation) present during reinternment. The Burial Treatment Report shall be considered a highly sensitive, confidential record and copies will be provided to the MLD and filed with the NAHC, the appropriate office of the California Historical Resources Information System, the appropriate County Coroner's office, and with any involved state or federal agencies. Full reporting of human remains will be contained in the Archaeological Data Recovery Report.

H. Curation of Archaeological Material Not Associated with Human Remains

Materials recovered during survey, evaluation and data recovery efforts will be curated at a facility that meets the criteria set forth in 36 CFR 79 (e.g., San Francisco State University). Items considered to be of a sacred and/or ceremonial nature as agreed upon by the MLD will be returned to (*name of tribe*).

Appendix 8.5
Detailed Continuous Noise Monitoring Results

SITE 1

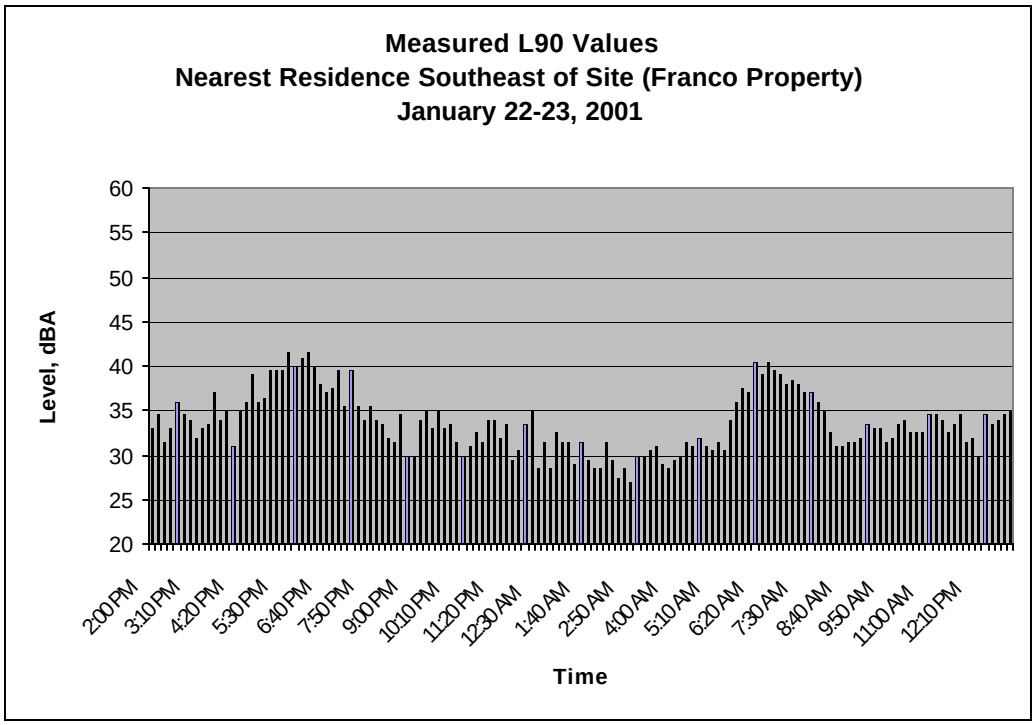
Nearest Residence on Kelso Road (1/22-1/23/2001)

Time	Leq	L10	L90	Time	Leq	L10	L90
2:00 PM	50.8	45.0	33.0	10:00 PM	53.4	39.0	33.5
2:10 PM	43.1	46.5	34.5	10:10 PM	44.3	43.5	31.5
2:20 PM	42.1	42.5	31.5	10:20 PM	52.0	41.5	30.0
2:30 PM	40.2	44.0	33.0	10:30 PM	53.1	38.5	31.0
2:40 PM	48.7	49.5	36.0	10:40 PM	38.6	41.0	32.5
2:50 PM	44.2	48.0	34.5	10:50 PM	38.4	41.0	31.5
3:00 PM	45.4	48.0	34.0	11:00 PM	38.9	41.0	34.0
3:10 PM	37.5	41.0	32.0	11:10 PM	38.2	40.5	34.0
3:20 PM	48.2	51.0	33.0	11:20 PM	37.9	41.0	32.0
3:30 PM	44.2	48.0	33.5	11:30 PM	36.8	39.5	33.5
3:40 PM	47.5	51.5	37.0	11:40 PM	36.6	40.0	29.5
3:50 PM	44.6	46.5	34.0	11:50 PM	38.6	41.0	30.5
4:00 PM	39.9	42.5	35.0	12:00 AM	35.5	37.0	33.5
4:10 PM	44.0	45.5	31.0	12:10 AM	53.8	41.5	35.0
4:20 PM	48.2	52.5	35.0	12:20 AM	33.9	37.0	28.5
4:30 PM	43.8	44.0	36.0	12:30 AM	58.2	40.5	31.5
4:40 PM	46.8	51.0	39.0	12:40 AM	34.4	37.0	28.5
4:50 PM	46.0	49.5	36.0	12:50 AM	36.7	40.0	32.5
5:00 PM	43.5	47.5	36.5	1:00 AM	34.8	37.0	31.5
5:10 PM	48.5	51.5	39.5	1:10 AM	33.7	35.0	31.5
5:20 PM	48.7	52.0	39.5	1:20 AM	55.3	38.5	29.0
5:30 PM	56.1	55.5	39.5	1:30 AM	34.8	37.0	31.5
5:40 PM	50.1	53.5	41.5	1:40 AM	30.8	37.5	29.5
5:50 PM	45.7	48.0	40.0	1:50 AM	31.5	33.0	28.5
6:00 PM	50.5	54.0	41.0	2:00 AM	34.5	36.0	28.5
6:10 PM	51.6	54.5	41.5	2:10 AM	34.7	37.0	31.5
6:20 PM	47.3	49.0	40.0	2:20 AM	33.9	36.5	29.5
6:30 PM	46.0	45.5	38.0	2:30 AM	31.0	33.5	27.5
6:40 PM	49.2	50.5	37.0	2:40 AM	32.4	35.5	28.5
6:50 PM	50.1	53.5	37.5	2:50 AM	37.0	39.0	27.0
7:00 PM	47.3	49.5	39.5	3:00 AM	38.8	41.0	30.0
7:10 PM	41.6	44.0	35.5	3:10 AM	36.9	39.0	30.0
7:20 PM	49.9	49.0	39.5	3:20 AM	35.1	37.0	30.5
7:30 PM	45.4	48.0	35.5	3:30 AM	51.1	39.5	31.0
7:40 PM	43.3	42.5	34.0	3:40 AM	33.1	35.5	29.0
7:50 PM	48.5	50.0	35.5	3:50 AM	31.0	33.5	28.5
8:00 PM	46.0	49.0	34.0	4:00 AM	51.6	41.0	29.5
8:10 PM	38.1	40.5	33.5	4:10 AM	33.1	34.0	30.0
8:20 PM	39.8	42.5	32.0	4:20 AM	54.1	41.5	31.5
8:30 PM	40.6	39.5	31.5	4:30 AM	35.4	38.5	31.0
8:40 PM	43.0	48.0	34.5	4:40 AM	35.4	37.5	32.0
8:50 PM	34.2	36.5	30.0	4:50 AM	35.7	38.5	31.0
9:00 PM	36.3	39.5	30.0	5:00 AM	35.0	38.0	30.5
9:10 PM	38.3	40.5	34.0	5:10 AM	37.9	41.0	31.5
9:20 PM	53.7	43.0	35.0	5:20 AM	37.6	41.5	30.5
9:30 PM	37.0	39.0	33.0	5:30 AM	39.1	42.5	34.0
9:40 PM	38.9	41.0	35.0	5:40 AM	59.4	47.0	36.0
9:50 PM	38.9	41.5	33.0	5:50 AM	57.8	46.0	37.5
6:00 AM	42.9	45.5	37.0	9:30 AM	56.4	36.0	33.0

SITE 1

Nearest Residence on Kelso Road (1/22-1/23/2001)

