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DOCKET
08-AFC-10
DATE FEB 05 2009
RECD. FEB 05 2009

February 5, 2009

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Mr. Rod Jones
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Lodi Energy Center (08-AFC-10)
Data Response Set 1A, Responses to CEC Staff Data Requests 1 through 56

Dear Mr. Jones:

Attached please find one original and 12 copies of Northern California Power Agency's. responses to California Energy Commission Staff Data Requests 1 through 56 for the Application for Certification for the Lodi Energy Center (08-AFC-10). Due to size, five hard copies and one electronic copy of Attachment DR38-1, Interconnection Facilities Study Report, have been provided to the CEC. Additional copies will be provided upon request.

If you have any questions about this matter, please contact me at (916) 286-0249 or Andrea Grenier at (916) 780-1171.

Sincerely,

CH2M HILL

Sarah Madams
AFC Project Manager

Attachment

cc: A. Grenier
E. Warner/NCPA

Application for Certification

Data Request Set 1A
(Responses to Data Requests 1–56)

Lodi Energy Center

February 2009

EY062008001SAC

Submitted by

NCPA
NORTHERN CALIFORNIA POWER AGENCY

Submitted to

California Energy Commission

With Technical Assistance by

CH2MHILL

Lodi Energy Center Project

(08-AFC-10)

Data Responses, Set 1A

(Response to Data Requests 1 to 56)

Submitted to

California Energy Commission

Submitted by

Northern California Power Agency

With Assistance from

CH2MHILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833

February 2009

Contents

Section Page

Introduction....1
Biological Resources (1–9)....3
Cultural Resources (10–16)....13
Geological Resources (17)....21
Land Use (18–25)....25
Power Plant Reliability (26)....29
Soil and Water Resources (27–37)....33
Transmission System Engineering (38–47)....43
Visual Resources (48–49)....49
Waste Management (50–56)....51

Attachments

DR17-1 1993 Kleinfelder Geotechnical Report
DR26-1 City of Lodi Water Supply Will-serve Letter
DR36-1 Soil Excavation Calculations
DR38-1 Interconnection Facilities Study Report
DR50-1 Phase I ESA Letter Identifying Project Size

Tables

DR10-1 Depth to Excavation for Project Features
DR18-1 Williamson Act Contract and Farmland Security Act Contract and Owner of Record by Assessor's Parcel Number
DR30-1 Agency Contacts for recycled water permitting

Figures

DR8-1a Arial Photographs of Natural Gas Pipeline
DR8-1b Arial Photographs of Natural Gas Pipeline
DR8-1c Arial Photographs of Natural Gas Pipeline
DR9-1 General Arrangement Showing Transmission Line and Pole Locations
DR11-1 Estimated Depths to Excavation for Project Equipment
DR12-1 Previously Disturbed Areas and the LEC Project Site

Introduction

Attached are Northern California Power Agency's (NCPA) responses to the California Energy Commission (CEC) Data Request Set 1 (numbers 1 through 55) regarding the Lodi Energy Center Project's (LEC) (08-AFC-10) Application for Certification (AFC).

The responses are grouped by individual discipline or topic area. Within each discipline area, the responses are presented in the same order as the CEC presented them and are keyed to the Data Request numbers (1 through 56)[1]. New or revised graphics or tables are numbered in reference to the Data Request number. For example, the first table used in response to Data Request 36 would be numbered Table DR36-1. The first figure used in response to Data Request 42 would be Figure DR42-1, and so on.

Additional tables, figures, or documents submitted in response to a data request or workshop query (supporting data, stand-alone documents such as plans, folding graphics, etc.) are found at the end of each discipline-specific section and are not sequentially page-numbered consistently with the remainder of the document, though they may have their own internal page numbering system.

[1] The Waste Management Data Requests were misnumbered in the original Data Request package. Data Request 52 has been added, increasing the number of Data Requests from 55 to 56.

Biological Resources (1–9)

Background

During an informal visit to the proposed project site, Energy Commission staff identified a wetland adjacent to the southwest edge of the project site in a depression paralleling a large vegetated irrigation canal. The irrigation canal is just outside the south edge of the project boundary. Arroyo willow (*Salix lasiolepis*) and Fremont cottonwood (*Populus fremontii*) also occur around this depression. The wetland is located within the proposed project site and was not mentioned in the Wetland Survey in Section 5.2.1.4.4 of the AFC. The dominant plants identified in the wetland are perennial pepperweed (*Lepidium latifolium*) and heliotrope (*Heliotropium curassavicum*), which are facultative wet (FACW) and obligate (OBL) species, respectively. A FACW plant is one which usually occurs in wetlands (estimated probability 67 percent to 99 percent), whereas an OBL plant occurs almost always under natural conditions in wetlands (estimated probability 99 percent). The depression also provides the necessary hydrologic conditions to collect water for a wetland.

According to the AFC Water Resources Section 5.15.1.1, page 5.15-5, the irrigation canal is connected to waters of the U.S. via the California Department of Fish and Game (CDFG) White Slough Wildlife Area, as White Slough ultimately drains to the Sacramento-San Joaquin River Delta. Since the wetland on-site is adjacent to the irrigation canal, this wetland may potentially fall under the U.S. Army Corps of Engineers (USACE) jurisdiction as waters of the U.S. Email correspondence had been initiated with Kate Dadey of the USACE who provided a wetlands and waters map, Figure DA 5.2-1a, had been provided. Also, since waters of the State are potentially on-site, impacts to potential waters of the State would require a Streambed Alteration Agreement by the CDFG before any disturbance. Assuming there is concurrence between staff and the applicant regarding the site as a potential wetland, a jurisdictional determination will be needed to complete the analysis.

Data Request

1. The AFC Data Adequacy Supplement B wetlands map Figure DA 5.2-1a does not identify the wetland described above. Please conduct a formal wetland delineation for the project area and provide the wetland delineation report and final determination from the USACE regarding whether or not jurisdiction will be asserted on the wetland and irrigation canals.

Response: Additional surveys were conducted in December 2008 by CH2M HILL wetland ecologist Russell Huddleston. Based on these investigations, it has been determined by the Applicant that this area is not a wetlands and a wetland delineation will not need to be conducted. A technical memorandum discussing these findings was docketed with the CEC on January 12, 2009, and submitted to USACE and Regional Water Quality Control Board (RWQCB) for concurrence on January 13, 2009.

Data Request

2. Please contact CDFG and provide a record of correspondence regarding the need to complete a Streambed Alteration Agreement. Should a Streambed Alteration Agreement be needed, please explain the project-specific circumstances that would necessitate substantial temporary or permanent impacts to jurisdictional waters of the State.

Response: Under Section 1602 of the California Fish and Game Code, notification is required by any person, business, state or local government agency, or public utility that proposes an activity that will:

- Substantially divert or obstruct the natural flow of any river, stream or lake;
- Substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or
- Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

The notification requirement applies to any work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel. This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It may also apply to work undertaken within the floodplain of a body of water.

The proposed LEC project will not affect any rivers, streams, lakes, or other features with a defined bed and bank, nor will it occur within the floodplain of any such features; therefore, no streambed alteration agreement would be required. Appropriate erosion-control measures and best management practices, including a minimum buffer area, will be established to ensure no material is allowed to enter the adjacent irrigation canal.

Data Request

3. Please provide the anticipated schedule of USACE and Regional Water Quality Control Board (RWQCB) permitting for (and verification of) jurisdictional waters, and expected mitigation measures likely to be included in USACE and RWQCB permits, if appropriate.

Response: The area of concern is located outside of the project area and, as noted in the response to Data Request 1, this area is not a wetland. Because no wetlands occur in the project area, no Permits for Wetland or Waters of the State would be required.

Data Request

4. Please provide a discussion of impact avoidance and minimization measures to be implemented to protect the adjacent irrigation canal during construction.

Response: The adjacent irrigation canal provides suitable habitat for the giant garter snake, a federally listed threatened species. Mitigation measures to protect this area include the establishment of an environmentally sensitive buffer area (25 to 30 feet) between the work areas and the edge of the canal. Silt fencing would be installed around the edges of the work areas to contain construction materials and activities, as well as to exclude snakes from the

work area. Signs would be posted along the fence clearly delineating the zone between the construction site and the canal as an environmentally sensitive area.

Background

AFC Section 5.2.1.1.4 on page 5.2-2 states that the CDFG White Slough Wildlife Area is located approximately 4 miles northwest of the project site, when in fact, the wildlife area is approximately one-half mile to the west of the project site. According to a December 2, 2008, phone conversation with Dan Gifford of CDFG, giant garter snake (GGS), federally and state listed as Threatened, and a bird, the California black rail (black rail), a federal species of special concern and state listed as Threatened and a Fully Protected species, occur in the White Slough Wildlife Area. The large vegetated irrigation canal located immediately south of the proposed project site connects to the White Slough Wildlife Area and provides suitable habitat for GGS and black rail. The proposed project area is considered by the San Joaquin Council of Governments' (SJCOG) document, the San Joaquin Multi-Species Habitat Conservation Plan (MSHCP) to be known occupied habitat for GGS. Staff also identified a wetland in a depression with arroyo willow and Fremont cottonwood adjacent to the southwest edge of the project boundary paralleling the irrigation canal. Bird species observed during field surveys included red-tailed hawk, white-tailed kite, a state Fully Protected species, and Swainson's hawk, a state listed Threatened species, on Table 5.2-2 on page 5.2-17 in AFC Section 5.2.1.4.2. Due to the presence of the wetland and trees, the area has the potential to provide habitat for special-status species and nesting raptors. Page 15 of the AFC Data Adequacy Supplement B Section 5 discusses impact avoidance and minimization measures that will be developed in coordination with the MSHCP Oversight Committee which includes representatives from U.S. Fish and Wildlife Service (USFWS) and CDFG. This is further complicated by a need to fill the wetland and may require a Clean Water Act Section 404 permit from the USACE. If the USACE determines that the wetland is not within its jurisdiction, then the applicant will lack a federal agency nexus and would likely need to consult directly with the USFWS through the Federal Endangered Species Act Section 10 process.

Data Request

5. Please provide the impact avoidance and minimization measures, other mitigation measures, the mitigation performance standards, and remedial measures that will be developed by the MSHCP Oversight Committee to be implemented to protect sensitive species and nesting raptors that could use t the White Slough Wildlife area during construction.

Response: The Applicant has had initial conversations with the San Joaquin Council of Governments, U.S. Fish and Wildlife Service, and California Department of Fish and Game regarding potential mitigation measures for special-status species potentially found on site. A mitigation plan will be prepared that will address special-status species with the potential to occur on site. This plan will be submitted to the San Joaquin County Multi-Species Habitat Conservation Plan (MSHCP) Technical Oversight Committee for approval prior to the start of construction. The plan will included surveys for sensitive bird species, preconstruction surveys for giant garter snakes and nesting birds, biological monitoring, and the establishment of an environmentally sensitive area buffer along the north side of the canal.

Data Request

6. Please contact the USFWS and provide a status update on the anticipated schedule for the Section 7 consultation process should a federal agency nexus occur regarding USACE jurisdiction of on-site waters.

Response: The project will be consulting with USFWS through Section 10 (San Joaquin County MSHCP) not Section 7. No wetlands are present on site and no other areas are subject to USACE jurisdiction. Preliminary discussion has already been initiated with the San Joaquin Council of Governments and USFWS regarding potential mitigation measures. A mitigation plan will be developed by the Applicant that will be submitted to the MSHCP technical oversight committee for review and approval prior to the start of construction.

Data Request

7. Please contact the CDFG and the SJCOG regarding the special-status species that are Fully Protected (i.e., the birds, black rail and white-tailed kite) and provide the impact avoidance and minimization measures and other mitigation measures.

Response: Preliminary discussions have already been initiated with the San Joaquin Council of Governments, CDFG, and USFWS regarding potential mitigation measures. As mentioned in the response to Data Request 6, a mitigation plan will be submitted to the MSHCP technical oversight committee (which includes SJCOC, CDFG, and USFWS) for review and approval prior to the start of construction.

Background

Figure 5.2-2 of AFC Section 5.2 shows the proposed natural gas pipeline route and the project site relative to surrounding vegetation communities and habitat types. The colored overlays obscure the land features on the aerial figure. A detailed color aerial photograph at a scale of 1 inch equals 500 feet (1:6,000) with a 30 percent overlap without colored overlays would show the proposed project site and natural gas pipeline route more clearly. Staff needs this information to complete its analysis.

Data Request

8. Please provide color aerial photographs taken at a recommended scale of 1 inch equals 500 feet (1:6,000) with a 30 percent overlap showing the proposed natural gas pipeline corridor so that the features pictured on the aerial photographs are not obscured.

Response: Figures DR8-1a through DR8-1c are provided at the recommended scale of 1:6000.

Background

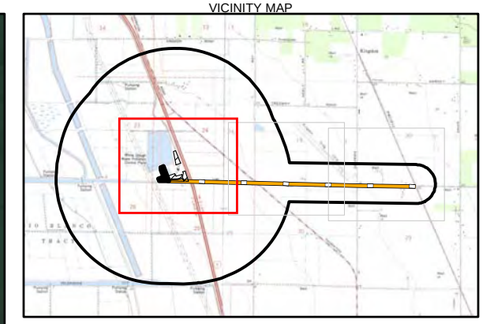
AFC Section 3.2 page 3-1 states that “there will be approximately 520 feet of line tying the plant to the existing STIG plant 230-kV switchyard.” AFC Figure 3.2-2 shows the proposed transmission tower to be utilized for the 520 feet of transmission line. No figures exist within the AFC with the location of the proposed transmission line or transmission towers relative to the biological resources on the project site. Staff needs this information to complete its analysis.

Data Request

9. Please provide a revised AFC Figure 5.2-4 with the location of the proposed transmission line and transmission towers added to the figure.

Response: Figure 2.1-1 in the AFC identifies both the proposed transmission line and transmission towers. For ease in locating the transmission line and towers, Figure 2.1-1 has been modified slightly (addition of color to show the transmission line and tower locations) and is provided as Figure DR9-1.