Time	Leq	L10	L90	Time	Leq	L10	L90
6:10 AM	45.4	48.5	40.5	9:40 AM	49.9	35.5	31.5
6:20 AM	53.6	47.5	39.0	9:50 AM	34.0	35.0	32.0
6:30 AM	45.7	48.5	40.5	10:00 AM	61.6	50.0	33.5
6:40 AM	57.6	47.5	39.5	10:10 AM	42.9	48.0	34.0
6:50 AM	53.9	47.5	39.0	10:20 AM	62.6	50.5	32.5
7:00 AM	56.3	44.0	38.0	10:30 AM	39.3	38.5	32.5
7:10 AM	42.3	45.0	38.5	10:40 AM	53.5	40.0	32.5
7:20 AM	58.2	48.0	38.0	10:50 AM	42.1	45.5	34.5
7:30 AM	56.3	48.5	37.0	11:00 AM	53.1	42.0	34.5
7:40 AM	54.4	42.5	37.0	11:10 AM	57.4	41.0	34.0
7:50 AM	59.0	44.5	36.0	11:20 AM	59.0	44.5	32.5
8:00 AM	47.8	42.0	35.0	11:30 AM	56.9	44.5	33.5
8:10 AM	60.2	45.5	32.5	11:40 AM	62.4	49.5	34.5
8:20 AM	56.1	44.0	31.0	11:50 AM	59.5	45.5	31.5
8:30 AM	60.5	46.0	31.0	12:00 PM	60.0	45.0	32.0
8:40 AM	54.2	45.0	31.5	12:10 PM	51.9	40.0	30.0
8:50 AM	54.4	43.5	31.5	12:20 PM	60.9	51.0	34.5
9:00 AM	52.6	44.5	32.0	12:30 PM	61.3	52.0	33.5
9:10 AM	58.2	44.0	33.5	12:40 PM	53.0	33.5	34.0
9:20 AM	58.4	37.5	33.0	12:50 PM	54.3	44.0	34.5



SITE 2

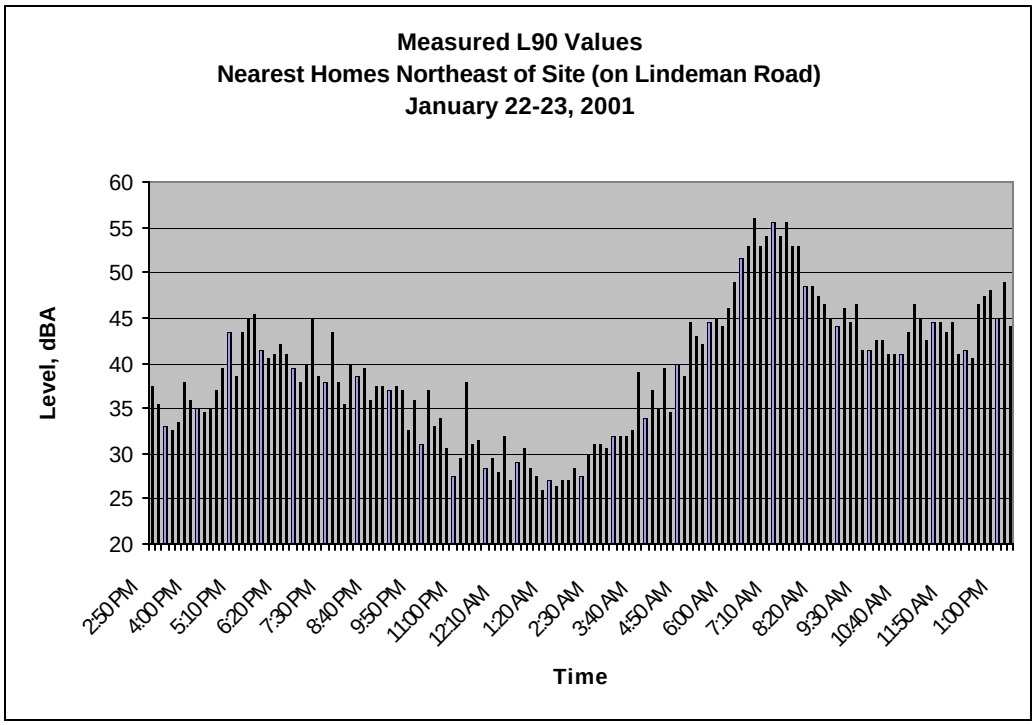
Nearest Homes Northeast of Site (1/22-1/23/2001)

Time	Leq	L10	L90	Time	Leq	L10	L90
2:50 PM	55.2	48.0	37.5	10:40 PM	46.2	51.0	27.5
3:00 PM	43.1	46.0	35.5	10:50 PM	42.7	47.0	29.5
3:10 PM	39.4	42.5	33.0	11:00 PM	45.6	49.0	38.0
3:20 PM	38.2	40.0	32.5	11:10 PM	41.9	45.5	31.0
3:30 PM	39.8	43.5	33.5	11:20 PM	46.3	50.5	31.5
3:40 PM	50.2	54.0	38.0	11:30 PM	46.6	51.0	28.5
3:50 PM	44.9	50.0	36.0	11:40 PM	43.6	47.5	29.5
4:00 PM	41.1	42.5	35.0	11:50 PM	41.9	47.0	28.0
4:10 PM	39.7	42.0	34.5	12:00 AM	44.6	48.5	32.0
4:20 PM	46.2	48.5	35.0	12:10 AM	41.9	46.5	27.0
4:30 PM	43.8	47.0	37.0	12:20 AM	39.5	45.0	29.0
4:40 PM	48.2	51.5	39.5	12:30 AM	43.4	49.0	30.5
4:50 PM	50.3	51.0	43.5	12:40 AM	38.9	43.5	28.5
5:00 PM	46.2	48.5	38.5	12:50 AM	37.0	40.5	27.5
5:10 PM	49.2	52.0	43.5	1:00 AM	43.5	48.0	26.0
5:20 PM	50.5	53.0	45.0	1:10 AM	42.7	47.5	27.0
5:30 PM	51.6	53.0	45.5	1:20 AM	38.0	42.5	26.5
5:40 PM	51.1	52.0	41.5	1:30 AM	40.6	46.0	27.0
5:50 PM	58.9	50.5	40.5	1:40 AM	44.1	49.0	27.0
6:00 PM	45.7	48.5	41.0	1:50 AM	45.1	49.5	28.5
6:10 PM	49.0	51.5	42.0	2:00 AM	44.6	50.0	27.5
6:20 PM	47.7	50.5	41.0	2:10 AM	46.5	51.5	30.0
6:30 PM	49.6	53.0	39.5	2:20 AM	43.4	47.5	31.0
6:40 PM	47.3	51.0	38.0	2:30 AM	44.7	49.0	31.0
6:50 PM	47.1	49.5	40.0	2:40 AM	51.5	55.5	30.5
7:00 PM	51.1	53.5	45.0	2:50 AM	46.0	50.0	32.0
7:10 PM	47.6	51.0	38.5	3:00 AM	49.4	54.5	32.0
7:20 PM	47.9	51.5	38.0	3:10 AM	48.6	50.5	32.0
7:30 PM	53.8	57.5	43.5	3:20 AM	46.5	51.0	32.5
7:40 PM	48.2	51.0	38.0	3:30 AM	49.1	52.5	39.0
7:50 PM	44.6	47.0	35.5	3:40 AM	45.4	49.5	34.0
8:00 PM	49.2	52.0	40.0	3:50 AM	44.2	47.5	37.0
8:10 PM	48.1	51.0	38.5	4:00 AM	41.3	44.5	35.0
8:20 PM	48.3	51.5	39.5	4:10 AM	47.2	50.5	39.5
8:30 PM	46.0	49.5	36.0	4:20 AM	44.6	49.0	34.5
8:40 PM	48.8	54.0	37.5	4:30 AM	47.7	51.5	40.0
8:50 PM	46.8	49.5	37.5	4:40 AM	47.5	51.0	38.5
9:00 PM	51.2	54.0	37.0	4:50 AM	51.2	53.5	44.5
9:10 PM	47.5	50.5	37.5	5:00 AM	50.9	55.0	43.0
9:20 PM	47.9	51.5	37.0	5:10 AM	50.8	54.0	42.0
9:30 PM	44.0	47.0	32.5	5:20 AM	52.4	55.5	44.5
9:40 PM	49.1	53.0	36.0	5:30 AM	50.0	52.5	45.0
9:50 PM	49.0	52.5	31.0	5:40 AM	49.6	52.5	44.0
10:00 PM	48.0	51.0	37.0	5:50 AM	52.6	55.5	46.0
10:10 PM	47.5	51.0	33.0	6:00 AM	54.2	56.5	49.0
10:20 PM	48.1	51.5	34.0	6:10 AM	54.5	57.0	51.5
10:30 PM	44.7	49.0	30.5	6:20 AM	56.9	59.0	53.0