VICINITY MAP



LEGEND

- Preferred NG Route
- Proposed Lay Down and/or Parking
- Proposed Plant Site
- One Mile Buffer

Vegetation and Habitat Communities

- Agricultural
- Commerical
- Freeway
- Open Space
- Residential
- Wastewater Treatment Plant

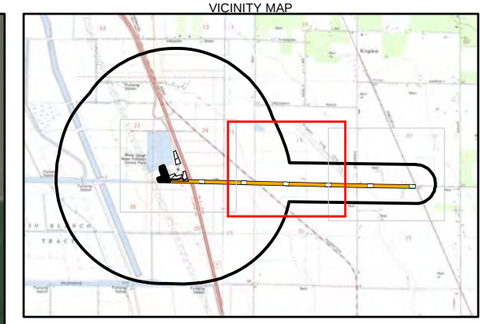
This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 250 500
Feet

FIGURE DR8-1A
AERIAL PHOTOGRAPH OF NATRUAL GAS PIPELINE
LODI ENERGY CENTER
LODI, CALIFORNIA

VICINITY MAP



LEGEND

- Preferred NG Route
- Proposed Lay Down and/or Parking
- Proposed Plant Site
- One Mile Buffer

Vegetation and Habitat Communities

- Agricultural
- Commerical
- Freeway
- Open Space
- Residential
- Wastewater Treatment Plant

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 250 500
Feet

FIGURE DR8-1B
AERIAL PHOTOGRAPH OF NATRUAL GAS PIPELINE
LODI ENERGY CENTER
LODI, CALIFORNIA

CH2MHILL

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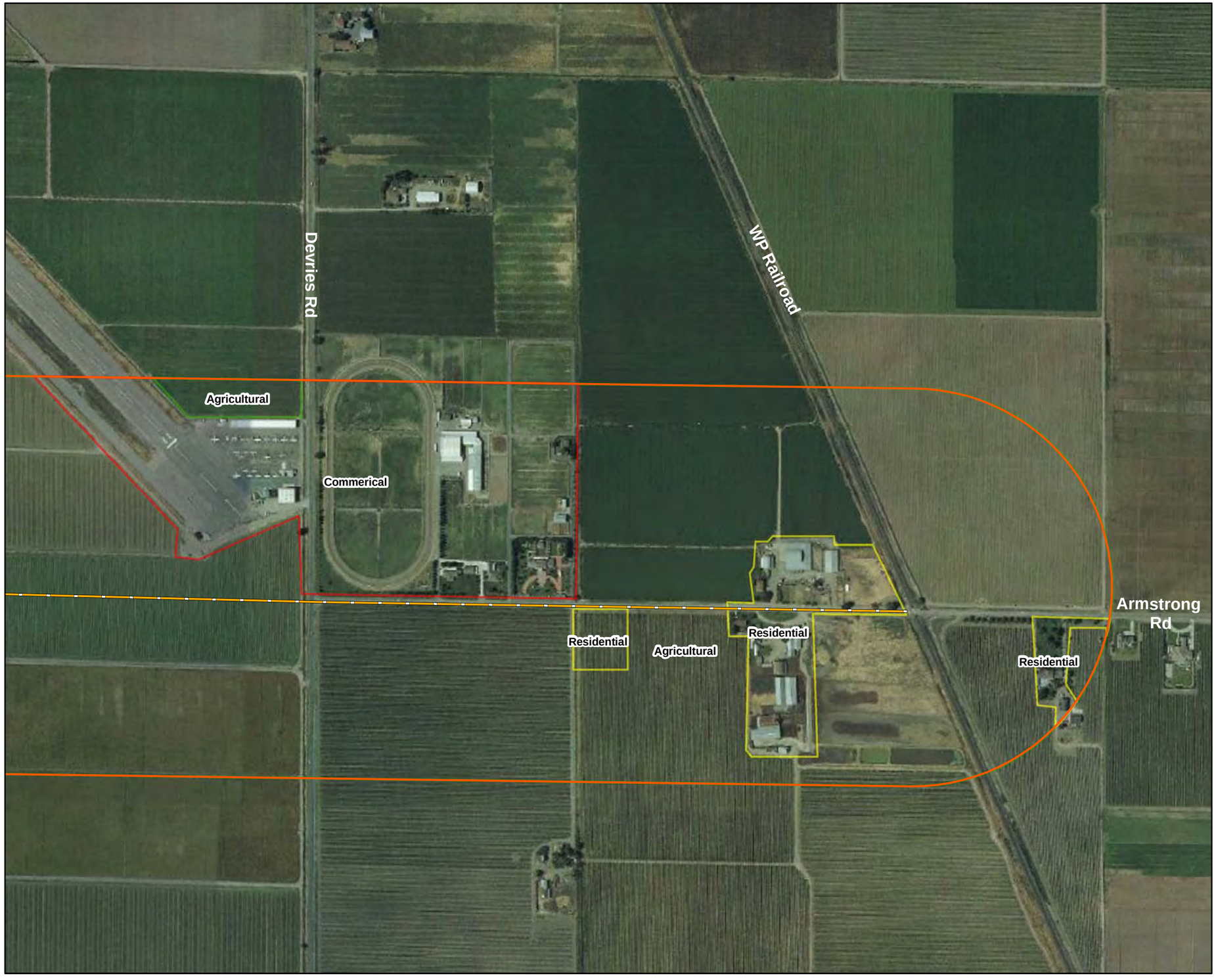

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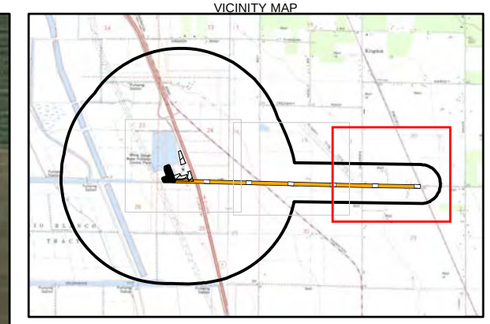

LEGEND

- Preferred NG Route
- Proposed Lay Down and/or Parking
- Proposed Plant Site
- One Mile Buffer

Vegetation and Habitat Communities

- Agricultural
- Commerical
- Freeway
- Open Space
- Residential
- Wastewater Treatment Plant

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 250 500
Feet

FIGURE DR8-1C
AERIAL PHOTOGRAPH OF NATRUAL GAS PIPELINE
LODI ENERGY CENTER
LODI, CALIFORNIA

CH2MHILL

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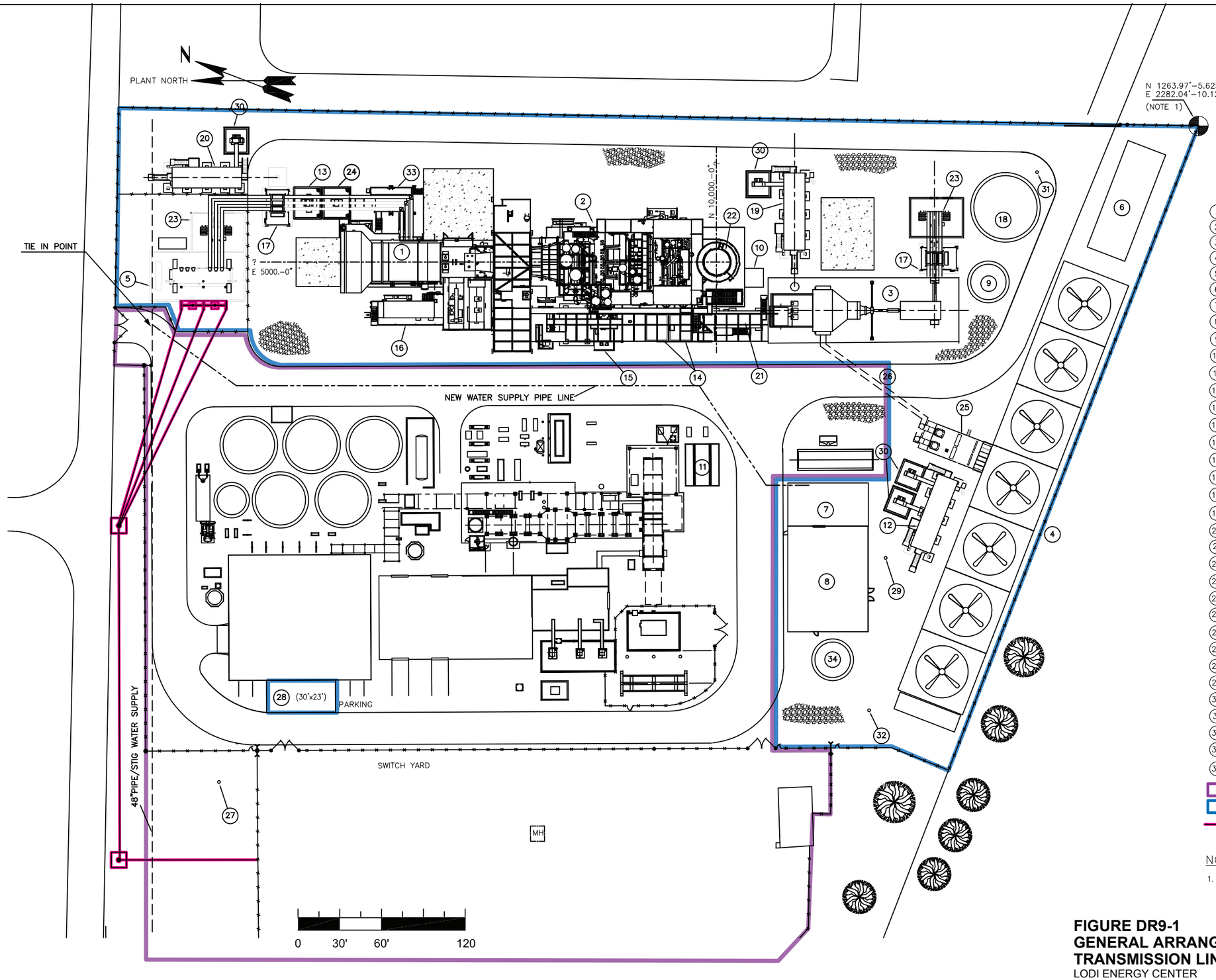

LEGEND:

1. COMBUSTION TURBINE/ GENERATOR
2. HRSG
3. STEAM TURBINE/ GENERATOR
4. COOLING TOWER
5. GSUT
6. GAS COMPRESSOR/METERING AREA
7. WATER TREATMENT BUILDING
8. COOLING TOWER CHEMICAL BLDG.
9. DEMIN. WATER TANK
10. CEMS
11. STIG PLANT COOLING TOWER
12. WT/CTWR PDC
13. LCI ISOLATION TRANSFORMER
14. BFP'S
15. BOILER BLOWDOWN TANK
16. PEECC
17. GEN. CIRCUIT BREAKER
18. FIRE/ RAW WATER TANK
19. STG PDC
20. CTG PDC
21. HRSG PDC
22. STACK
23. UNIT AUX. TRANSFORMER
24. EXCITATION TRANSFORMER
25. COOLING WATER PUMP STRUCTURE
26. U/G COOLING WATER PIPING
27. EXISTING INJECTION WELL
28. NCPA WAREHOUSE
29. POTABLE WATER WELL
30. SUS TRANSFORMER
31. REPLACEMENT WELL (FUTURE)
32. INJECTION WELL HEAD
33. LCI/GENERATOR EXCITMENT COMPARTMENT
34. WASTE WATER STORAGE TANK

EXISTING STIG PLANT AND SWITCHYARD
LEC PROJECT
TRANSMISSION LINE AND POLE LOCATIONS

NOTES

1. COORDINATES DEPICTED REFLECT STACK CENTERLINE.

FIGURE DR9-1
GENERAL ARRANGEMENT SHOWING TRANSMISSION LINE AND POLE LOCATIONS
LODI ENERGY CENTER
LODI, CALIFORNIA

Source: Worley Parsons LTD, Drawing LODI-0-SK-111-007-001C, 08-28-08

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Cultural Resources (10–16)

Background

The AFC for the Lodi Energy Center (LEC) includes information on the acreage of soil disturbance for laydown, site preparation, and grading. Information that appears to be missing from the AFC includes details regarding the respective depths of various excavation activities for construction of the new facility. The previous construction of the NCPA Combustion Turbine # 2 (CTP) probably resulted in the disturbance of the upper soil layers of at least part of the proposed project site.

The LEC project description (pp. 2-9–2-17) lists several equipment installations that appear to require foundations capable of considerable weight-bearing. Staff assumes that such foundations would have to extend to some depth in the ground and additionally that overexcavation of the holes for these foundations and filling with engineered fill could be required to ensure the stability of the foundations. Thus it is possible that excavations associated with the new installation could reach previously undisturbed soil layers where intact archaeological deposits could exist.

To assess potential project impacts to possible buried archaeological resources, staff needs information on the locations and on the greatest depths to which previous ground disturbance of any nature extended and on the greatest depths to which the proposed new equipment foundations would extend.

Data Request

10 Please provide the depths of the excavations, from the existing finish grade, required for the following trenches and foundations for proposed LEC equipment, systems, and features:

a. new combustion turbine generation
b. new steam turbine generator
c. new automatic generator control
d. new selective catalytic reduction emission control system
e. new auxiliary boiler and stack
f. pipelines for water, natural gas, wastewater, and stormwater
g. new generation setup unit

Response: The estimated depth of excavation required for each foundation, from the existing site grade to the bottom of excavation is indicated in Table DR10-1. Because overexcavation and recompaction will be required for power island equipment, the level of disturbance in some cases is deeper than the bottom of foundation.

TABLE DR10-1
Depth to Excavation for Project Features

Project Feature	Depth to Excavation
Combustion turbine generator	~ 7 feet (to elevation -1) (relative to sea level)
Steam turbine Generator	~ 7 feet (to elevation -1)
Automatic generator control	The arrangement drawing does not identify a "new automatic generator control" and therefore this information is not provided.
Selective catalytic reduction emission control system	~6 feet (to elevation 0)
Auxiliary boiler and stack	~5 feet (to elevation 0)
Pipelines for water, natural gas, wastewater, and stormwater	Varies from 0 feet (where shallow pipes will be placed in areas of fill) to approximately 10 feet (to elevation -4) for the circulating water pipe.
Generation step-up unit	~7 feet (to elevation -1) (assumed to be the generator step-up transformer)

Data Request

11. Please adapt Figure 2.1-2 (Proposed LEC Project Elevations) to show the expected depths of foundations for the illustrated equipment, pipelines, and underground tank installations.

Response: Figure DR11-1 shows the expected depths of foundations for the equipment, pipelines, and underground tank installations.

Data Request

12. Please provide a separate project site plan showing the locations of all previous ground-disturbing activities. A site plan such as AFC Figure 2.1-3 with the disturbed areas indicated by shading or other such convention would be acceptable.

Response: Figure DR12-1 shows the locations of all previous ground-disturbing activities at the project site.

Background

The “Construction Impacts” subsection of the AFC’s discussion of cultural resources notes the “extensive disturbance” of the project site due to the construction of the existing STIG plant, and the unlikelihood of encountering buried cultural resources except for “limited potential” below the “plow zone.” Paleontological and soils investigations in the AFC describe soils in the project area consisting of the Mokelumne River alluvial fan deposits, and alluvial silty clay, sand, and gravel, all of which could have covered prehistoric archaeological sites. Prior to historic leveling of the area for agriculture, many of the prehistoric archaeological sites in the Delta were on low mounds possibly associated with the alluvial fan deposits and late Pleistocene-age dunes. Archaeologists have observed that some of the mounds extend below the current ground level and some are buried entirely with no surface evidence, making the consideration of the potential presence of buried

archaeological deposits relevant. Staff needs additional information to evaluate the potential for encountering buried archaeological deposits during the construction and operation of the project.

Data Request

13. Please provide a discussion of the historical geomorphology of the project site that evidences consideration of the potential there for buried archaeological deposits. The discussion should include information on the development of Delta sand deposits during and subsequent to the Late Pleistocene era, particularly sands of the Piper series. The primary bases for the discussion should be data on the geomorphology, sedimentology, pedology, and stratigraphy of the project area or the near vicinity during the Late Quaternary period. The sources of these data may be a combination, as necessary, of extant literature or primary field research.

Response: A discussion regarding the geomorphology of the project area is currently underway and will be provided in mid-February.

Background

The AFC does not mention whether the project will need to import fill to the site and/or export unsuitable soils off-site. Staff needs to know if the soil borrow or soil disposal sites the project would use have been surveyed for cultural resources.

Data Request

14. Please indicate whether the proposed project may use any non-licensed, non-commercial soil borrow or disposal sites. If so:

    Please have a qualified archaeologist survey these sites and record on Department of Parks and Recreation (DPR) 523 forms any cultural resources that are identified;

    a. Please submit to staff a report on the methods and results of these surveys, with recommendations for the treatment of any cultural resources identified in the surveys; and

    b. Per Soils on page 37 of AFC Supplement B, please create a list of potential vendors for fill in the project vicinity.

Response: As discussed in the AFC Supplement B, response 15, the project will only use licensed commercial fill and will not utilize a borrow or disposal site. At this time, vendors have not yet been selected, but will be selected prior to the start of construction.

Background

Trenching dimensions for the natural gas pipeline for the project are included in the AFC, but with no discussion of associated additional ground disturbance, such as new access roads. Staff needs to identify any cultural resources that could be impacted by additional ground disturbance, and to identify any additional potential impacts to cultural resources.