SITE 2

Nearest Homes Northeast of Site (1/22-1/23/2001)

Time	Leq	L10	L90	Time	Leq	L10	L90
6:30 AM	58.5	60.5	56.0	10:00 AM	44.9	47.0	41.0
6:40 AM	56.5	58.0	53.0	10:10 AM	44.1	46.0	41.0
6:50 AM	58.7	61.5	54.0	10:20 AM	47.6	50.5	41.0
7:00 AM	60.1	62.0	55.5	10:30 AM	49.1	51.5	43.5
7:10 AM	57.3	59.0	54.0	10:40 AM	50.0	52.0	46.5
7:20 AM	60.2	62.5	55.5	10:50 AM	50.0	52.5	45.0
7:30 AM	59.4	62.0	53.0	11:00 AM	49.5	52.5	42.5
7:40 AM	59.8	62.5	53.0	11:10 AM	51.0	53.5	44.5
7:50 AM	54.5	58.0	48.5	11:20 AM	54.7	58.5	44.5
8:00 AM	53.3	56.0	48.5	11:30 AM	50.4	53.5	43.5
8:10 AM	51.9	54.5	47.5	11:40 AM	48.7	51.0	44.5
8:20 AM	50.1	52.5	46.5	11:50 AM	49.7	53.0	41.0
8:30 AM	49.0	51.5	45.0	12:00 PM	51.5	55.5	41.5
8:40 AM	48.4	51.0	44.0	12:10 PM	51.1	55.5	40.5
8:50 AM	48.8	50.5	46.0	12:20 PM	53.5	56.5	46.5
9:00 AM	48.3	50.0	44.5	12:30 PM	51.6	54.0	47.5
9:10 AM	51.3	53.0	46.5	12:40 PM	52.0	54.5	48.0
9:20 AM	48.3	52.5	41.5	12:50 PM	51.1	55.5	45.0
9:30 AM	44.3	46.0	41.5	1:00 PM	53.5	56.5	49.0
9:40 AM	47.9	49.5	42.5	1:10 PM	53.6	53.5	44.0
9:50 AM	46.8	48.5	42.5				



Appendix 8.14A
Will-Serve Letter from BBID

Board of Directors:

Brent Gilbert
Gerald E. Tennant
Tim Maggiore
Mark Franco
Charles Spatafore Jr.

General Manager:
Rick L. Gilmore

Office Manager:
Betty Compilli

February 6, 2001

Ms. Alicia Torre
Manager - Project Development
Calpine Corporation
6700 Koll Center Parkway, Suite 200
Pleasanton, CA 94566

Dear Ms. Torre:

This "will serve" letter is in response to Calpine's request to Byron-Bethany Irrigation District (BBID or District) to supply water to a modern natural gas-fueled combined-cycle electric generating facility. The proposed East Altamont Energy Center, EAEC, to be constructed by Calpine, is located on lands within District boundaries.

The District is a California Irrigation District operating under and by virtue of Division 11 of the California Water Code. BBID is legally authorized, pursuant to Water Code sections 22075 and 22076, to deliver water for domestic, municipal and industrial purposes.

It is the District's understanding that Calpine projects an average water demand of 4,600 acre-feet per year and in peak years, demand could be as high as 7,000 acre-feet per year. BBID has sufficient water to meet these projected demands of the Calpine project and hereby advises Calpine that the District is willing and able to provide water service to the EAEC. Delivery of water to the EAEC will require the construction of a pumping station and conveyance facilities. All construction costs, including any engineering or permitting costs, must be born by Calpine.

The delivery of water will be subject to all rules and regulations established by the District and Calpine shall be required to pay for the cost of all water delivered at the then applicable municipal and industrial rate charged by the District.

The District's obligation to serve the East Altamont Energy Center must be confirmed by such further agreements, as the parties deem necessary.

Sincerely,

Rick Gilmore
General Manager

C: Board of Directors

P.O. Box 160 • 3944 Main Street • Byron, California 94514-0160
Telephone (925) 634-3534 FAX (925) 516-1239

Appendix 8.16A
Paleontological Resources Technical Report
(Confidential)

Report

8.16-A Confidential

Appendix 10A
Civil Engineering Design Criteria

APPENDIX 10A

Civil Engineering Design Criteria

10A1 Introduction

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and construction of civil engineering systems the project. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

10A2 Codes and Standards

The design of civil engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, the county, the city and industry standards. The current issue or edition of the documents at the time of filing of this Application for Certification (AFC) will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

10A2.1 Civil Engineering Codes and Standards

The following codes and standards have been identified as applicable, in whole or in part, to civil engineering design and construction of power plants.

- American Association of State Highway and Transportation Officials (AASHTO) - Standards and Specifications
- American Concrete Institute (ACI) - Standards and Recommended Practices
- American Institute of Steel Construction (AISC) - Standards and Specifications
- American National Standards Institute (ANSI) - Standards
- American Society of Testing and Materials (ASTM) - Standards, Specifications and Recommended Practices
- American Water Works association (AWWA) - Standards and Specifications
- American Welding Society (AWS) - Codes and Standards
- Asphalt Institute (AI) - Asphalt Handbook
- California Energy Commission - Recommended Seismic Design Criteria for Non-Nuclear Generating Facilities in California, 1989
- Concrete Reinforcing Steel Institute (CRSI) - Standards

- Factory Mutual (FM) - Standards
- National Fire Protection Association (NFPA) - Standards
- International Conference of Building Officials (ICBO) - Uniform Building Code (UBC), 1997
- Steel Structures Painting Council (SSPC) - Standards and Specifications

10A2.2 Engineering Geology Codes, Standards and Certifications

Engineering geology activities will conform to the applicable federal, state and local laws, regulations, ordinances and industry codes and standards.

10A2.2.1 Federal

None are applicable.

10A2.2.2 State

The Warren-Alquist Act, PRC, Section 25000 et seq. and the California Energy Commission (CEC) Code of Regulations (CCR), Siting Regulations, Title 20 CCR, Chapter 2, require that Application for Certification (AFC) address the geologic and seismic aspects of the project.

The California Environmental Quality Act (CEQA), PRC 21000 et seq. and the CEQA Guidelines require that potentially significant effects, including geologic hazards, be identified and a determination made as to whether they can be substantially reduced.

10A2.2.3 County

California State Planning Law, Government Code Section 65302, requires each county to adopt a general plan, consisting of nine mandatory elements, to guide its physical development. Section 65302(f) requires that a seismic safety element be included in the general plan.

The project development activities will require certification by a Professional Geotechnical Engineer and a Professional Engineering Geologist during and following construction, in accordance with the Uniform Building Code UBC), 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, as follows:

- Both the Professional Geotechnical Engineer and the Professional Engineer will address UBC Chapter 70, Sections 7006 (Grading Plans), 7009 (Cuts), 7012 (Terraces), 7013 (Erosion Control), and 7015 (Final Report).
- The Professional Geotechnical Engineer will also address UBC Chapter 70, Sections 7011 (Cuts) and 7012 (Terraces).

Additionally, the Professional Engineering Geologist will present findings and conclusions pursuant to PRC, Section 25523 (a) and (c); and 20 CCR, Section 1752 (b) and (c).

Appendix 10B
Structural Engineering Design Criteria

APPENDIX 10B

Structural Engineering Design Criteria

10B1. Introduction

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and construction of structural engineering systems for the Facility. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement specification and construction specifications.

10B2. Codes and Standards

The design of structural engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, Alameda County ordinances, and the industry standards. The current issue or edition of the documents at the time of filing of this Application for Certification (AFC) will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

The following codes and standards have been identified as applicable, in whole or in part, to structural engineering design and construction of power plants:

- California Building Code (CBC), 1998 Edition.
- Amendments to CBC-1998, County of Alameda.
- American Institute of Steel Construction (AISC):

  a. Manual of Steel Construction - 9th Edition

  b. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings - ASD

  c. Specification for Structural Joints Using ASTM A325 or A490 Bolts

  d. Code of Standard Practice for Steel Buildings and Bridges

- American Concrete Institute (ACI):

  a. ACI 318 - 99, Building Code Requirements for Structural Concrete
  b. ACI 301 - 99, Specifications for Structural Concrete for Buildings
  c. ACI 543R - 00, Design, Manufacture, and Installation of Concrete Piles

- American Society of Civil Engineers (ASCE):

  a. ASCE 7-98 - Minimum Design Loads for Buildings and Other Structures

- American Welding Society (AWS):

  a. D1.1 - Structural Welding Code - Steel
  b. D1.3 - Structural Welding Code - Sheet Steel

- Code of Federal Regulations, Title 29 - Labor, Chapter XVII, Occupational Safety and Health Administration (OSHA).

  a. Part 1910 - Occupational Safety and Health Standards
  b. Part 1926 - Construction Safety and Health Regulations

- National Association of Architectural Metal Manufacturer (NAAMM) - Metal Bar Grating Manual.