Data Request

15. If any additional ground disturbance, such as new access roads, will be needed to construct the natural gas pipeline, please have an archaeologist who meets the

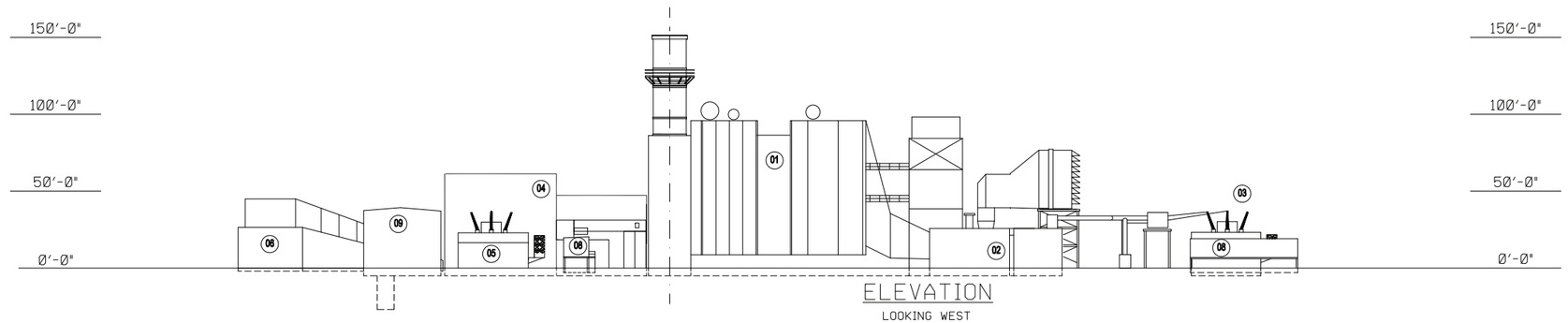
Secretary of the Interior's Professional Standards survey for cultural resources the impact areas of all additional ground-disturbing activities and provide staff with a report of the survey methods, personnel resumes, and results.

Response: The new natural gas pipeline will be constructed, owned, and operated by PG&E. It will be located in a preexisting PG&E easement.

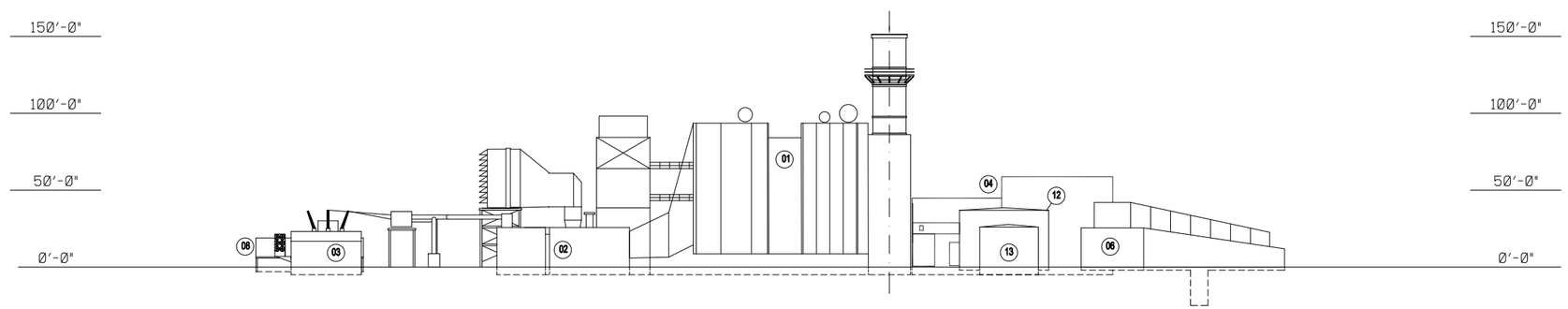
Data Request

16. If there will be any additional ground disturbance, please provide staff with a description of the ground-disturbing activity and maps showing the extent of all such areas.

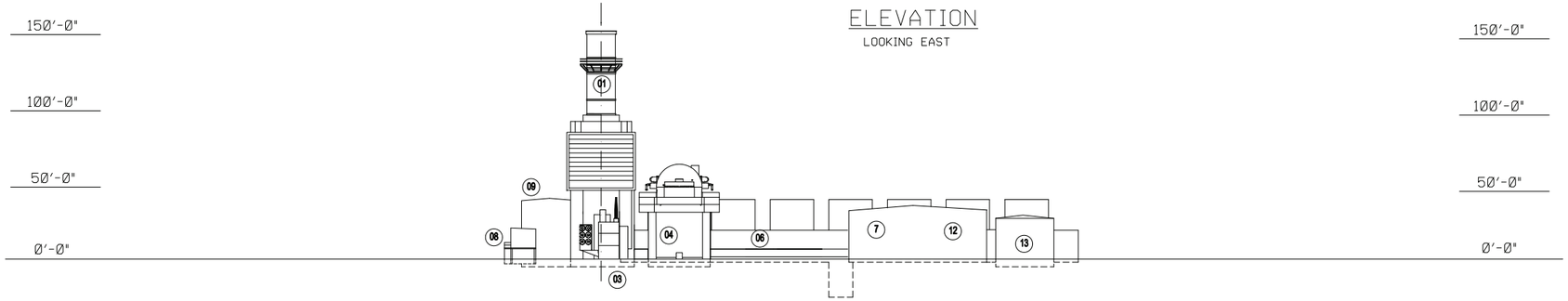
Response: Please see the response to Data Request 15.



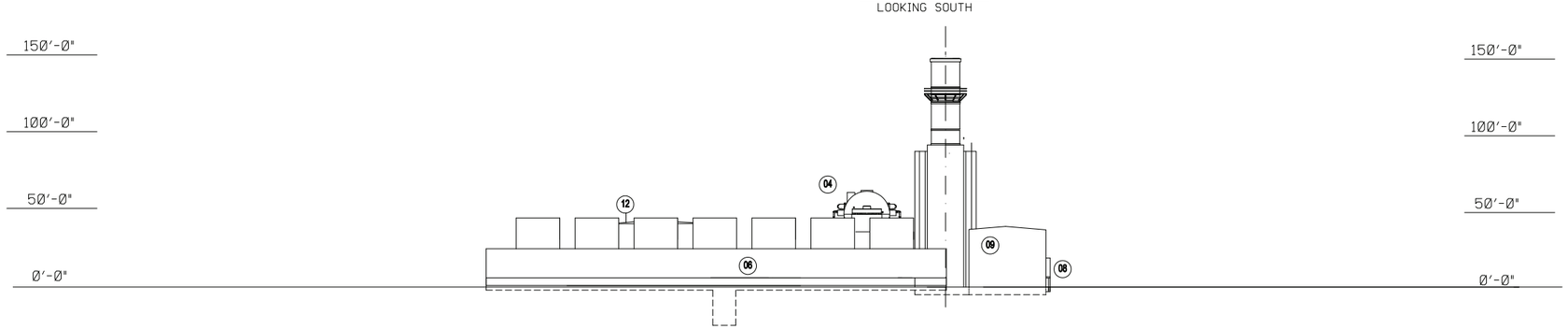
ELEVATION
LOOKING WEST



ELEVATION
LOOKING EAST



ELEVATION
LOOKING SOUTH



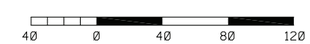
ELEVATION
LOOKING NORTH

LEGEND:

01- HRSG
02- COMBUSTION TURBINE GENERATOR
03- GENERATOR STEP-UP TRANSFORMER
04- STEAM TURBINE GENERATOR
05- UNIT AUX TRANSFORMER
06- COOLING TOWER
07- COOLING TOWER CHEMICAL FEED BUILDING
08- PDC
09- RAW/FIRE WATER STORAGE TANK
10- NOT USED
11- NOT USED
12- WATER TREATMENT BUILDING
13- WATSE WATER STORAGE TANK

NOTES:

ELEVATION DRAWINGS ARE REFERENCING PLANT NORTH



Source: Worley Parsons LTD, Drawing LODI-0-SK-111-002-101B, 01-13-09

FIGURE DR11-1
ESTIMATED DEPTHS TO EXCAVATION FOR PROJECT EQUIPMENT
LODI ENERGY CENTER
LODI, CALIFORNIA

CH2MHILL

FIGURE DR12-1
PREVIOUSLY DISTURBED AREAS AT THE LEC PROJECT SITE
LODI ENERGY CENTER
LODI, CAIFORNIA

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

CH2MHILL

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Geological Resources (17)

Background

Site-specific subsurface information is essential to completely evaluate a site with respect to potential geologic hazards and how the existing materials may impact design, construction, and operation of the facility. The information is also useful in establishing the geologic profile with respect to potential paleontological resources. The AFC for the Lodi Energy Center references an existing geotechnical report for an adjacent project (Kleinfelder, 1993).

Data Request

17. Please provide a copy of the 1993 Kleinfelder geotechnical report.

Response: A copy of the 1993 Kleinfelder geotechnical report is provided as Attachment DR17-1.

ATTACHMENT DR17-1

1993 Kleinfelder Geotechnical Report

REPORT
GEOTECHNICAL INVESTIGATION
PROPOSED COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA

PREPARED FOR: NOELL, INC.
2411 DULLES CORNER PARK, SUITE 410
HERNDON, VIRGINIA 22071

ATTENTION: MR. PETER LUMINI

BY: KLEINFELDER, INC.
2825 EAST MYRTLE STREET
STOCKTON, CALIFORNIA 95205

DATE: FEBRUARY 23, 1993

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THIS DOCUMENT WAS PREPARED FOR USE ONLY BY THE CLIENT, ONLY FOR THE PURPOSES STATED, AND WITHIN A REASONABLE TIME FROM ITS ISSUANCE. PLEASE READ THE "LIMITATIONS" SECTION OF THIS REPORT.

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KLEINFELDER

File No-20-3693-01.001
February 23, 1993

Mr. Peter Lumini
Noell, Inc.
2411 Dulles Corner Park, Suite 410
Herndon, Virginia 22071

Subject: GEOTECHNICAL INVESTIGATION REPORT
PROPOSED COMBUSTION TURBINE PROJECT NO. 1
LODI, CALIFORNIA

Dear Mr. Lumini:

Kleinfelder, Inc. is pleased to present the attached geotechnical investigation report for the proposed combustion turbine No. 1 project to be located in Lodi, California. The purpose of our investigation was to explore and evaluate the subsurface conditions at requested locations on the site in order to provide geotechnical parameters and recommendations for use in design.

Based on the results of our field explorations and laboratory testing, it is our professional opinion that the site can be developed as planned. We understand that it is proposed to raise the grade at the site by 3 feet so all structures will be underlain by a minimum of 3 feet of Engineered Fill. We recommend that the heavier structures of the facility be supported on mat or spread foundations underlain by 5 to 8 feet of Engineered Fill. Due to the presence of loose, near-surface sandy soils, it will be necessary to overexcavate and recompact these soils, or use dynamic compaction techniques, in the vicinity of the heavier, more sensitive elements of the facility in order to reduce the risk of differential settlement. Our comments, geotechnical parameters, and recommendations regarding site earthwork and foundation design are presented in the attached report.

Recommendations provided herein are contingent on the provisions outlined in the "ADDITIONAL SERVICES" and "LIMITATIONS" sections of this report. The project owner should become familiar with these provisions in order to assess further involvement by Kleinfelder, Inc. and other potential impact on the proposed project.

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KLEINFELDER 2825 East Myrtle Street, Stockton, CA 95205 (209) 948-1345

We appreciate the opportunity of providing our services for this project and look forward to providing further assistance during construction. If you have any questions regarding this report or if we can be of further assistance, please contact the undersigned.

Very truly yours,

KLEINFELDER, INC.

Patrick C. Dell, C.E.
Project Engineer

Ron Heinzen, G.E.
Regional Manager

REGISTERED PROFESSIONAL ENGINEER
PATRICK CRAIG DELL
No. 42018
Exp. 3-31-96
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
RONALD TERRY HEINZEN
No. 388
Exp. 3-31-95
GEOTECHNICAL
STATE OF CALIFORNIA

PCD:sh
Attachments

cc: ESA Engineering Corp. - Laguna Hills, California
Noell, Inc. - Long Beach, California

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REPORT
GEOTECHNICAL INVESTIGATION
PROPOSED COMBUSTION TURBINE PROJECT NO. 1
LODI, CALIFORNIA

I. INTRODUCTION

This report presents the results of our geotechnical investigation performed for the proposed combustion turbine project No. 1 to be located adjacent to the City of Lodi White Slough Waste Water Treatment Plant, west of Interstate 5 and south of Highway 12 in Lodi, California. A plot plan and vicinity map showing the facility layout and site location are presented on Plate A-1 of the appendix.

This report includes geotechnical parameters and recommendations for use in site development and structure design. The conclusions and recommendations presented in this report are based on the subsurface conditions encountered at the locations of our field explorations and on our general knowledge of soil and foundation conditions within the site area.

II. PROPOSED CONSTRUCTION

The proposed project will involve construction of a combustion turbine/generator; water, ammonia, and fuel storage tanks; transformers and other electrical equipment; gas compressors; and warehouse and support structures. A 25-foot wide road will extend around the planned structures. The location and dimensions for key elements of the project were provided on your Drawing No. 55100-C-15, dated May 17, 1991, and a plot date of January 22, 1993.

Grading plans were not available at the time this report was prepared. However, we understand that it is planned to raise the grade by approximately 3 feet. We have assumed that this Engineered Fill will consist of imported soil.

III. PURPOSE AND SCOPE OF INVESTIGATION

The purpose of our geotechnical investigation has been to explore and evaluate the subsurface conditions at requested locations on the site in order to provide geotechnical parameters and recommendations for use in design. Our scope of services was outlined in our proposal dated November 19, 1992 and consisted of following:

- Exploration, using twelve test borings, of the subsurface conditions at requested locations within the area of the proposed construction (sixteen borings actually drilled)

- Laboratory testing of representative samples obtained during the field explorations to evaluate relevant engineering parameters of the subsurface soils

- Preparation of this report which consists of:

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- A description of the proposed project
- A description of the surface and subsurface site conditions encountered during our field explorations
- Summary of geological hazards, including liquefaction potential
- Comments and recommendations regarding site preparation, Engineered Fill, and anticipated excavation conditions
- Recommendations for various foundation support systems and associated geotechnical parameters applicable to the proposed construction
- Geotechnical parameters and recommendations regarding concrete slabs supported-on-grade
- Recommended asphalt concrete and concrete pavement sections
- Results of a field resistivity survey
- A summary of the field explorations and laboratory testing programs

IV. SITE CONDITIONS

1. Surface

The site is essentially flat and was covered with low weeds and grasses at the time of our field explorations. It appeared as though the site may have been used as pasture in the past. We understand that some sludge from the adjacent treatment facility has been spread on the surface of the site. This material appears to have mixed in with the upper 6 inches or so of surface soils.

The site is bounded on the west and south by more pasture fields. Settling basins and the waste water treatment facility bound the site on the north and east. A drainage ditch is also present along the southern boundary of the site. The approximate elevation of the site is 5 feet, based on the USGS topography map for this area. The locations of any underground utilities or other buried objects at the site are not known to our firm.

2. Subsurface

In general, the surface soils encountered in the sixteen borings drilled for this project consisted of loose silty and clayey sands and soft to medium stiff sandy silts and sandy silty clays that extended to depths of approximately 2 to 3 feet below the ground surface. An exception to these surface soil conditions was encountered in the area of the steam turbine and heat recovery structures area. In borings B-7 and B-9, the loose silty sands extended to depths of approximately 8 feet below the ground surface. Below these depths, alternating layers and

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mixtures of medium stiff to hard sandy and silty clays and sandy and clayey silts and medium dense to very dense silty, clayey, and relatively clean sands were encountered which extended to the maximum depths explored of approximately 71½ feet.

Free groundwater was encountered in all our borings at depths of approximately 7 feet below existing ground surface. The depth to groundwater was measured after the borings had been left open for several days, which allowed the groundwater to stabilize in the test borings. Historically, the depth of groundwater has varied significantly in this area. At the adjacent Lodi White Slough Waste Water Treatment Facility, geotechnical studies performed in 1966, 1975, and 1988 encountered groundwater from approximately 2 to 12 feet below the existing ground surface. During the preliminary geotechnical investigation performed for this project in 1990, groundwater was encountered at a depth of approximately 12 feet below ground surface. The fluctuation in the groundwater elevation is due to the varied rainfall conditions that the central valley of California has experienced in the recent past. Therefore, groundwater conditions in this area may vary depending on rainfall, irrigation, groundwater withdrawal, construction activities, or other conditions not apparent at the time of our field explorations. At the time of our field explorations, the Lodi area had recently received above average rainfall for the previous four to six weeks. This probably had an effect on the groundwater table at the time of our field explorations.

A discussion of the field exploration and laboratory testing programs is presented in the appendix of this report. Detailed descriptions of the soils encountered in the borings are presented on the Logs of Borings, Plates A-3 through A-18 of the appendix.

V. GEOLOGIC HAZARDS SUMMARY

1. Regional Geology

Lodi is located in the central part of the Great Valley geomorphic province of California. The valley is situated between the Sierra Nevada mountains on the east and the Coast Ranges mountains on the west. These mountain ranges were formed by uplifts which occurred during the late Tertiary[1] and Quaternary periods. The structural trough or depression in bedrock formations between the ranges has been filled with alluvial, lacustrine, and some marine sediments that attain a maximum thickness of about 30,000 feet near the western margin. The bedrock complex is composed of metamorphosed marine sediments similar to those found in the foothills of the western Sierra Nevada and the core of the Coast Ranges.

2. Local Geology

The portion of the valley in the Lodi area exhibits a fairly complete stratigraphic section of Cretaceous, Tertiary, and Quaternary deposits. The sediments deposited prior to mid-Tertiary time were in a marine environment. Changes in sea level, valley filling, and uplift resulted in deposition of sediments in a continental environment after mid-Tertiary time. These continental

[1]Geologic Time Scale, Plate A-26

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sediments are exposed at the surface in the Lodi area. Near-surface sediments at the Lodi combustion turbine project site have been deposited primarily during flood stages of the Mokelumne and San Joaquin River systems, prior to the present-day flood-control systems. The logs of test borings included in the appendix of this report present a generalized cross-section of the soils encountered beneath the site to a depth of approximately 71½ feet.

3. Faults and Seismicity

The Central Valley of California is considered to be an area of relatively low seismicity in a state which is characterized by moderate-to-high seismic activity. During the formation of the Coast Ranges and the Sierra Nevada mountains, numerous faults and shear zones developed. These faults are primarily in the Sierra Nevada foothills and the Coast Ranges; however, a few extend beneath the valley sediments.

The site is not located within a special study zone as delineated by the Alquist-Priolo Special Studies Zones Act of 1972, and according to the San Joaquin County Seismic Safety Element and State Geology Map, no active or potentially active faults are known to reach the surface within Lodi. Several faults beneath the valley that displace "basement" rocks and some of the overlying sediments are suspected from subsurface oil and gas exploration. The nearest of these suspected buried faults are the Midland fault and the Tracy-Stockton fault. Neither of these faults is located near the site, and there is no evidence to suggest that either fault is likely to cause surface displacement in the Lodi area.

The major faults which have historically produced earthquakes of greatest magnitude in central California are the Calaveras, Hayward, and San Andreas faults in the Coast Ranges; the Greenville and Midland (suspected) faults on the west side of the Great Valley; and the Sierra Nevada and Owens Valley faults east of the Sierra Nevada mountains. A map showing the locations of the major faults of central California, in relation to the site, is presented on Plate A-27 of the appendix. A map showing the locations of historical earthquakes with Richter magnitudes greater than 5.0 that occurred between 1800 and 1990 within approximately 100 miles of the site is presented on Plate A-28 of the appendix.

The Maximum Credible Earthquake (MCE) is defined as "the maximum earthquake that appears to be reasonably capable of occurring under the conditions of the presently known 'geologic framework.'" The Maximum Probable Earthquake (MPE) is defined as "the maximum earthquake that appears to be reasonably expectable within a 100-year period." Ground accelerations anticipated to be associated with the MCE's and MPE's, presented in Table I, are derived from attenuation relationships developed by Donovan and Bornstein (1978).

The peak accelerations listed with other deterministic parameters in Table I are not intended for design purposes. They are intended only to provide a means of comparison between the possible affects of earthquakes occurring on the faults listed. The peak acceleration values listed are based on a specific attenuation relationship, and the values may vary significantly

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from those calculated using other relationships. As a general rule, seismic design should be performed in accordance with criteria set forth in the Uniform Building Code (UBC), except when site-specific seismic response spectra (dynamic analyses) are required. High-rise structures, certain hospital structures, and dams are examples of the types of structures commonly requiring dynamic analysis. The project structural engineer should assess the need for seismic response spectra for design of the project.

TABLE I
DETERMINISTIC SITE PARAMETERS

		Maximum Credible Event		Maximum Probable Event	
Fault Name	Approximate Distance (mi)	Max. Cred. Mag.	Peak Site Acc.(g)	Max. Peak Mag.	Peak Site Acc.(g)
Antioch	23	6.5	0.10	4.0	0.02
Calaveras	38	7.5	0.14	7.0	0.09
Foothills (Bear Mntns.)	33	6.5	0.07	5.0	0.02
Greenville	29	7.0	0.12	5.25	0.03
Hayward	48	7.5	0.11	7.0	0.07
San Andreas	66	8.5	0.22	8.0	0.14

Listing peak accelerations is a convenient method of categorizing and comparing earthquakes for geologic purposes. However, peak acceleration values are poor indications of potential building performance during earthquakes. The duration of shaking, the frequency content of the motion, localized subsurface conditions, and the details of the structures involved are all important factors in influencing building performance.

4. Liquefaction Potential

The analysis of the liquefaction potential for sediments beneath the site follows procedures outlined by Seed and Idriss. Soils most susceptible to liquefaction are uniformly graded soils, and of these soils, fine sands tend to liquefy more easily than do coarse sands, gravelly soils, silts, or clays. Other factors involved with liquefaction potential are the relative density of the soil, the amount and type of overburden, the shape and arrangement of soil particles, groundwater elevation, and seismic parameters of anticipated earthquakes.

As previously described in this report, the relative density of the near surface soils varied considerably over the site, from loose to dense. Loose soils within the upper 2 to 3 feet of the ground surface are not considered a problem since these will be recompacted during

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grading operations at the site. However, in several borings the loose soils extended to approximately 8 feet below the surface. Based on this information, it appears as though there are isolated pockets of loose, near-surface, sandy soils present at this site. In our opinion, because of the relatively high groundwater encountered and loose, near-surface, sandy soils, the liquefaction potential of some soils at the site is moderate to high. Even though the deeper deposits of loose soil were only encountered in two of the sixteen borings drilled for this study, in our opinion it would be prudent to attempt to mitigate the liquefaction potential of these soils rather than treat them as isolated pockets which would not effect the project.

If the surface to 3 feet of soil beneath the entire site is recompacted as recommended in subsequent sections of this report and because of the presence of strata of denser soils beneath the near-surface soils and the placement of 3 feet of Engineered Fill over the entire site, in our opinion the risk of damage to the lightly-loaded structures will be reduced. The placement of the Engineered Fill will act as an overburden pressure that will help to reduce the liquefaction potential at this site. In addition, if the upper 5 feet of soils beneath the heavily-loaded structures are overexcavated and recompacted as recommended, in our opinion the risk of damage to these structures from differential settlement will be reduced to tolerable limits.

The amount of overexcavating and recompaction of soil beneath the heavily-loaded structures is somewhat limited by the groundwater table encountered approximately 7 feet below the ground surface. In our opinion, if at least 5 feet of soil beneath the heavily-loaded structures is overexcavated and recompacted, some compactive effort will be transmitted down to the 8-foot level, thereby densifying these soils somewhat.

5. Other Geologic Hazards and Conclusions

In considering other possible geologic hazards to the combustion turbine project site, we evaluated the potential for ground lurching, landsliding, earthquake-induced flooding, tsunamis, and seiches. On the basis of our evaluation, we find that because of the topography and location of the site, it is highly improbable that damage would occur to the combustion turbine project site as a result of any of these possible hazards.

As a result of our evaluation, the following conclusions were reached regarding the geologic and seismic hazards at the combustion turbine project site:

- The potential for landslides or other downslope earth movements is very low because of the relatively flat topography.

- There are no known faults or shear zones crossing the site which would endanger the structures because of ground rupture.

- The potential for damaging strong motions associated with earthquakes in the site area, based on history, is low compared to much of California.

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- On the basis of available data, it is anticipated that the maximum peak site acceleration would not exceed approximately 0.22g based on a MCE of Richter magnitude 8.5 occurring on the closest point of the San Andreas fault zone, approximately 65 miles from Stockton.

- The potential for liquefaction beneath the site is moderate to high because of the soil and groundwater conditions encountered. However, the risk of damage to structures can be reduced provided the recommendations given in the following section are followed.

- The inland location of the site makes damage from tsunamis or seiches unlikely.

On the basis of our experience in this area and on our review of available literature, the structures should, as a minimum, be designed to meet seismic requirements stipulated by the current UBC for Seismic Zone 3 or California Administration Code, Title 24, whichever governs. The site coefficient per UBC, Table 23-J, is S2.

VI. SITE PREPARATION AND GRADING

1. Stripping and Grubbing

Prior to general site grading, all vegetation should be stripped and disposed of outside the construction limits. Deeper stripping or grubbing may be required where concentrations of organic soils are encountered during site grading. Although not encountered during our field investigation, it is possible that abandoned utility lines, septic tanks, cesspools, wells and/or foundations may exist on site. Since this is an agricultural site, the potential for such structures to have existed on this site is relatively low. If encountered, these items should be removed and disposed of off-site. Existing wells should be abandoned in accordance with applicable regulatory requirements.

Should site grading be performed during the winter or early spring, we anticipate near-surface site soils may be significantly above the optimum moisture content. These conditions could hamper equipment maneuverability on the site and efforts to compact the site soils to the recommended compaction criteria. Disking to aerate, chemical treatment, replacement with drier materials, or other methods may be required to reduce excessive soil moisture.

2. Anticipated Excavation Conditions

We anticipate earthwork grading and trench excavation should be possible using conventional earthwork equipment and techniques. However, somewhat slower excavations should be anticipated if cemented soils are encountered near the surface, such as was encountered in borings B-5, B-7, B-8, and B-12.

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3. Temporary Excavations

All excavations will have to comply with the requirements of Cal/OSHA. Additionally, all excavations deeper than 5 feet and involving personnel working within the excavation will have to be sloped and/or shored. Temporary excavations to a depth of approximately 10 feet below surrounding grade will likely require excavated slopes of 1:1 (1 horizontal to 1 vertical) or flatter, unless cemented materials are encountered. Steeper cuts can be utilized for excavations less than 5 feet deep, depending on the strength, moisture content, and homogeneity of the soils observed in the field. Based on our experience, we anticipate that portions of the upper, more silty sand soils can be excavated to shallow depths of 5 feet or less at near-vertical slopes. **Note: Flatter slopes and/or trench shields may be required where less silty and/or clean sand soils are encountered.**

4. Groundwater Considerations

Based on our borings and experience, groundwater may be a factor during construction on the site, depending on the depth of overexcavation required for support of the structures and the depth of underground utilities. Localized dewatering may be required, depending on the depth of groundwater at the time of construction and the depth of construction.

5. Engineered Fill

We anticipate that the majority of the on-site soils can be used as Engineered Fill. The near-surface soils that have been mixed with organic sludge material can be used as Engineered Fill provided these soils are thoroughly mixed with either clean native soils or imported soils. However, depending on the time of year that grading operations are begun, these soils may be in a very moist and unstable condition. If the on-site soils are overly moist at the time of construction, it is our opinion that they could be mixed with drier, imported material in order to be compacted as Engineered Fill.

Engineered Fill should be placed in loose lifts a maximum of 8 inches thick and should be compacted to at least 90 percent of the maximum dry density as determined by the ASTM D-1557 test procedure in all areas except beneath pavement areas and mat or other heavily-loaded foundation areas where the recommended minimum compaction should be increased to 95 percent. The more-silty, on-site materials are considered "moisture sensitive" and may be difficult to compact if the moisture content is elevated more than 2 or 3 percent above optimum.

Prior to the placement of any Engineered Fill, we recommend that the upper 2 to 3 feet of surface soils be recompacted to a minimum of 90 percent of the referenced maximum dry density. This may require overexcavation of 12 to 24 inches of the surface soils prior to the recompaction process.

As indicated in the following section on foundations for the turbine and heat recovery structures, we recommend that the upper 5 feet of native soil beneath these structures be overexcavated and recompacted to a minimum of 95 percent of the referenced maximum dry

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density. Because groundwater was encountered during our field explorations at a depth of approximately 7 feet below ground surface, overexcavating and recompacting the native soils to the depth requested may be difficult to achieve without dewatering the area. The use of lightweight excavating and compacting equipment in the bottom of the excavation and for the lower 1 to 2 feet of Engineered Fill may reduce the need for significant dewatering of this area.

Dewatering of this area should be done at least one to two weeks in advance of overexcavation in order to allow the soils to drain. Several methods are available to dewater this area. One method is to install several shallow wells around the perimeter of the area. Another method that can be used if only one to two feet of drawdown is required would be to use several sump pumps within the overexcavated area. In our opinion, the water table would probably only need to be lowered 2 to 3 feet from the present groundwater depth of 7 feet in order for equipment to work in the bottom of the excavation. If the work is carried out when the water table is lower, dewatering of the area might not be required. In surrounding areas, the irrigation season, roughly between May and October, can be the most difficult time from a groundwater standpoint because fields are being flooded which can temporarily raise the groundwater table on adjacent properties.

We have assumed imported fill will be required to raise the site 3 feet to final grade. We recommend that imported materials consist of granular, nonexpansive soil having a maximum percentage passing the No. 200 sieve of 40, a maximum plasticity index of 8, and a minimum Resistance-Value (R-Value) of 40. Samples of any proposed imported fill should be submitted to the soils engineer for approval prior to being taken to the site.

VII. FOUNDATIONS

1. Spread Footings

In our opinion, lightly-loaded structures which are not sensitive to settlement, such as office or warehouse buildings, can be supported on spread foundations bearing on Engineered Fill. We recommend that foundations extend at least 12 inches below grade. With these provisions, we recommend that a maximum allowable soil-bearing pressure of 3,000 pounds per square foot (psf) for dead plus live loads be used in the design.

Total settlement of an individual foundation will vary depending on the plan dimensions of the foundation and the actual load supported. Based on an assumed maximum foundation load of 50 kips (dead plus live loads) bearing on the compacted Engineered Fill, we anticipate a maximum settlement on the order of ¼ to ½ inch. Differential settlement between similarly-loaded adjacent footings is expected to be approximately ½ these values. Because of the predominantly sandy nature of the near-surface soils encountered across the site, settlement resulting from foundations bearing directly on Engineered Fill should be in the form of elastic compression of the underlying sandy soils. The majority of settlement should occur during construction and as the structural loads are applied.

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2. Heavily Loaded/Settlement-Sensitive Structures

We understand that the combustion turbine and heat recovery structure's mat foundations will exert contact pressures on the soil of approximately 2,000 psf. We anticipate that many of the heavier structures will be supported on mat foundations. Because the loose sandy soils extend deeper below the ground surface in the area of the turbine and heat recovery structure's location, we recommend that the upper 5 feet of soil beneath these structures be overexcavated and recompacted to a minimum of 95 percent of the maximum dry density prior to the placement of the 3 feet of Engineered Fill planned to raise the site grade.

With these provisions, it is our opinion that a maximum soil-bearing pressure of 4,000 psf can be used for design of both spread and mat foundations underlain by 6 to 8 feet of Engineered Fill. We recommend that the minimum embedment for spread foundations for heavily-loaded structures be 18 inches.

As with the more lightly loaded spread foundations, we anticipate that settlement will be in the form of elastic compression of the underlying soils. With between approximately 6 and 8 feet of Engineered Fill beneath the more heavily loaded foundations, we anticipate that settlement could be on the order of ¼ to ½ inch for spread foundations and ½ to ¾ inches for mat foundations, based on the assumed loading conditions. We anticipate that the differential movement of mat foundations will be within approximate ¼ inch in 20 feet.

The recommended bearing pressure can be increased, if desired, provided additional elastic compression is acceptable. As alternatives, mat foundations can be extended to reduce the actual bearing pressure and/or the thickness of Engineered Fill beneath foundations can be increased to more than the 6 to 8 feet recommended above.

3. General

Engineered Fill beneath all foundations should extend at least 5 feet outside the structure outline. The minimum width of all foundations should be 12 inches. All of the above-stated soil bearing pressures can by increased by ⅓ to account for the total of all loads, including wind and seismic forces. The above-mentioned soil bearing pressures are net values, and the weight of the concrete that extends below grade can be neglected in proportioning the foundations. In addition, all foundations should be designed by a structural engineer.