- Hoist Manufacturers Institute (HMI), Standard Specifications for Electric Wire Rope Hoists (HMI 100).

- National Electric Safety Code (NESC), C2-1993.

- National Fire Protection Association (NFPA Standards).

  a. NFPA 850 Fire Protection for Electric Generating Plants.

- OSHA Williams-Steiger Occupational Safety and Health Act of 1970.

- Steel Deck Institute (SDI) - Design Manual for Floor Decks and Roof Decks.

- Design of Large Steam Turbine-Generator Foundations, ASCE 1987.

10B2.1 CEC Special Requirements

Prior to the start of any increment of construction, the proposed lateral force procedures for project structures and the applicable designs, plans and drawings for project structures will be submitted for approval.

Proposed lateral-force procedures, designs, plans, and drawings shall be those for:

- Major project structures
- Major foundations, equipment supports, and anchorage
- Large, field-fabricated tanks
- Turbine / generator pedestal; and
- Switchyard structures

10B3. Structural Design Criteria

10B3.1 Datum

Site topographic elevations will be based on an elevation survey conducted using known elevation benchmarks.

10B3.2 Frost Penetration

The site is located in an area free of frost penetration. Bottom elevation of all foundations for structures and equipment, however, will be maintained at a minimum of 12 inches below the finished grade.

10B3.3 Temperatures

The design basis temperatures for Civil and structural engineering systems will be as follows:

- Maximum 105° F
- Minimum 25° F

10B3.4 Subsurface Conditions

Site-specific subsurface data are not available at this time. Instead, data from the 21 MW Tracy biomass plant located off Schulte Road approximately 6 miles south of the project site were reviewed. The following assumptions regarding soil type and foundation systems for the proposed facility are based on this review conducted by geotechnical consultants Kleinfelder, Inc., Stockton, California.

Based on Kleinfleder's previous experience, it is anticipated that the soil conditions at the Facility site will consist primarily of very stiff silt and clay soils. It is anticipated that groundwater will be below the 15-foot depth. Based on loading information and allowable settlement values provided by Parsons Energy and Chemicals Group, Inc., and Kleinfelder's experience with other power plants and large structures, Kleinfelder anticipates that settlement criteria will control the foundation design selection for the major elements of the project. In other words, in order to limit the maximum allowable post-construction settlement to approximately one-half inch for the steam and combustion turbine/generator facilities, it is Kleinfelder's opinion that drilled, cast-in-place friction piers should be used. Cast-in-place friction piers varying from 24 to 60 inches in diameter were used for the nearby Tracy Thermal Energy Development. According to Kleinfelder's records, the depths of piers below the ground surface varied from approximately 15 feet for the smaller 24-inch diameter piers to approximately 50 feet for the 60-inch diameter piers. Groundwater was encountered in many of the excavations, and drilling fluid was used to maintain hole integrity versus the use of steel casing. For design purposes, Kleinfelder anticipates a friction value of 1,000 pounds per square foot (psf) for dead plus live loads with a one-third increase for total loads including wind and seismic forces. Kleinfelder notes that the Tracy facility was designed using slightly higher friction values since the groundwater was lower and the silt and clay materials had higher strength.

In Kleinfelder's opinion, the remaining elements of the project, the cooling tower and basin, the water tanks, buildings, miscellaneous foundations, and transformers can all be placed on spread, continuous, or ringwall foundations. Kleinfelder anticipates an allowable bearing value of 2,000 psf for foundations supported directly on the near-surface silty clay soils. Kleinfelder anticipates that the near-surface clay soils will grade to hard silt and clay material at depths of approximately 4 to 5 feet below existing ground surface. Therefore, if higher bearing values are desired, in the range of 3,500 psf, it may be possible to extend

spread foundations to these depths. If desired, lean concrete can be used to backfill foundation excavations up to approximately 18 to 24 inches below grade.

Resistance to lateral forces can be provided by passive pressure of the sides of the footings against the soil and/or by friction on the base of the footing. Passive pressure available in engineered fill or undisturbed, native soil may be taken as equivalent to the pressure exerted by a fluid weighing 400 and 350 pcf, respectively. Resistance to lateral loads for drilled piers will be provided by the resistance of the soil against the piers and by the bending stiffness of the piers themselves. Typically, Kleifelder bases their recommendations on programs such as COM624P (1993) originally developed by Dr. Lymon Reese.

A site-specific drilling and testing program will be conducted to confirm the above assumptions. The field investigations, analyses, and geotechnical design criteria will be summarized in a Geotechnical Report, scheduled to be issued in the summer of 2001.

10B3.5 Design Loads

10B3.5.1 General

Design loads for structures and foundations will comply with all applicable building code requirements.

10B3.5.2 Dead Loads

Dead loads will consist of the weights of the structure and all equipment of a permanent or semi-permanent nature including tanks, bins, wall panels, partitions, roofing, drains, piping, cable trays, bus ducts, and the contents of tanks and bins measured at full operating capacity. The contents of the tanks and bins, however, will not be considered as effective in resisting structure uplift due to wind forces; but will be considered as effective for seismic forces.

10B3.5.3 Live Loads

Live loads will consist of uniform floor live loads and equipment live loads. Uniform live loads are assumed equivalent unit loads that are considered sufficient to provide for movable and transitory loads, such as the weights of people, portable equipment and tools, small equipment or parts, which may be moved over or placed on the floors during maintenance operations, and planking. The uniform live loads will not be applied to floor areas that will be permanently occupied by equipment.

Lateral earth pressures, hydrostatic pressures, and wheel loads from trucks will be considered as live loads.

Uniform live loads will be in accordance with ASCE Standard 7, but will not be less than the following:

a.	Roofs	20 psf
b.	Floors and Platforms (Steel grating and checkered plates)	100 psf

In addition, a uniform load of 50 psf will be used to account for piping and cable trays, except that where the piping and cable loads exceed 50 psf, the actual loads will be used.

Furthermore, a concentrated load of 5 kips will be applied concurrently to the supporting beams of the floors to maximize stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

c.	Floors (Elevated Concrete floors)	100 psf

In addition, elevated concrete slabs will be designed to support an alternate concentrated load of 2 kips in lieu of the uniform loads, whichever governs. The concentrated load will be treated as a uniformly distributed load acting over an area of 2.5 square feet, and will be located in a manner to produce the maximum stress conditions in the slabs.

d.	Control Room Floor	150 psf
e.	Stairs, Landings and, Walkways	100 psf

In addition, a concentrated load of 2 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

f.	Pipe Racks	100 psf

Where the piping and cable tray loads exceed the design uniform load, the actual loads will be used. In addition, a concentrated load of 15 kips will be applied concurrently to the supporting beams for the walkways to maximize the stresses in the members, but the reactions from the concentrated loads will not be carried to the columns.

g. Hand Railings

Hand railings will be designed for either an uniform horizontal force of 50 plf applied simultaneously with a 100 plf uniform vertical live load, or a 200-pound concentrated load applied at any point and in any direction, whichever governs.

h.	Slabs on Grade	250 psf
i.	Truck Loading Surcharge Adjacent to Structures	250 psf
j.	Truck Support Structures	AASHTO-HS-20-44
k.	Special Loading Conditions	Actual loadings

Laydown loads from equipment components during maintenance and floor areas where trucks, forklifts, or other transports will have access, will be considered in the design live loads.

Live loads may be reduced in accordance with the provisions of UBC Section 1606.

Posting of the floor load capacity signs for all roofs, elevated floors, platforms and walkways will be in compliance with the OSHA Occupational Safety and Health Standard, Walking and Working Surfaces, Subpart D. Floor load capacity for slabs on grade will not be posted.

10B3.5.4 Earth Pressures

Earth pressures will be in accordance with the recommendations contained in the project-specific geotechnical report.

10B3.5.5 Groundwater Pressures

Hydrostatic pressures due to groundwater or temporary water loads will be considered.

10B3.5.6 Wind Loads

The wind forces will be calculated in accordance with CBC 1998 with a basic wind speed of 80 mph and a 'C' exposure category.