VIII. LATERAL PRESSURES

Resistance to lateral loads, including those due to wind or seismic forces, can be provided by frictional resistance between the bottom of concrete foundations and the underlying soils and by passive soil pressure against the sides of the foundations. We recommend a coefficient of friction of 0.40 be used between cast-in-place concrete foundations and the Engineered Fill. The passive resistance can be taken as equivalent to the pressure exerted by a fluid weighing 350 pounds per cubic foot (pcf) for Engineered Fill. The values recommended above include a calculated factor of safety of at least 1.5; therefore, frictional and passive pressure resistances may be used in combination without reduction.

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IX. DYNAMIC SOIL ANALYSIS PARAMETERS

In our opinion, the following parameters can be used for a dynamic soils analysis:

- Poisson's Ratio - 0.3
- Shear Modulus - 1,500 pounds per square inch (psi)
- Modulus of Elasticity - 40,000 psi
- Soil Density - 120 pcf
- Angle of Internal Friction - 30°
- Modulus of Subgrade Reaction:

  Vertical (Engineered Fill) - 200 pci
  Horizontal - Depends on depth

These approximate values are based on field and laboratory test results, past experience, and literature research.

X. CONCRETE SLABS SUPPORTED ON GRADE

Since the concrete slabs within the planned structures will be supported on compacted Engineered Fill at least 3 feet in thickness, a modulus of subgrade reaction of 200 psi per inch of deflection may be used for slabs supported on nonexpansive, compacted Engineered Fill.

XI. PAVEMENT SECTIONS

Since the existing surface soils at the site will be covered with at least 3 feet of Engineered Fill, no bulk samples were tested for R-Value for use in pavement section design. For purposes of this report, we have assumed that the upper 12 inches of Engineered Fill will have a minimum R-Value of 40. This value should be confirmed by laboratory tests prior to placement of the upper 12 to 18 inches of Engineered Fill in areas to receive pavement. If the imported Engineered Fill has a higher or lower R-Value than 40, the pavement sections presented below should be modified. Many borrow areas in Lodi contain soils that typically produce R-Values in excess of 50. If the R-Value of the Engineered Fill placed beneath pavement sections is greater than 40 the recommended pavement sections can be the same as those for the Ceres project.

Based on the design method presented in Topic 608 of the Caltrans Highway Design Manual, a design R-Value of 40, and assumed traffic indices, we recommend the following asphalt concrete and concrete pavement sections:

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Pavement Area	Assumed Traffic Index	Minimum Thickness of Asphalt Concrete	Minimum Thickness of Class II Aggregate Base	Minimum Thickness of Concrete Paving
General Parking	4.0	2" -	4" -	- 4"
Main Aisles and Truck Lanes	5.0	2" -	6" -	- 5"
	6.0	2½" -	8" -	- 6"
	7.0	3" -	9½" -	- 7"
	8.0	4" -	9½" -	- 8"

The subgrade soils over which the concrete paving materials are to be placed should be compacted to a minimum depth of 12 inches to a minimum of 95 percent of the ASTM D-1557 maximum dry density. In areas to receive asphalt concrete paving, the depth of compaction can be reduced to a minimum depth of 6 inches at a moisture content near optimum. In addition, it is recommended that all pavements conform to the following criteria:

- All trench backfills, including utility and sprinkler lines, should be properly placed and adequately compacted to provide a stable subgrade.
- An adequate drainage system should be provided to prevent surface water or subsurface seepage from saturating the subgrade soil.
- The aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by the ASTM D-1557 test method.
- The aggregate base, asphalt concrete, and concrete pavement materials should conform to the specifications stated in Sections 26, 39, and 40, respectively, of the State of California Standard Specifications, latest edition.
- The pavement section recommendations presented assume that periodic maintenance of pavements will be done, including sealing of cracks.

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- All curbs surrounding landscape areas should be embedded at least 6 inches below subgrade to minimize the movement of moisture beneath pavements.

The concrete paving should be air-entrained to provide air content of between 3 and 5 percent. We recommend that the concrete provide a 28-day compressive strength exceeding 4,000 psi and a modulus of rupture (flexural strength) exceeding 500 psi. In addition, it is recommended that the cement factor be a minimum of 5.5 sacks per cubic yard. The concrete mix should also be designed for a slump not exceeding 4 inches. For all outside edges of the pavement, it is recommended that they be thickened in accordance with PCA guidelines.

The concrete pavement should be constructed in an approximate 15 foot square grid system. If a square system is impractical, rectangular panels can be used in the form of 15 feet maximum. Joints should be spaced at each grid line location, a maximum of 15 feet apart.

XII. RESISTIVITY TESTS

Three resistivity tests were performed at the locations shown on Plate A-1 using a Soiltest model R-40C resistivity meter. The Wenner four-point configuration was used. The tests were performed with electrode spacing as specified of 2.5, 5.0, 10, and 15 feet. The test results are summarized in the following table.

FIELD RESISTIVITY TESTS

				Resistivity (ohm-cm)	
Location	**Electrode Spacing Feet**	**Layer Depth Feet**	**Layer Thickness Feet**	**Layer**	**Surface to Layer Bottom**
R-1	2.5	0 - 2.5	2.5	43830	43830
	5.0	2.5 - 5.0	2.5	28840	34870
	10	5 - 10	5	20120	25490
	15	10 - 15	5	15960	21260
R-2	2.5	0 - 2.5	2.5	47050	47050
	5.0	2.5 - 5.0	2.5	23130	31020
	10	5 - 10	5	16450	21490
	15	10 - 15	5	18240	20280
R-3	2.5	0 - 2.5	2.5	46550	46550
	5.0	2.5 - 5	2.5	19700	27690
	10	5 - 10	5	15650	19990
	15	10 - 15	5	18780	19560

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XIII. ADDITIONAL SERVICES

The review of plans and specifications, field observations, and testing by Kleinfelder, Inc. are an integral part of the conclusions and recommendations made in this report. The tests and observations requested at this time to be performed by Kleinfelder, Inc. during construction are as follows:

- Observation and testing during site preparation and grading and placement of 3 feet of Engineered Fill
- Observation of foundation excavations prior to placement of reinforcing steel

The above listed testing and observations are additional services to be provided by our firm. The costs for these services are included in our current fee arrangements. The costs for these services are not included in our current fee arrangements. Additional tests and consultations may be requested by the client during construction. These may include the following:

- Consultation during construction regarding items not covered in this report
- Testing of concrete during construction of facilities
- Testing of trench backfill

XIV. LIMITATIONS

1. The conclusions and recommendations in this report are for design purposes for the proposed combustion turbine project No. 1 as described in the text of this report. The conclusions and recommendations in this report are invalid if:

   - The assumed design loads change
   - The report is used for adjacent or other property
   - Changes of grades and/or groundwater occur between the issuance of this report and construction.
   - Any other change is implemented which materially alters the project from that proposed at the time this report was prepared.

2. The conclusions and recommendations in this report are based on the field explorations performed for this investigation. It is possible that variations in the soil conditions exist between or beyond the points of exploration, or the groundwater elevation may change, both of which may require additional investigations, consultation, and possible design revisions.

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3. This report was prepared in accordance with the generally accepted standard of practice which existed in San Joaquin County at the time the report was written. No warranty, expressed or implied, is made.

4. It is the CLIENT'S responsibility to see that all parties to the project, including the designer, contractor, subcontractor, etc., are made aware of this report in its entirety.

5. This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder, Inc. of such intended use. Based on the intended use of the report, Kleinfelder, Inc. may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder, Inc. from any liability resulting from the use of this report by any unauthorized party.

XVII. ADDITIONAL COPIES OF REPORT

We are providing Noell, Inc. with six bound copies of this report. If additional copies are required, we can provide them at an additional cost (in accordance with our current fee schedule) and after receipt of a written request from our client. **Under no circumstances will we provide a copy of the report to other design consultants or contractors without permission from our client.**

If you have any questions or need additional information, please contact us.

Respectfully submitted,

KLEINFELDER, INC.

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APPENDIX

FIELD INVESTIGATION AND LABORATORY TESTING

FIELD INVESTIGATION

General

The subsurface conditions at the site were explored between February 1 and 2, 1993, by drilling sixteen borings to depths ranging from approximately 30 to 71½ feet below existing grade. In addition, three resistivity tests were performed on February 9, 1993. The borings were performed at the approximate locations requested on the plans provided. Thirteen of the borings were drilled using a truck-mounted drill rig equipped with 6-inch-diameter hollow-stem augers. Three of the borings (B-7, B-8, and B-9) were drilled using a truck-mounted drill rig equipped with 8-inch diameter augers using the mud-rotary technique. The locations of the field explorations performed for this investigation are shown on Plate A-1. Note: The borings and resistivity test locations were located in the field by measuring with a tape measure from staked property corners. Therefore, the location of borings and resistivity tests shown on Plate A-1 should be relatively close to the locations requested.

Representatives of our firm maintained continuous logs of the borings, visually classified soils encountered according to the Unified Soil Classification System (See Plate A-2), and obtained relatively undisturbed soil samples of the subsurface materials. A key to the Logs of Borings is presented on Plate A-2 of this appendix; Logs of Borings are presented on Plates A-3 through A-18.

Sampling Procedures

Soil samples were obtained from the borings using a Modified California Sampler and Standard Penetration Sampler driven 18 inches (unless otherwise noted) into undisturbed soil using a 30-inch drop of a 140-pound hammer. Blow counts were recorded at 6-inch intervals for each sample attempt and are reported on Plates A-3 through A-18 in terms of blow-per-foot for the last foot of penetration. Soil samples obtained from the borings were packaged and sealed in the field to reduce moisture loss and disturbance, and returned to our Stockton laboratory for further testing. After borings were completed, they were backfilled with bentonite clay and drill cuttings.

LABORATORY TESTING

General

Laboratory tests were performed on selected samples to aid in soil classification and to evaluate physical properties of the soils which may affect the geotechnical aspects of project design and construction. A description of the laboratory testing program is presented below; a summary of all laboratory tests performed is presented on Plate A-19.

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Moisture Content and Dry Unit Weight

Moisture content and dry unit weight tests were performed to evaluate moisture-conditioning requirements during site preparation and earthwork grading; soil overburden, and active and passive earth pressures; and relative soil strength and compressibility. Moisture content was evaluated in general accordance with ASTM Test Method D 2216; dry unit weight was evaluated using procedures similar to ASTM Test Method D 2937. Results of these tests are presented on the logs and are summarized on Plate A-19.

Sieve Analysis

Sieve analyses and No. 200 Sieve Washings were performed to evaluate the gradational characteristics of the materials and to aid in soil classification. Tests were performed in general accordance with ASTM Test Methods C-136 and D-422. Results of these tests are presented on the logs and are also summarized on Plates A-19, A-24, and A-25.

Consolidation

Two consolidation tests were performed on samples obtained from the test borings to evaluate the consolidation characteristics of the soil. These test results were then used to estimate the approximate settlement that can be expected at this site based on the anticipated loading conditions. The tests were performed in general accordance with the procedures outlined in ASTM Test Method D 2435. Results of these tests are presented on Plates A-22 and A-23.

Direct Shear

Direct shear tests were performed on selected samples obtained from our test borings. These tests were performed to determine the drained shear strength and angle of internal friction of the native sandy soils. The tests were performed in general accordance with ASTM Test Method D 3080. Results of the direct shear tests are presented on Plates A-20 and A-21.

Unconfined Compression

Unconfined compression tests were performed on selected samples to evaluate the undrained shear strength of the fine-grained site soils. Test procedures were in general accordance with ASTM Test Method D 2166. Results of these tests are presented on the logs and Plate A-19.

Atterberg Limits Test

An Atterberg Limits test was performed on a sample of near-surface soil to evaluate the clay content and plasticity of the soil. This test was performed in general accordance with ASTM Test Method D-4318. Results of this test are presented on Plate A-19.

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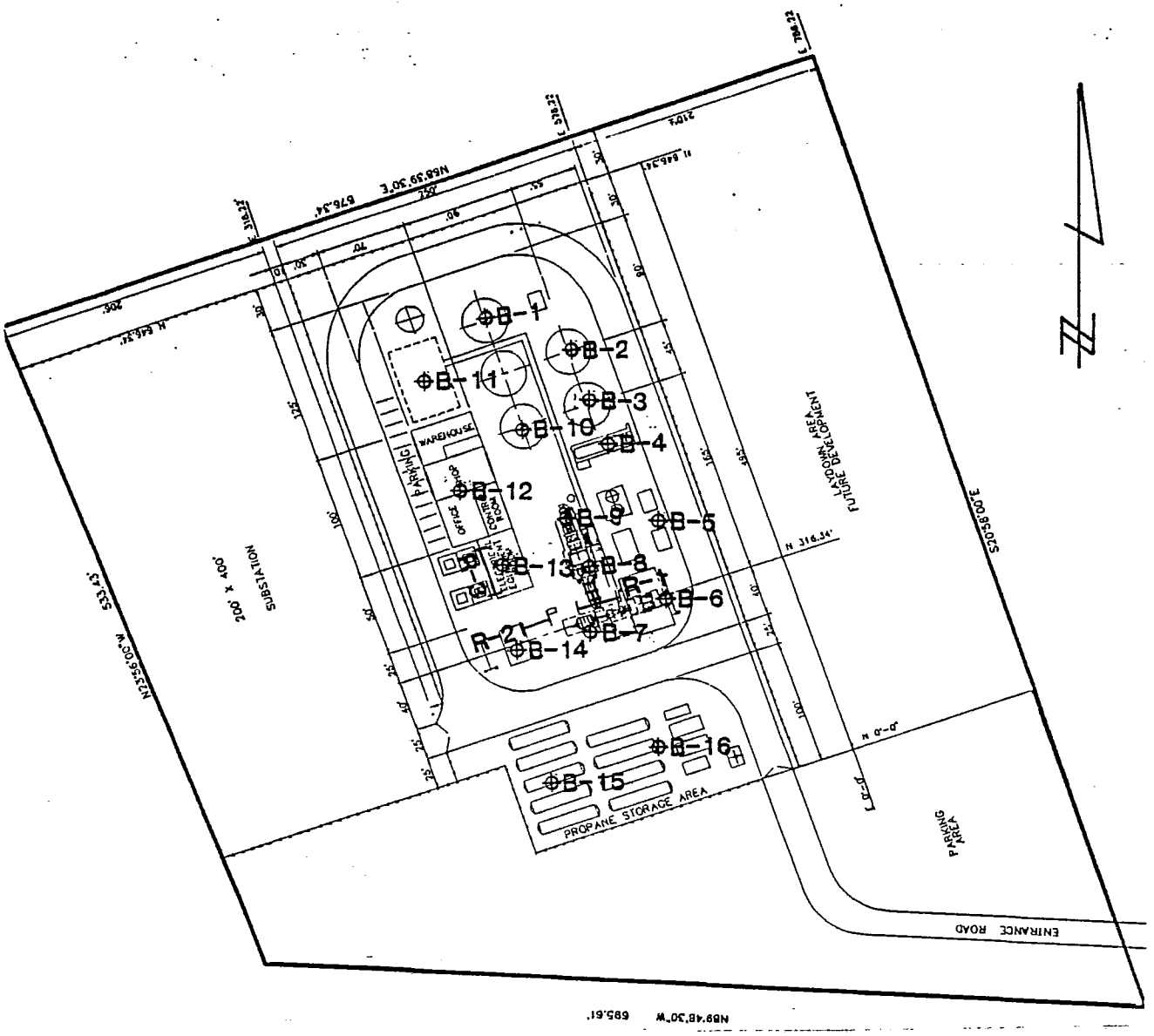
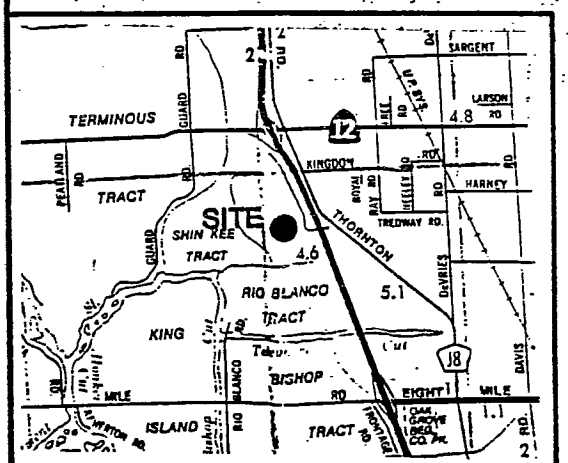
LIST OF ATTACHMENTS

	PLATE NO.
PLOT PLAN AND VICINITY MAP	A-1
UNIFIED SOIL CLASSIFICATION SYSTEM	A-2
LOGS OF BORINGS	A-3 THROUGH A-18
LABORATORY TESTS	A-19
DIRECT SHEAR TESTS	A-20 AND A-21
CONSOLIDATION TESTS	A-22 AND A-23
GRAIN SIZE DISTRIBUTION TEST	A-24 AND A-25
GEOLOGIC TIME SCALE	A-26
CALIFORNIA FAULT MAP	A-27
HISTORICAL EARTHQUAKE MAP	A-28





VICINITY MAP

B-1 DENOTES NUMBER AND APPROXIMATE LOCATION OF BORINGS DRILLED FOR THIS INVESTIGATION

R-1 DENOTES NUMBER AND APPROXIMATE LOCATION OF RESISTIVITY TRAVERSE PERFORMED FOR THIS INVESTIGATION

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PROJECT NO. 20-3693-01.001

PLOT PLAN AND VICINITY MAP
COMBUSTION TURBINE PROJECT NO. 1
LODI, CALIFORNIA

PLATE

A-1

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	G W	Well-graded gravels or gravel sand mixtures, little or no fines.	FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	M L	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		G P	Poorly-graded gravels or gravel sand mixture, little or no fines.			C L	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		G M	Silty gravels, gravel-sand-silt mixtures.			O L	Organic silts and organic silt-clays of low plasticity.
		G C	Clayey gravels, gravel-sand-clay mixtures.		SILTS AND CLAYS LL > 50	M H	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts.
	SAND AND SANDY SOILS	S W	Well-graded sands or gravelly sands, little or no fines.			C H	Inorganic clays of high plasticity, fat clays.
		S P	Poorly-graded sands or gravelly sands, little or no fines.			O H	Organic clays of medium to high plasticity.
		S M	Silty sands, sand, and silt mixtures.				
		S C	Clayey sands, and clay mixtures.	HIGHLY ORGANIC SOILS		P t	Peat and other highly organic soils.

Standard penetration split spoon sample

Modified California sampler

Shelby tube sample

Water level observed in boring

* No recovery

NFWE No free water encountered

NOTE: The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

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BORING LOG LEGEND

PROJECT NO. 20-3693-01.001

PLATE

A-2

Date Completed: 1/25/93

Logged By: HLE

Total Depth: 41.5 feet

Surface Conditions: Flat Field - Few Weeds and Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		11					(SM) SILTY CLAYEY SAND - Brown to Dark Brown, Fine to Medium Grained, Loose, Moist
5		25	105	17		Groundwater	(CL) SANDY SILTY CLAY - Brown, Slightly Mottled, Fine Grained, Stiff, Moist (CL) SANDY SILTY CLAY - Brown to Light Brown, Partially Cemented, Mottled, Fine Grained, Very Stiff, Moist
10		17	100	23	4.0		(CL) SANDY SILTY CLAY - Light Brown, Fine Grained, Very Stiff, Wet
15		30					(SM) GRAVELLY SILTY SAND - Brown, Medium to Coarse Grained, Medium Dense, Wet
20							(SP) SAND - Brown, Slightly Silty, Fine to Medium Grained, Wet Packed Sampler, No Blow Count @ 20 Feet
25							
30		30	90	32			(CL) SILTY CLAY - Brown, Very Stiff, Wet
35							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-1

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION
							(Continued from previous plate)
	■	21					(SM) SILTY SAND - Brown, Very Fine Grained, Medium Dense, Wet
40	■	20					(SM) SILTY SAND - Brown, Some Dark Stains, Fine to Medium Grained, Medium Dense, Wet
							END OF BORING
45							
50							
55							
60							
65							
70							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-1

Date Completed: 1/25/93

Logged By: HLE

Total Depth: 31.5 feet

Surface Conditions: Flat Field - Some Minor Weeds and Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SM) SILTY CLAYEY SAND - Dark Brown, Loose, Moist
	■	37					(SM) SILTY SAND - Brown, Cemented, Very Fine to Fine Grained, Dense, Slightly Moist
5	■	24				Groundwater	(ML) SANDY CLAYEY SILT - Gray-Brown, Mottled, Very Fine Grained, Very Stiff, Moist
10	■	29					(ML) SANDY CLAYEY SILT - Brown, Very Fine Grained, Very Stiff, Moist
15	■	26		21		Gradation	(SM/SP) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense, Wet
20	■						(SP) SAND - Light Brown to White, Relatively Clean, Medium to Coarse Grained, Wet Packed Sampler, No Blow Count @ 20 Feet
25							
30	■	32	92	30			(CL) SANDY SILTY CLAY - Brown, Very Fine Grained, Hard, Wet END OF BORING
35							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-2

PLATE 1 of 1

A-4

Date Completed: 1/25/93

Logged By: HLE

Total Depth: 41.5 feet

Surface Conditions: Flat Field -Some Minor Weeds and Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
	■	5				-#200 = 34%	(CL) SANDY SILTY CLAY - Dark Brown, Very Fine Grained, Soft, Moist
5	■	23					(SM/SP) SILTY SAND/SAND - Brown, Medium Dense, Moist
			▼	▼		Groundwater	
10	■					Gradation	(SP) SAND - Light Gray to White, Relatively Clean, Cemented, Medium to Coarse Grained, Loose, Wet Packed Sampler, No Blow Count @ 10 Feet Cemented Layer From 12-1/2 to 14 Feet
15	■	23					(SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense, Wet
20	■	27					(ML) SANDY SILT - Gray-Brown, Cemented, Very Fine Grained, Very Stiff, Wet
25	■	22	89	33		-#200 = 56%	(ML/SM) SANDY SILT/SILTY SAND - Brown, Very Fine Grained, Very Stiff, Wet
30	■	40					(CL) SANDY SILTY CLAY - Brown, Partially Cemented, Mottled, Very Fine Grained, Hard, Wet
35							(SM) SILTY SAND - Brown, Fine Grained,

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-3

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION
							(Continued from previous plate)
		17					Medium Dense, Wet
40							(SP) SAND - Brown, Fine to Medium Grained, Wet Packed Sampler, No Blow Count @ 40 Feet
							END OF BORING
45							
50							
55							
60							
65							
70							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-3

Date Completed: 1/25/93

Logged By: HLE

Total Depth: 35.5 feet

Surface Conditions: Flat Field - Some Minor Weeds and Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		26					(ML) SANDY SILT - Gray to Dark Brown, Cemented, Fine Grained, Very Stiff, Moist
5		28					(ML) SANDY SILT - Gray-Brown, Fine Grained, Very Stiff, Moist
						Groundwater	
10		20	112	18	4.8		(CL) SANDY SILTY CLAY - Brown, Fine Grained, Very Stiff, Moist
15		20					(SM) SILTY SAND - Brown, With Dark Stains, Fine to Medium Grained, Medium Dense, Wet
20							(SP) SAND - Brown, Medium Grained, Wet Packed Sampler, No Blow Count @ 20 Feet
25							
30		33				-#200 = 44%	(SM) SILTY SAND - Brown, Fine Grained, Medium Dense, Wet
35							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-4

PLATE 1 of 2

A-6

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION (Continued from previous plate)
		28					
							END OF BORING
40							
45							
50							
55							
60							
65							
70							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-4

PLATE 2 of 2

A-6

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grass

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
	■	74				-#200 = 31%	(SM) SILTY SAND - Light Brown, Cemented, Fine to Medium Grained, Very Dense, Moist
5							
	■	24		▼		Groundwater	(SM/ML) SILTY SAND/SANDY SILT - Brown, Grades More Silty, Fine Grained, Medium Dense, Moist
10							(CL) SANDY SILTY CLAY - Brown-Gray, Mottled, Very Fine Grained, Stiff, Wet
	■	18	94	29			
15							(SM) SILTY SAND - Brown, Very Fine to Fine Grained, Medium Dense, Wet
20							(SP/SM) SAND - Brown, Slightly Silty, Wet
25							(ML) CLAYEY SILT - Brown, Fine Grained, Very Stiff
30							(SP/SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense
							END OF BORING
35							

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-5

PLATE 1 of 1

A-7

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 40 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		14				LL = 18 PI = 3	(SM) SILTY SAND - Dark Brown, Fine Grained, Loose, Very Moist
							(SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense, Moist
5		15					(SC) CLAYEY SAND - Light Gray-Brown, Fine to Medium Grained, Medium Dense, Wet
						Groundwater	
10		8	87	32	1.2	Consolidation	(CL) SANDY SILTY CLAY - Light Gray-Brown, With White Stringers, Medium Stiff, Moist
15		25					(SP/SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense
20						*PP = 1.5 TSF	(ML) CLAYEY SILT - Brown, With Trace of Fine Sand, Stiff, Wet
25							
30							
35							(SP/SM) SILTY SAND - Brown, Fine

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-6

PLATE 1 of 2

A-8

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION
							(Continued from previous plate)
							Grained, Wet
							(CL) SILTY CLAY - Brown, With Fine Sand, Wet
40							END OF BORING *Pocket Penetrometer Reading
45							
50							
55							
60							
65							
70							

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COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-6

Date Completed: 2/1/93

Logged By: GSM

Total Depth: 46.5 feet

Surface Conditions: Low Grass

Groundwater: Encounterd at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		105					(SC) CLAYEY SAND - Dark Brown, Fine Grained, Loose, Moist
							(SM) SILTY SAND - Light Brown, Cemented, Fine to Medium Grained, Very Dense, Moist
5		9		28		Direct Shear	(SM) SILTY SAND - Light Gray-Brown, Very Sandy With Silt, Fine Grained, Loose, Very Moist
						Groundwater	
10		5					(CL) SANDY SILTY CLAY - Gray, Grades With Less Sand, Soft, Very Moist to Wet
15		18				Gradation	(SP) SAND - Gray, Medium to Coarse Grained, Slightly Silty, Medium Dense, Wet
20		12					(ML) SANDY SILT - Brown, Very Fine Grained, Stiff, Wet
25		9					Grades Less Sandy With Depth, Medium Stiff
30							
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-7

PLATE 1 of 2

A-9

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength ksf	LABORATORY Other Tests	DESCRIPTION (Continued from previous plate)
		75				-#200 = 15%	(SP/SM) SILTY SAND - Brown to Black, Coarse on Top, Fine to Medium Grained, Very Dense, Wet
40							(SC/SM) CLAYEY SAND - Brown, Very Fine to Fine Grained, Medium Dense, Wet
45		25					END OF BORING
50							
55							
60							
65							
70							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-7

PLATE 2 of 2

A-9

Date Completed: 2/1/93

Logged By: GSM

Total Depth: 71.5 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		66	117	15	9.2		(SM) SILTY SAND - Brown to Dark Brown, Some Clay, Fine to Medium Grained, Loose, Moist
5						Groundwater	(SM) SILTY SAND - Light Brown, Fine to Medium Grained, Very Dense, Moist to Wet
10							(SP/SM) SILTY SAND - Light Brown, Fine to Medium Grained, Medium Dense, Wet
15		27				Gradation	
20		39					(ML) CLAYEY SILT - Brown, Very Fine Grained, Hard, Wet
25		17	81	39	2.0		
						*PP = 1.5 TSF	(CL) SILTY CLAY - Brown, Slightly Cemented, Fine Grained, Grades More Sand With Depth, Very Stiff, Wet
30		19					
35							(SM) SILTY SAND - Brown, Very Fine Grained, Medium Dense, Wet

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-8

PLATE 1 of 2

A-10

Date Completed: 2/1/93

Logged By: GSM

Total Depth: 41.5 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION: USCS Classification
		15					(SM) SILTY SAND - Dark Brown, With Clay, Fine Grained, Loose, Moist
							(SM) SILTY SAND - Brown, Moderately Cemented, Fine to Coarse Grained, Medium Dense, Moist
5		11					(SM) SILTY SAND - Light Gray-Brown, Loose, Wet
				▼		Groundwater	
10		25	109	17	2.3		(CL) SANDY SILTY CLAY - Gray-Brown With White Stringers, Fine to Medium Grained, Very Stiff, Wet
15		30				Direct Shear	(SP/SM) SILTY SAND - Brown, Fine to Coarse Grained, Medium Dense, Wet
20		14					(CL) SILTY CLAY - Brown, Slightly Sandy, Stiff, Wet
							(SM) SILTY SAND - Brown, Fine Grained, Medium Dense, Wet
25		11				Consolidation	(CL) SILTY CLAY - Brown, Stiff, Wet
						*PP = 1.5 TSF	
30		24					(SP/SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense, Wet
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-9

PLATE 1 of 2

A-11

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength ksf	LABORATORY Other Tests	DESCRIPTION (Continued from previous plate)
40	■	63				-#200 = 31%	(SM) SILTY SAND - Gray-Brown, Fine to Coarse Grained, Very Dense, Wet
45							
50	■	49					(SM) SILTY SAND - Brown With Orange Streaks, Very Fine Grained, Dense, Wet
55							
60							(ML) SANDY SILT - Brown With Orange Streaks, Slightly Clayey, Very Fine Grained, Hard, Wet
65							
70	■	61	84	38			
							END OF BORING *Pocket Penetrometer Reading

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PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-8

PLATE 2 of 2

A-10

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION
							(Continued from previous plate)
40	■	45					(ML/CL) CLAYEY SILT/SILTY CLAY - Brown, Trace of Fine Sand, Hard, Wet
							END OF BORING
							*Pocket Penetrometer Reading
45							
50							
55							
60							
65							
70							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-9

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
	■	30	108	18			
							(SM/ML) SILTY SAND/SANDY SILT - Light Brown, Partially Cemented, Very Fine to Fine Grained, Dense, Moist
5	■	19					
				▼		Groundwater	(SM) SILTY SAND - Brown, Very Fine to Fine Grained, Medium Dense, Wet
10	■	22					(ML) CLAYEY SILT - Light Brown, Slightly Sandy, Fine Grained, Very Stiff, Wet
15							
							(SP/SM) SILTY SAND/SAND - Brown, Fine Grained, Wet
20							
25							(ML) CLAYEY SILT - Brown, Stiff, Wet
30							END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-10

PLATE 1 of 1

A-12

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		7				pH - 7.5	(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
5		13					(SM) SILTY SAND - Brown, Fine to Medium Grained, Medium Dense, Moist
						Groundwater	
10		16		22			(ML/CL) SANDY CLAYEY SILT - Gray-Brown, With White Stringers, Fine to Medium Grained, Very Stiff, Moist
15		12				-#200 = 12%	(SP) SAND - Brown, Slightly Silty, Fine to Medium Grained, Medium Dense, Wet
20							(ML) CLAYEY SILT - Brown, Fine Grained, Very Stiff, Wet
25							(SM) SILTY SAND - Brown, Fine to Medium Grained, Wet
							(ML) SANDY SILT - Brown, Wet
							(SM) SILTY SAND - Brown, Wet
30							END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-11

PLATE 1 of 1

A-13

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
		40 for 6"		13		-#200 = 48%	(SM) SILTY SAND - Brown, Cemented, Fine to Medium Grained, Very Dense, Moist
5							(SC) CLAYEY SAND - Brown, Fine Grained, Moist
		8				Groundwater	
10							(SM) SILTY SAND - Brown, Slightly Clayey, Fine to Medium Grained, Loose, Wet
		17					(ML) SANDY CLAYEY SILT - Brown, Grades Less Sand With Depth, Very Stiff, Wet
15							
20							
							(SM) SILTY SAND - Brown, Fine Grained, Medium Dense, Wet
25							(ML) CLAYEY SANDY SILT - Brown, Wet
							(SM) SILTY SAND - Brown, Fine Grained, Wet
30							END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-12