10B3.5.7 Seismic Loads

Structures will be designed and constructed to resist the effects of earthquake loads as determined in CBC 1998, Section 1630. The site is located on seismic zone 4. The occupancy category of the structure is 3 (Special Occupancy Structure) and corresponding importance factor (I) is 1.0. Other seismic parameters will be obtained from the geotechnical report.

10B3.5.8 Snow Loads

Snow loads will not be considered.

10B3.5.9 Turbine-Generator Loads

The combustion turbine-generators and the steam-turbine generators loads for pedestal and foundation design will be furnished by the equipment manufacturers, and will be applied in accordance with the equipment manufacturers' specifications, criteria and recommendations.

10B3.5.10 Special Considerations for Steel Stacks

Steel stacks will be designed to withstand the normal and abnormal operating conditions in combination with wind loads and seismic loads, and will include the along-wind and across-wind effects on the stacks. The design will meet the requirements of ASME/ANSI STS-1-1986, "Steel Stacks," using allowable stress design method, except that increased allowable stress for wind loads, as permitted by AISC, will not be used.

10B3.5.11 Special Considerations for Structures and Loads During Construction

For temporary structures, or permanent structures left temporarily incomplete to facilitate equipment installations, or temporary loads imposed on permanent structures during construction, the allowable stresses may be increased by 33 percent.

Structural backfill may be placed against walls, retaining walls, and similar structures when the concrete strength attains 80 percent of the design compressive strength (f'_c), as determined by sample cylinder tests. Restrictions on structural backfill, if any, will be shown on the engineering design drawings.

Design restrictions imposed on construction shoring removal that are different from normal practices recommended by the ACI Codes will be shown on engineering design drawings.

Metal decking used as forms for elevated concrete slabs will be evaluated to adequately support the weight of concrete plus a uniform construction load of 50 psf, without increase in allowable stresses.

10B4. Design Bases

10B4.1 General

Reinforced concrete structures will be designed by the strength design method, in accordance with ACI 318, "Building Code Requirements for Structural Concrete."

Steel structures will be designed by the working stress method, in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

Allowable soil bearing pressures for foundation design will be in accordance with the "Final Subsurface Investigation and Foundation Report" for the Facility.

10B4.2 Factors of Safety

The factor of safety for all structures, tanks, and equipment supports will be as follows:

• Against Overturning	1.50
• Against Sliding	1.50 for Wind Loads 1.10 for Seismic Loads
• Against Uplift Due to Wind	1.50
• Against Buoyancy	1.25

10B4.3 Allowable Stresses

Calculated stresses from the governing loading combinations for structures and equipment supports will not exceed the allowable limits permitted by the applicable codes, standards and specifications.

10B4.4 Load Factors and Load Combinations

For reinforced concrete structures and equipment supports, using the strength method, the strength design equations will be determined based on CBC 1998, Sections 1612.2, 1612.4, 1909.2 and using ACI-318-99 Eqs (9-2), (9-3). The Allowable Stress Design load combinations of CBC 1998 section 1612.3 will be used to assess soil bearing pressure and stability of structures per CBC 1998 Sections 1805 and 1629.1, respectively.

Steel framed structures will be designed in accordance with CBC 1998, Chapter 22, Divisions I, III and IV and the AISC Specification for the Structural Steel Buildings, Allowable Stress Design and Plastic Design, June 1, 1989. Connections will conform to Research Council on Structural Connections of the Engineering Foundation Specification for Structural Joints.

10B5. Construction Materials

10B5.1 Concrete and Grout

The design compressive strength (f'_c) of concrete and grout, as measured at 28 days, will be as follows:

- Electrical ductbank encasement and lean concrete backfill (Class L-1) — 2000 psi
- Structural concrete (Class S-1) — 3000 psi
- Structural concrete (Class S-2) — 4000 psi
- Grout (Class G-1) — 5000 psi

The classes of concrete and grout to be used will be shown on engineering design drawings or indicated in design specifications.

10B5.2 Reinforcing Steel

Reinforcing steel bars for concrete will be deformed bars of billet steel, conforming to ASTM A 615, Grade 60.

Welded wire fabric for concrete will conform to ASTM A 185.

10B5.3 Structural and Miscellaneous Steel

Structural and miscellaneous steel will generally conform to ASTM A 36, ASTM A 572, or ASTM A992 except in special situations where higher strength steel is required.

High strength structural bolts, including nuts and washers, will conform to ASTM A 325 or ASTM A 490.

Bolts other than high strength structural bolts, will conform to ASTM 307, Grade A.

10B5.4 Concrete Masonry

Concrete masonry units will be hollow, normal weight, non-load bearing Type I conforming to ASTM C 129.

Mortar will conform to ASTM C 270, Type M.

Grout will conform to ASTM C 476.

10B5.5 Other Materials

Other materials for construction, such as anchor bolts, shear connectors, concrete expansion anchors, embedded metal, etc., will conform to industry standards and will be identified on engineering design drawings or specifications.

Appendix 10C
Mechanical Engineering Design Criteria

APPENDIX 10C

Mechanical Engineering Design Criteria

10C1 Introduction

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and construction of mechanical engineering systems for EAEC. More specific project information will be developed prior to construction of EAEC to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

10C2 Codes and Standards

The design of the mechanical systems and components will be in accordance with the laws and regulations of the federal government, state of California, and industry standards. The current issue or revision of the documents, at the time of the filing of this AFC will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirements shall apply.

The following codes and standards are applicable to the mechanical aspects of the power facility.

- Uniform Building Code
- Uniform Mechanical Code
- Uniform Plumbing Code
- ASME Boiler and Pressure Vessel Code
- ASME / ANSI 1331.1 Power Piping Code
- ASME Performance Test Codes
- ASME Standard TDP-1
- ANSI B16.5, B16.34, and B133.8
- American Boiler Manufacturers Association (ABMA)
- American Gear Manufacturers Association (AFMA)
- Air Moving and Conditioning Association (AMCA)
- American Petroleum Institute (API) – except for electrical requirements
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American Welding Society (AWS)
- Cooling Tower Institute (CTI)
- Heat Exchange Institute (HEI)
- Manufacturing Standardization Society (MSS) of the Valve and Fitting Industry
- National Fire Protection Association (NFPA)

10C3 Mechanical Engineering General Design Criteria

10C3.1 General

The systems, equipment, materials, and their installation that will be designed in accordance with the applicable codes; industry standards; and local, state, and federal regulations, as well as the design criteria; manufacturing processes and procedures; and material selection, testing, welding, and finishing procedures specified in this section.

Detailed equipment design will be performed by the equipment vendors in accordance with the performance and general design requirements specified by Bechtel. Equipment vendors will be responsible for using construction materials suited for the intended use.

Asbestos will not be used in the materials and equipment supplied. Flanges manufactured in the People's Republic of China will be prohibited from use on any mechanical equipment. Where feasible, materials will be selected to withstand the design operating conditions, including expected ambient conditions, for the design life of the plant. It is anticipated that some materials will require replacement during the life of the plant due to corrosion, erosion, etc.

10C3.2 Pumps

Pumps will be sized in accordance with industry standards. Where feasible, pumps will be sized for maximum efficiency at the normal operating point. Pumps will be designed to be free from excessive vibration throughout the operating range.

10C3.3 Tanks

Large outdoor storage tanks will not be insulated.

Overflow connections and lines will be provided. Maintenance drain connections will be provided for complete tank drainage.

Manholes, where provided, will be at least 18 in. in diameter and hinged to facilitate removal. Storage tanks will have ladders and cleanout doors as required to facilitate access/maintenance. Provisions will be included for proper tank ventilation during internal maintenance.

10C3.4 Heat Exchangers

The surface condenser will be designed in accordance with Heat Exchanger Institute (HEI) standards. Other heat exchangers will be provided as components of mechanical equipment packages and may be shell-and-tube or plate type. Heat exchangers will be designed in accordance with Tubular Exchanger Manufacturers Association (TEMA) or manufacturer's standards. Fouling factors will be specified in accordance with TEMA.

10C3.5 Pressure Vessels

Pressure vessels will include the following features/appurtenances:

- Process, vent, and drain connections for startup, operation, and maintenance

- Materials compatible with the fluid being handled
- A minimum of one manhole and one air ventilation opening (e.g., handhole) where required for maintenance or cleaning access
- For vessels requiring insulation, shop-installed insulation clips spaced not greater than 18 in. on center
- Relief valves in accordance with the applicable codes

10C3.6 Piping and Piping Supports

Stainless steel pipe may be Schedule 5S or 10S where design pressure permits. Underground piping may be high density polyethylene (HDPE) where permitted by code, operating conditions, and fluid properties. In general, water system piping will be HDPE where embedded or underground and carbon steel where above ground.

Piping systems containing steam will be of welded construction. Threaded joints will not be used in piping used for steam, lubricating oil, and CTG natural gas service. Natural gas piping components will not use synthetic lubricants. Victaulic, or equal, couplings will be used for low energy aboveground piping, where feasible.

Piping systems will have high point vents and low point drains. Drains with restricting orifices or steam traps with startup and blowdown drains and strainers/crud traps will be installed in low points of steam lines where condensate can collect during normal operation.

Steam piping systems and steam drain lines in the plant will be sloped in the direction of steam flow. Condensate collection in piping systems will be avoided by installing automatic drain devices and manual devices as appropriate.

Steam lines fitted with restricting devices, such as orifices in the process runs, will include adequate drainage upstream of the device to prevent water from collecting in lines.

Hose and process tubing connections to portable components and systems will be compatible with the respective equipment suppliers' standard connections for each service.

Stainless steel piping will be used for the lubricating oil system.

10C3.7 Valves

10C3.7.1 General Requirements

Valves will be arranged for convenient operation from floor level where possible and, if required, will have extension spindles, chain operators, or gearing. Hand-actuated valves will be operable by one person.

Valves will be arranged to close when the handwheel is rotated in a clockwise direction when looking at the handwheel from the operating position. The direction of rotation to close the valve will be clearly marked on the face of each handwheel.

The stops that limit the travel of each valve in the open or closed position will be arranged on the exterior of the valve body. Valves will be fitted with an indicator to show whether

they are open or closed; however, only critical valves will be remotely monitored for position.

Valve materials will be suitable for operation at the maximum working pressure and temperature of the piping to which they are connected. Steel valves will have cast or forged steel spindles. Seats and faces will be of low friction, wear-resistant materials. Valves in throttling service will be selected with design characteristics and of materials that will resist erosion of the valve seats when the valves are operated partly closed.

Valves operating at less than atmospheric pressure will include means to prevent air in-leakage. No provision will be made to repack valve glands under pressure.

10C3.7.2 Drain and Vent Valves and Traps

Drains and vents in 900 pound class or higher piping and 500º F or higher service will be double valved.

Drain traps will include air cock and easing mechanism. Internal parts will be constructed from corrosion-resistant materials and will be renewable.

Trap bodies and covers will be cast or forged steel and will be suitable for operating at the maximum working pressure and temperature of the piping to which they are connected. Traps will be piped to drain collection tank or sumps and returned to the cycle if convenient.

10C3.7.3 Low Pressure Water Valves

LP water valves will be the butterfly type of cast iron construction. Cast iron valves will have cast iron bodies, covers, gates (discs), and bridges; the spindles, seats, and faces will be bronze. Fire protection valves will be UL-approved butterfly valves meeting NFPA requirements.

10C3.7.4 Instrument Air Valves

Instrument air valves will be the ball type of bronze construction, with valve face and seat of approved wear-resistant alloy.

10C3.7.5 Nonreturn Valves

Nonreturn valves for steam service will be in accordance with ANSI standards and properly drained. Nonreturn valves in vertical positions will have bypass and drain valves. Bodies will have removable access covers to enable the internal parts to be examined or renewed without removing the valve from the pipeline.

10C3.7.6 Motor-Actuated Valves

Motor-actuated valves will be fitted with both hand and motor operating gear. The hand and motor actuation mechanisms will be interlocked so that the hand mechanism is disconnected before the motor is started.

Motor actuators will include torque switches to stop the motor automatically when the valve gate has reached the "full open" or "full closed" position.

The motor actuator will be placed in a position relative to the valve that prevents leakage of liquid, steam, or corrosive gas from valve joints onto the motor or control equipment.

10C3.7.7 Safety and Relief Valves

Safety valves and/or relief valves will be provided as required by code for pressure vessels, heaters, and boilers. Safety and relief valves will be installed vertically. Piping systems that can be over-pressurized by a higher pressure source will also be protected by pressure relief valves. Equipment or parts of equipment that can be over-pressurized by thermal expansion of the contained liquid will have thermal relief valves. HRSG safety valves will be flanged.

10C3.7.8 Instrument Root Valves

Instrument root valves will be specified for operation at the working pressure and temperature of the piping to which they are connected. Test points and sample lines in systems that are 600 pound class or higher service will be double valved.

10C3.8 Heating, Ventilating, and Air Conditioning

HVAC system design will be based on site ambient conditions specified in Section 1.0.

Except for the HVAC systems serving the control room and administration areas, the systems will not be designed to provide comfort levels for extended human occupancy.

Air conditioning will include both heating and cooling of the inlet filtered air. Air velocities in ducts and from louvers and grills will be low enough not to cause unacceptable noise levels in areas where personnel are normally located.

Fans and motors will be mounted on anti-vibration bases to isolate the units from the building structure. Exposed fan outlets and inlets will be fitted with guards. Wire guards will be specified for belt-driven fans and arranged to enclose the pulleys and belts.

Air filters will be housed in a manner that facilitates removal. The filter frames will be specified to pass the air being handled through the filter without leakage.

Ductwork, filter frames, and fan casings will be constructed of mild steel sheets stiffened with mild steel flanges and galvanized. Ductwork will be the sectional bolted type and will be adequately supported. Duct joints will be leaktight.

Grills and louvers will be of adjustable metal construction.

10C3.9 Thermal Insulation and Cladding

Parts of EAEC requiring insulation to reduce heat loss or afford personnel safety will be thermally insulated. Minimum insulation thickness for hot surfaces near personnel will be designed to limit the outside lagging surface temperature to a maximum of 140 °F, based on 80 °F ambient temperature and 1 mph/hr air velocity. Other insulation minimums will be designed to limit the heat loss to approximately 80 Btu/hr-ft^2 based on an 80 °F ambient condition and an air velocity of 20 mph/hr.

The thermal insulation will have as its main constituent calcium silicate, foam glass, fiber glass, or mineral wool, and will consist of pre-formed slabs or blankets, where feasible.

Asbestos materials will be prohibited. An aluminum jacket or suitable coating will be provided on the outside surface of the insulation. Where a hard-setting compound is used as an outer coating, it will be nonabsorbent and noncracking. Thermal insulation will be chemically inert even when saturated with water. Insulation system materials, including jacketing, will have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.

Insulation at valves, pipe joints, steam traps, or other points to which access may be required for maintenance will be specified to be removable with a minimum of disturbance to the pipe insulation. At each flanged joint, the molded material will terminate on the pipe at a distance from the flange equal to the overall length of the flange bolts to permit their removal without damaging the molded insulation. Steam trap stations will be "boxed" for ease of trap maintenance and freeze protection.

Above ground insulated piping will be clad with pebbled or corrugated aluminum of not less than 30 mil thickness and frame reinforced. At the joints, the sheets will be sufficiently overlapped and corrugated to prevent moisture from penetrating the insulation.

Design temperature limits for thermal insulation will be based on system operating temperature during normal operation.

Outdoor and underground insulation, if required, will be moisture resistant.

10C3.10 Testing

Hydrostatic testing, including pressure testing at 1.5 times the design pressure, will be specified and performed for pressure boundary components where an in-service test is not feasible or permitted by code.

10C3.11 Welding

Welders and welding procedures will be certified in accordance with the requirements of the applicable codes and standards before performing any welding. Bechtel will maintain indexed records of welder qualifications and weld procedures.

10C3.12 Painting

Except as otherwise specified, equipment will receive the respective manufacturer's standard shop finish. Finish colors will be selected from among the paint manufacturer's standard colors.

Finish painting of uninsulated piping will be limited to that required by OSHA for safety or for protection from the elements.

Piping to be insulated will not be painted.

10C3.13 Lubrication

The types of lubrication specified for facility equipment will be suited to the operating conditions and will comply with the recommendations of the equipment manufacturers.

The initial startup charge of flushing oil will be provided by the equipment manufacturer and will be the manufacturer's standard lubricant for the intended service. Subsequently, such flushing oil will be sampled and analyzed to determine whether it can also be used for normal operation or must be replaced in accordance with the equipment supplier's recommendations.