PLATE 1 of 1

A-14

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
	■	20					(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
5	■	17	101	24		Groundwater	(SM) SILTY SAND - Brown, Slightly Cemented, Fine to Medium Grained, Medium Dense, Moist
10	■	20					(ML) CLAYEY SILT - Brown, Slightly Sandy, Very Stiff, Wet
15	■	60					(SC) CLAYEY SAND - Brown, Fine to Coarse Grained, Stiff, Wet
							(SP/SM) SILTY SAND - Brown, Fine to Coarse Grained, Very Dense, Wet
20							(ML) CLAYEY SILT - Brown
							(SM/SC) SILTY SAND - Brown, With Clay, Fine Grained
25							(ML) CLAYEY SILT - Brown, Very Stiff, Wet
30							(SP/SM) SILTY SAND - Brown, Fine to Medium Grained, Dense, Wet
							END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-13

PLATE 1 of 1

A-15

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
	■	49					(SM) SILTY SAND - Brown, Cemented, Fine Grained, Dense, Moist
5							
						Groundwater	(SC) CLAYEY SAND - Brown, Fine to Medium Grained, Medium Dense, Wet
	■	29	111	17	3.7		
10							(ML) SANDY SILT - Brown, Fine Grained, Stiff, Wet
						*PP = 1.0 TSF	(CL) SANDY CLAY - Brown, Fine to Medium Grained, Stiff, Wet
	■	44	119	15			(SM) SILTY SAND - Brown, Fine to Coarse Grained, Dense, Wet
15							(ML) SANDY SILT - Orange-Brown, Mottled, Fine Grained, Very Stiff, Wet
20							(ML) CLAYEY SILT - Brown, Slightly Sandy, Stiff, Wet
25							(SM) SILTY SAND - Brown, Fine Grained, Wet
30							(CL) SILTY CLAY - Brown, Wet
							END OF BORING *Pocket Penetrometer Reading
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-14

PLATE 1 of 1

A-16

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
		7					(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
5		25	94	27		Groundwater	(SM) SILTY SAND - Light Brown, Slightly Cemented, Very Fine to Fine Grained, Medium Dense, Moist
10							(SM) SILTY SAND - Orange-Brown, Mottled, Fine Grained, Dense, Wet
15		59					
20							(ML) CLAYEY SILT - Stiff to Very Stiff, Wet
25							
30							(SM) SILTY SAND - Brown, Slightly Clayey, Fine Grained, Wet
							END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-15

PLATE 1 of 1

A-17

Date Completed: 2/2/93

Logged By: GSM

Total Depth: 30 feet

Surface Conditions: Low Grasses

Groundwater: Encountered at 7-Foot Depth

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength ksf	LABORATORY: Other Tests	DESCRIPTION / USCS Classification
							(SC) CLAYEY SAND - Dark Brown, Fine to Medium Grained, Loose, Moist
5						Groundwater	(SM) SILTY SAND - Light Brown, Cemented, Fine to Medium Grained, Dense, Moist to Wet
10							
15							(SP/SM) SILTY SAND - Brown, Wet
20							(ML) CLAYEY SILT/SANDY SILT - Brown, Fine Grained, Wet
25							
30							(SM) SILTY SAND - Brown, Fine Grained, Wet END OF BORING
35							

KLEINFELDER

PROJECT NO. 20-3693-01.001

COMBUSTION TURBINE
PROJECT NO. 1
LODI, CALIFORNIA
LOG OF BORING B-16

PLATE 1 of 1

A-18

KLEINFELDER

PROJECT NO. 20-3693-01.001

LABORATORY TESTS

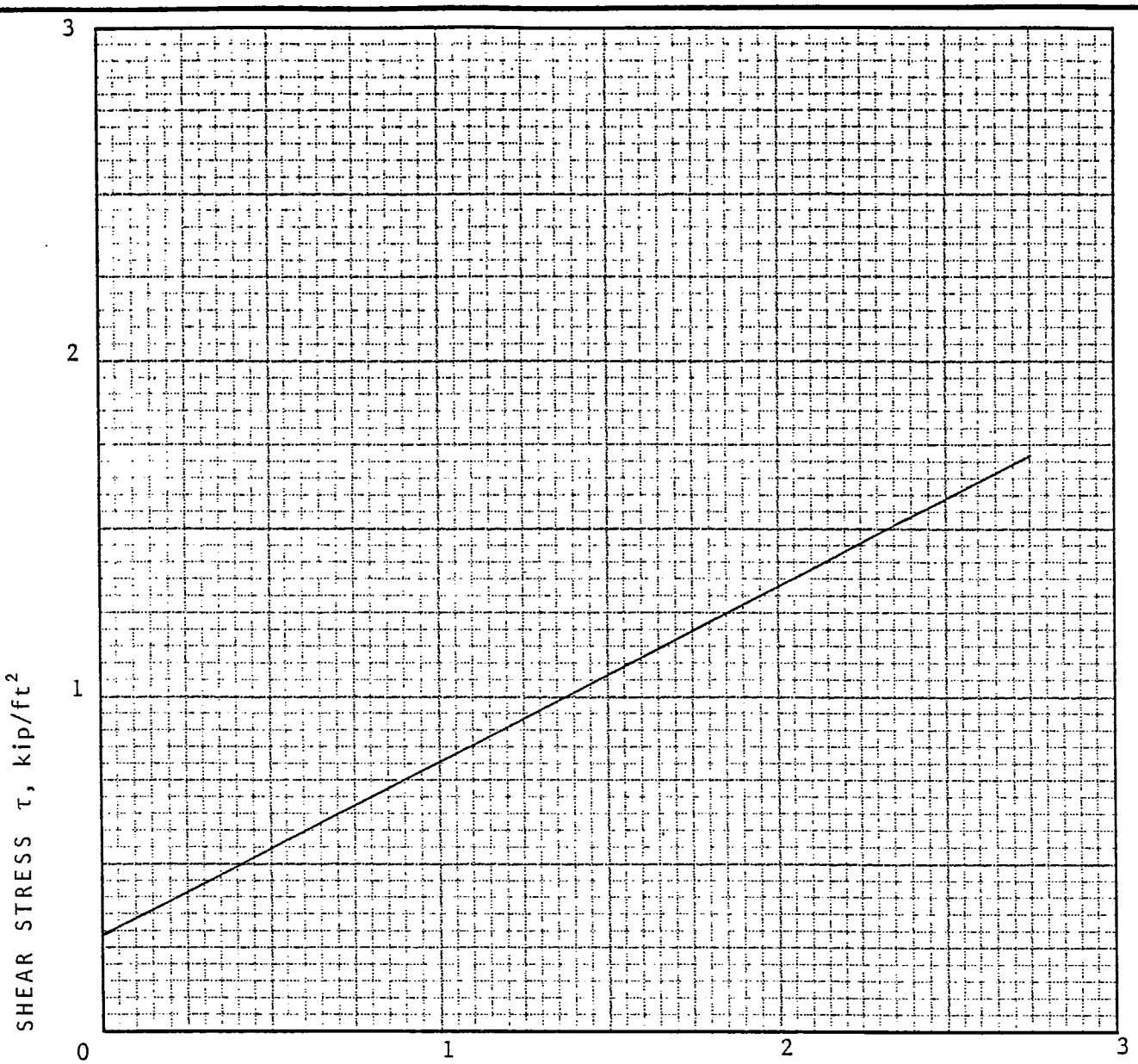
BORING NO.	SAMPLE NO.	DRY UNIT WEIGHT lb/ft³	MOISTURE CONTENT % OF DRY WEIGHT	GRADING ANALYSES – SIEVE SIZE – PERCENT PASSING 1"	3/4"	4	10	40	200	HYDROMETER ANALYSES SILT SIZE	CLAY SIZE	COLLOIDS	ATTERBERG LIMITS L.L.	P.I.	UNCONFINED COMPRESSIVE STRENGTH kips/ft²
1	5-1	105	17												
1	10-1	100	23												4.0
1	27-1/2-1	90	32												
2	15-1		21												
2	30-1	92	30												
3	5-1								34						
3	25-1	89	33						56						
4	10-1	112	18												4.8
4	30-1								44						
5	3-1								31						
5	12-1	94	29												
6	1-1												18	3	
6	10-1	87	32												1.2
7	5-1		28												
7	35-1								15						
8	2-1	117	15												9.2
8	25-1	81	39												2.0
8	40-1								31						
8	70-1	84	38												

J.H. KLEINFELDER & ASSOCIATES
GEOTECHNICAL CONSULTANTS • MATERIALS TESTING

PROJECT NO. 20-3693-01.001

LABORATORY TESTS

BORING NO.	SAMPLE NO.	DRY UNIT WEIGHT lb/ft³	MOISTURE CONTENT % OF DRY WEIGHT	GRADING ANALYSES: SIEVE SIZE - PERCENT PASSING 1"	3/4"	4	10	40	200	HYDROMETER ANALYSES: SILT SIZE	CLAY SIZE	COLLOIDS	ATTERBERG LIMITS: L.L.	P.I.	UNCONFINED COMPRESSIVE STRENGTH kips/ft²
9	10-1	109	17												2.3
10	2-1	108	18												
11	1-1			pH =	7.5										
11	10-1								12						
12	2-1		13						48						
13	5-1	101	24												
14	8-1	111	17												3.7
14	13-1	119	15												
15	6-1	94	27												



BORING NO. 7 SAMPLE NO. 1 DEPTH, ft 5

DESCRIPTION Brown Silty Fine Sand

Remolded to approximate 95 percent relative compaction, staged

SYMBOL			
DRY DENSITY lb/ft³	96.9		
INITIAL WATER CONTENT %	26.0		
FINAL WATER CONTENT %	25.0		
NORMAL STRESS σ, kip/ft²	0.69	1.19	2.38
SHEAR STRESS τ, kip/ft²	0.64	0.88	1.54

ANGLE OF INTERNAL FRICTION, ϕ 28°

COHESION, kip/ft² 0.28

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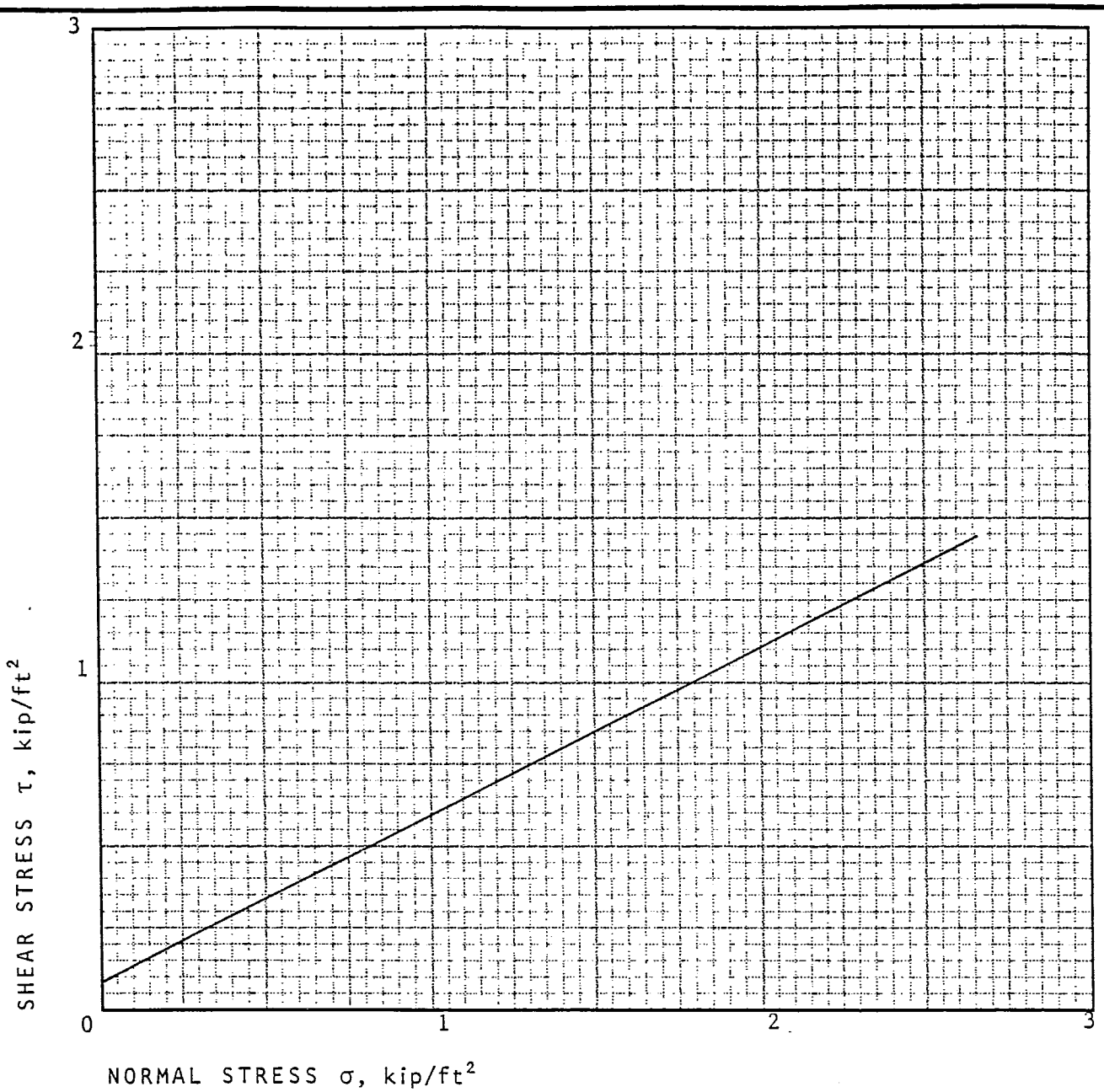
PROJECT NO. 20-3693-01.001

DIRECT SHEAR TEST

PLATE A-20



BORING NO. 9 SAMPLE NO. 1 DEPTH, ft 15

DESCRIPTION Brown Silty Sand

Remolded to Approximate 95 percent relative compaction, staged

SYMBOL			
DRY DENSITY lb/ft³	108.2		
INITIAL WATER CONTENT %	22.0		
FINAL WATER CONTENT %	21.5		
NORMAL STRESS σ, kip/ft²	0.64	1.21	2.36
SHEAR STRESS τ, kip/ft²	0.43	0.72	1.27