Rotating equipment will be splash lubricated, force lubricated, or self-lubricated. Oil cups will be provided as necessary. Where automatic lubricators are fitted to equipment, provision for emergency hand lubrication will also be specified. Where applicable, equipment will be designed to be manually lubricated while in operation without the removal of protective guards. Lubrication filling and drain points will be readily accessible.

Appendix 10D
Electrical Engineering Design Criteria

APPENDIX 10D

Electrical Engineering Design Criteria

10D1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems for the facility. More specific project information will be developed prior to construction of EAEC to support detailed design, engineering, material procurement, and construction specifications as required by the California Energy Commission.

10D2 Codes and Standards

The design of the electrical systems and components will be in accordance with the laws and regulations of the federal government, State of California and industry standards. The current issue or revision of the documents at the time of the filing of this AFC will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement shall apply.

The following codes and standards are applicable to the electrical aspects of the power facility.

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories, Inc. (UL)

10D3 Switchyard and Transformers

10D3.1 Switchyard

The switchyard will be air-insulated. The switchyard will consist of SF6 circuit breakers for the transformers and lines to the grid, with disconnect switches on each side of the breakers. Each line will be equipped with the appropriate instrument transformers for protection and metering. Instrument transformers will also be used for generator synchronizing. Surge arresters will be provided for the outgoing lines in the area of the takeoff towers.

The SF6 breakers may be of either the dead or live tank design with two bushing current transformers on each bushing. Disconnect switches shall be vertical. Switches will be located on each side of the breakers to isolate the breaker, and one switch will be located at each line termination or transformer connection for isolation of the lines or transformer for maintenance. Instrument transformers (current and capacitive voltage transformers) will be included for protection. Separate instrument transformers will be used for metering.

Aluminum alloy tubular bus will be used. Cable connections between the tube bus and equipment will be ACSR cable. Tube and cables will meet all electrical and mechanical design requirements.

The switchyard design will meet the requirements of the National Electrical Safety Code—ANSI C2.

A grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. All equipment, structures and fencing will be connected to the grounding grid of buried conductors and ground rods, as required. The substation ground grid will be tied to the plant ground grid.

Lightning protection will be provided by shield wires and/or lightning masts. The lightning protection system will be designed in accordance with IEEE 998 guidelines.

All faults shall be detected, isolated, and cleared in a safe and coordinated manner as soon as practical to insure the safety of Equipment, Personnel, and the Public. Protective relaying will meet IEEE requirements and will be coordinated with the utilities requirements.

Each bus will be provided with a redundant high impedance differential relay system. Each outgoing line will be provided with redundant high speed relay systems with transfer trip capability. Transmission lines will have primary and backup microprocessor based distance relays with communication capability to the remote substation. Relay equipment for the remote ends are not included.

Each circuit breaker will be provided with independent breaker failure relay protection schemes. Breaker failure protection will be accomplished by fault detector relays and timing relays for each breaker. Each high voltage breaker will have 2 redundant trip coils.

Interface with the utility supervisory control and data acquisition (SCADA) system will be provided. Interface will be at the interface terminal box and RTU. Communication between the facility switchyard and the substation at the other end of the overhead transmission lines will be included. Remote Terminal Units (RTUs) will allow interface and remote control of the switchyard.

Revenue metering will be provided on the 230 kV outgoing lines recording net power to or from the switchyard (bidirectional). Meters and the metering panel will be provided.

10D3.2 Transformers

Each generator will be connected to the 230kV switchyard through a separate main 18 kV to 230 kV step-up transformer. The step-up transformers will be designed in accordance with ANSI standards C57.12.00, C57.12.90, and C57.116. The main transformers will be two-winding, delta-wye, OA/FA/FA. The neutral point of the HV winding will be solidly

grounded. Each main step-up transformer will have metal oxide surge arrestors adjacent to the HV terminals and will have manual de-energized (“no-load”) tap changers located in the HV windings.

Facility power will be supplied through a unit auxiliary transformer connected upstream of the STG Breaker. One two-winding, delta-wye 18 kV to 4.16 kV transformer will be provided.

Appendix 10E
Control Engineering Design Criteria

APPENDIX 10E

Control Engineering Design Criteria

10E1 Introduction

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and installation for 10F.1 instrumentation and controls for the Facility. More specific project information will be developed prior to construction of EAEC to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

10E2 Codes and Standards

The design specification of all work will be in accordance with the laws and regulations of the federal government and the state of California. A summary of general codes and industry standards applicable to design and construction follows.

- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- The Institute of Electrical and Electronics Engineers (IEEE)
- Instrument Society of America (ISA)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- American Society for Testing and Materials (ASTM)

10E3 Control Systems Design Criteria

10E3.1 General Requirements

Pneumatic signal levels, where used, will be 3–15 psig for pneumatic transmitter outputs, controller outputs, electric-to-pneumatic converter outputs, and valve positioner inputs.

The primary sensor full-scale signal level, other than thermocouples, will be between 10 mV and 125 V.

10E3.2 Pressure Instruments

In general, pressure instruments will have linear scales with units of measurement in pounds per square inch gauge.

Pressure gauges will have either a blowout disk or a blowout back and an acrylic or shatterproof glass face.

Pressure gauges on process piping will be resistant to plant atmospheres.

Siphons will be installed on pressure gauges in steam service as required by the system design. Steam pressure sensing transmitters or gauges mounted above the steam line will be protected by a loop seal.

Pressure test points will have isolation valves and caps or plugs. Pressure devices on pulsating services will have pulsation dampers.

10E3.3 Temperature Instruments

In general, temperature instruments will have scales with temperature units in degrees Fahrenheit. Exceptions to this are electrical machinery RTDs and transformer winding temperatures, which are in degrees Celsius.

Dial thermometers will have 4-1/2- or 5-inch-in-diameter (minimum) dials and white faces with black scale markings and will be every-angle type and bimetal actuated. Dial thermometers will be resistant to plant atmospheres.

Temperature elements and dial thermometers will be protected by thermowells except when measuring gas or air temperatures at atmospheric pressure. Temperature test points will have thermowells and caps or plugs.

RTDs will be either 100 ohm platinum or 10 ohm copper, ungrounded, three-wire circuits (R_{100}/R_0-1.385). The element will be spring-loaded, mounted in a thermowell, and connected to a cast iron head assembly.

Thermocouples will be single-element, grounded, spring-loaded, Chromel-Constantan (ANSI Type E) for general service. Thermocouple heads will be the cast type with an internal grounding screw.

10E3.4 Level Instruments

Reflex-glass or magnetic level gauges will be used. Level gauges for high-pressure service will have suitable personnel protection.

Gauge glasses used in conjunction with level instruments will cover a range that is covered by the instrument. Level gauges will be selected so that the normal vessel level is approximately at gauge center.

A single remote water level indicating system will be provided for each HRSG drum.

10E3.5 Flow Instruments

Flow transmitters will be the differential pressure type with the range matching the primary element. In general, linear scales and charts will be used for flow indication and recording.

The flow element for feedwater flow to each HRSG will be laboratory calibrated venturi flow nozzles.

In general, feedwater flow meters will be temperature compensated when the water temperature is greater than approximately 250°F, critical steam flow meters will be temperature and/or pressure compensated, and airflow measurements will be temperature compensated.

10E3.6 Control Valves

Control valves in throttling service will generally be the globe-body cage type with body materials, pressure rating, and valve trims suitable for the service involved. Other style valve bodies (e.g., butterfly, eccentric disk) may also be used when suitable for the intended service.

Valves will be designed to fail in a safe position.

Control valve body size will not be more than two sizes smaller than line size, unless the smaller size is specifically reviewed for stresses in the piping.

Control valves in 600 class service and below will be flanged where economical. Where flanged valves are used, minimum flange rating will be ANSI 300 Class.

Critical service valves will be defined as ANSI 900 Class and higher valves in sizes larger than 2 inches.

Severe service valves will be defined as valves requiring anticavitation trim, low noise trim, or flashing service, with differential pressures greater than 100 psid.

In general, control valves will be specified for a noise level no greater than 90 dBA when measured 3 feet downstream and 3 feet away from the pipe surface.

Valve actuators will use positioners and the highest pressure, smallest size actuator, and will be the pneumatic-spring diaphragm or piston type. Actuators will be sized to shut off against at least 110 percent of the maximum shutoff pressure and designed to function with instrument air pressure ranging from 60 to 125 psig.

Handwheels will be furnished only on those valves that can be manually set and controlled during system operation (to maintain plant operation) and do not have manual bypasses.

Control valve accessories, excluding controllers, will be mounted on the valve actuator unless severe vibration is expected.

Solenoid valves supplied with the control valves will have Class H coils. The coil enclosure will normally be a minimum of NEMA 4 but will be suitable for the area of installation. Terminations will typically be by pigtail wires.

Valve position switches (with input to the DCS for display) will be provided for MOVs and open/close pneumatic valves. Automatic combined recirculation flow control and check valves (provided by the pump manufacturer) will be used for pump minimum-flow recirculation control. These valves will be the modulating type.

10E3.7 Instrument Tubing and Installation

Tubing used to connect instruments to the process line will be 3/8- or 1/2-inch-outside-diameter copper or stainless steel as necessary for the process conditions.

Instrument tubing fittings will be the compression type. One manufacturer will be selected for use and will be standardized as much as practical throughout the plant.

Differential pressure (flow) instruments will be fitted with three-valve manifolds; two-valve manifolds will be specified for other instruments as appropriate.

Instrument installation will be designed to correctly sense the process variable. Taps on process lines will be located so that sensing lines do not trap air in liquid service or liquid in gas service. Taps on process lines will be fitted with a shutoff (root or gauge valve) close to the process line. Root and gauge valves will be main-line class valves.

Instrument tubing will be supported in both horizontal and vertical runs as necessary. Expansion loops will be provided in tubing runs subject to high temperatures. The instrument tubing support design will allow for movement of the main process line.

10E3.8 Pressure and Temperature Switches

Field-mounted pressure and temperature switches will have either NEMA Type 4 housings or housings suitable for the environment.

In general, switches will be applied such that the actuation point is within the center one-third of the instrument range.

10E3.9 Field-Mounted Instruments

Field-mounted instruments will be of a design suitable for the area in which they are located. They will be mounted in areas accessible for maintenance and relatively free of vibration and will not block walkways or prevent maintenance of other equipment. Freeze protection will be provided.

Field-mounted instruments will be grouped on racks. Supports for individual instruments will be prefabricated, off-the-shelf, 2-inch pipestand. Instrument racks and individual supports will be mounted to concrete floors, to platforms, or on support steel in locations not subject to excessive vibration.

Individual field instrument sensing lines will be sloped or pitched in such a manner and be of such length, routing, and configuration that signal response is not adversely affected.

Local control loops will generally use a locally mounted indicating controller (pressure, temperature, flow, etc.).

Liquid level controllers will generally be the nonindicating, displacement type with external cages.

10E3.10 Instrument Air System

Branch headers will have a shutoff valve at the takeoff from the main header. The branch headers will be sized for the air usage of the instruments served, but will be no smaller than 3/8 inch. Each instrument air user will have a shutoff valve and filter at the instrument.

Appendix 10F
Chemical Engineering Design Criteria

APPENDIX 10F

Chemical Engineering Design Criteria

10F1 Introduction

This appendix summarizes the codes, standards, criteria and practices that will be generally used in the design and installation for chemical engineering systems for the Facility. More specific project information will be developed prior to construction of EAEC to support detailed design, engineering, material procurement specification and construction specifications as required by the California Energy Commission.

10F2 Design Codes and Standards

The design and specification of all work will be in accordance with the laws and regulations of the federal government and the state of California. Industry codes and standards partially unique to chemical engineering design to be used in design and construction are summarized below.

- ANSI—American National Standards Institute
  ANSI B31.1—Power Piping Code
- ASME—American Society of Mechanical Engineers
  ASME—Performance Test Code 31, Ion Exchange Equipment
- ASTM—American Society for Testing and Materials.
  ASTM D859-94—Referee Method B for Silica as SiO_2
  ASTM D888-96—Referee Method A for Dissolved Oxygen
  ASTM D513-96—Referee Method D for CO_2
- OSHA—Occupational Safety and Health Administration
- SSPC—Steel Structures Painting Council Standards
  SSPC SP3—Power Tool Cleaning
  SSPC SP7—Brush-Off Blast Cleaning
  SSPC SP1—Solvent Cleaning
  SSPC SP6—Commercial Blast Cleaning
  SSPC SP5—White Metal Blast Cleaning
- UL—Underwriters Laboratories
- AWWA—American Waterworks Association
  WWA 2540-95—Method C for TDS

Other recognized standards will be used as required to serve as design, fabrication, and construction guidelines when not in conflict with the above listed standards.

The codes and industry standards used for design, fabrication, and construction will be the codes and industry standards, including all addenda, in effect as stated in equipment and construction purchase or contract documents.

10F3 General Criteria

10F3.1 Design Water Quality

10F3.1.1 Circulating Water

Water from Byron Bethany Irrigation District (BBID) will supply EAEC with circulating water makeup.

Data from the BBID indicate that the effluent from the BBID has the characteristics defined in Section 8.14, Water Resources.

BBID will also supply EAEC with a backup supply of circulating water makeup.

10F3.1.2 Service Water

BBID will be used to supply EAEC with all general service water requirements such as sanitary, and fire fighting water, as well as process needs for HRSG, and evaporative cooler water makeup.

A typical water analysis range for this water is presented in Section 8.14.

10F3.1.3 Cycle Makeup

Service water will be supplied to the Cycle Makeup Treatment System (demineralization system). The high quality effluent from the Cycle Makeup Treatment System will serve as makeup to the steam cycle. In addition, cycle makeup water will be used also to supply water for various uses during unit startup.

Water for cycle makeup will be the highest quality practical. Minimum quality requirements for cycle makeup water will be as follows.

- Total dissolved solids--0.1mg/l
- Silica as SiO_2--0.02 mg/l
- Specific conductance at demineralizer effluent--0.2 µS/cm
- pH--6.5 to 7.5

10F3.1.4 Construction Water

Water for use during construction will be supplied from by BBID.

10F3.1.5 Fire Protection Water

The source of water for fire protection will be dedicated portion of the fire/service water storage tank and the cooling tower basin.

10F3.2 Chemical Conditioning

10F3.2.1 Cycle Chemical Conditioning

Condensate-feedwater chemical conditioning will consist of an oxygen scavenger supplemented as required by a volatile, alkaline material such as ammonia for pH control.

HRSG chemical feed will consist of a mixture of sodium phosphates to control boiler water pH and to minimize scale formation and provide boiler water buffering capacity.

10F3.2.2 Circulating Water System Chemical Conditioning

Circulating water chemical conditioning will consist of chemicals to minimize corrosion and to control the formation of mineral scale and biofouling. Corrosion and scaling will be controlled by the use of sulfuric acid for alkalinity adjustment in conjunction with inhibitors, as required, for scale and corrosion control. Chlorination utilizing sodium hypochlorite will be used to minimize biofouling of the condenser tubes and the cooling tower.

10F3.2.3 Closed-Cycle System Chemical Conditioning

Bypass chemical feeders will provide water conditioning chemicals to the Closed Cycle Cooling System. Makeup water to the closed systems will be condensate quality and an inhibitor will be used for corrosion control.

10F3.3 Chemical Storage

10F3.3.1 Storage Capacity

Chemical storage tanks will, in general, be sized to store a minimum of 1.5 times the normal bulk shipment. The minimum acceptable volume of the SCR anhydrous ammonia storage tank will provide at least 8 days storage.

10F3.3.2 Containment

Chemical storage tanks containing corrosive fluids will be surrounded by curbing. Curbing and drain piping design will allow a full tank capacity spill without overflowing the curbing. For multiple tanks located within the same curbed area, the largest single tank will be used to size the curbing and drain piping.

10F3.3.3 Closed Drains

Waste piping for volatile liquids and wastes with offensive odors will used closed drains to control noxious fumes and vapors.

10F3.3.4 Coatings

Tanks, piping, and curbing for chemical storage applications will be provided with a protective coating system. The specific requirements for selection of an appropriate coating will be identified prior to equipment and construction contract procurements.

10F3.4 Wastewater Treatment

Metal cleaning wastes from properational and operational chemical cleaning of the boiler and preboiler systems of the HRSG will be collected, treated, and disposed offsite by the chemical cleaning contractor. Cooling tower blowdown will be discharged directly from the circulating water system. Reverse osmosis brine will also be discharged directly from the RO system. Other plant process wastewaters will be collected in the plant wastewater collection system for discharge to the onsite zero discharge system.

Sanitary wastewater will be collected, treated and discharged to the onsite package treatment system.