ANGLE OF INTERNAL FRICTION, φ 27°

COHESION, kip/ft² 0.08

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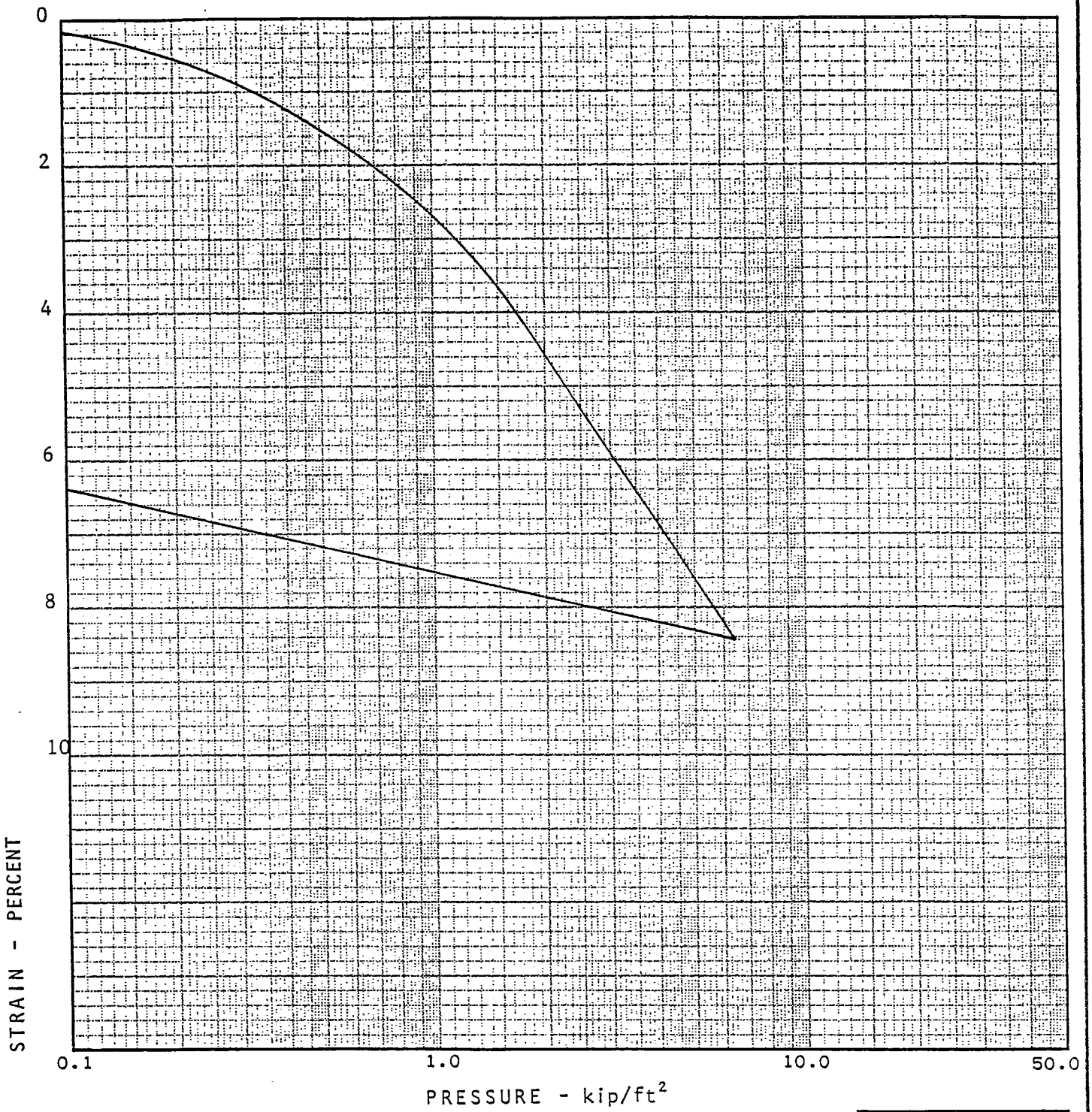
PROJECT NO. 20-3693-01.001

DIRECT SHEAR TEST

PLATE A-21



BORING NO. 6
DEPTH 10
SAMPLE DESCRIPTION Light brown sandy silty clay
OVERBURDEN PRESSURE 850 psf
PRECONSOLIDATION PRESSURE
COMPRESSION INDEX, C_c 0.07
RECOMPRESSION INDEX, C_r 0.01

	INITIAL	FINAL
DRY DENSITY - lb/ft³	90.3	98.6
WATER CONTENT - %	30.9	27.6
VOID RATIO		
DEGREE OF SATURATION, %		100
SAMPLE HEIGHT - inches	1.00	0.91

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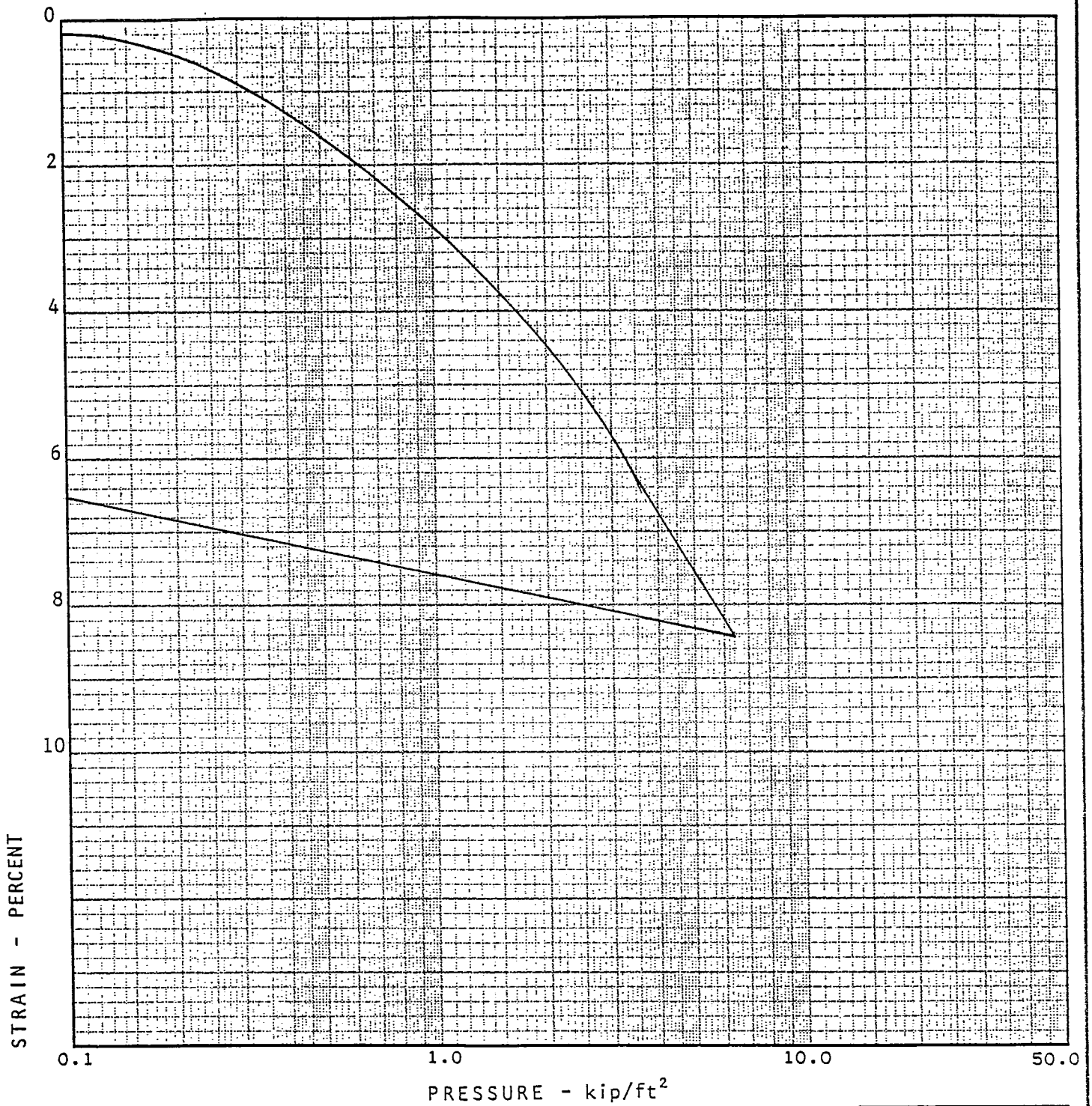
PROJECT NO. 20-3693-01.001

CONSOLIDATION TEST

PLATE A-22



BORING NO. 9
DEPTH 25
SAMPLE DESCRIPTION Brown silty clay

OVERBURDEN PRESSURE 1200 psf
PRECONSOLIDATION PRESSURE
COMPRESSION INDEX, C_c 0.07
RECOMPRESSION INDEX, C_r 0.01

	INITIAL	FINAL
DRY DENSITY - lb/ft³	77.9	85.1
WATER CONTENT - %	43.2	38.5
VOID RATIO		
DEGREE OF SATURATION, %		100
SAMPLE HEIGHT - inches	1.00	0.91

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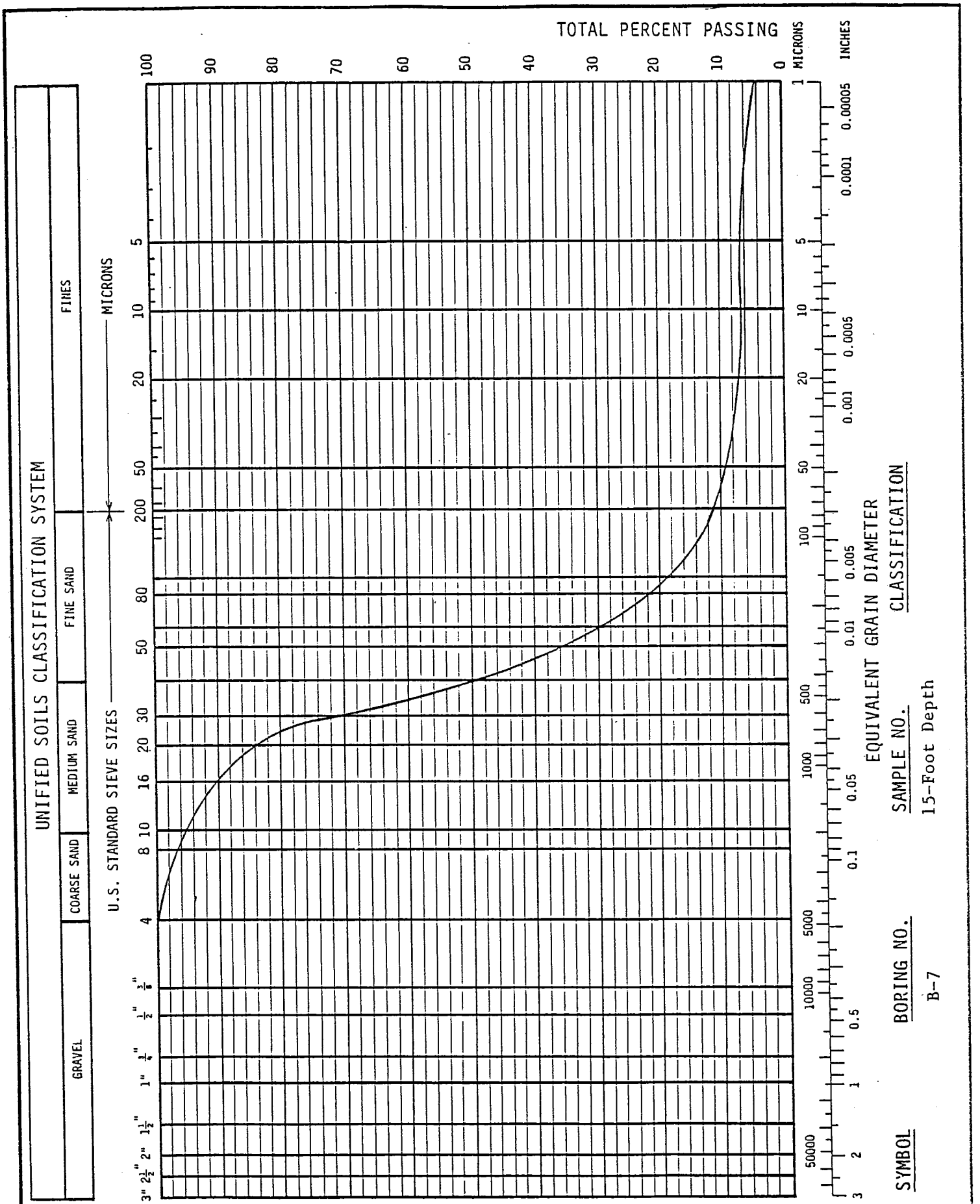
PROJECT NO. 20-3693-01.001

CONSOLIDATION TEST

PLATE A-23



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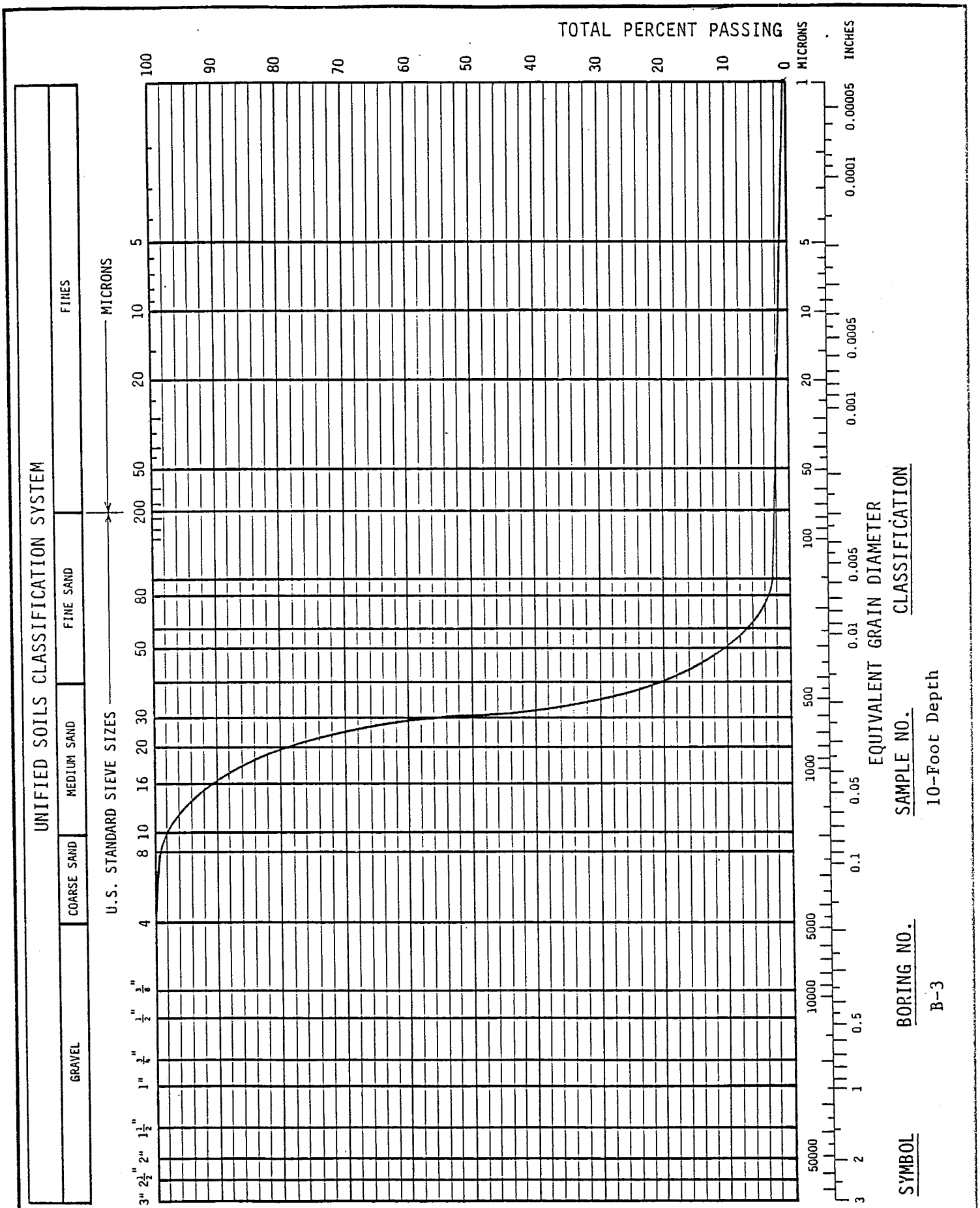
PROJECT NO. 20-3693-01.001

GRAIN SIZE DISTRIBUTION

PLATE A-24



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PROJECT NO. 20-3693-01.001

GRAIN SIZE DISTRIBUTION

PLATE

A-25

Era	Time Period or Rock System	Epoch	Rock Series	Estimated Duration, Years	Estimated Years Since Beginning
Cenozoic Era	Quaternary	Recent Epoch Pleistocene	Recent Pleistocene	 1 million	10 to 25,000 1 million
	Tertiary	Pliocene Miocene Oligocene Eocene Paleocene	Pliocene Miocene Oligocene Eocene Paleocene	12 million 12 million 11 million 22 million 5 million	13 million 25 million 36 million 58 million 63 million
Mesozoic Era	Cretaceous	Late Cretaceous Early Cretaceous	Upper Cretaceous Lower Cretaceous	62 million	135 million
	Jurassic	Late Jurassic Early Jurassic	Upper Jurassic Lower Jurassic	46 million	181 million
	Triassic	Late Triassic Early Triassic	Upper Triassic Lower Triassic	49 million	230 million
Paleozoic Era	Permian	Late Permian Early Permian	Upper Permian Lower Permian	50 million	280 million
	*Pennsylvanian	Late Pennsylvanian Middle Pennsylvanian Early Pennsylvanian	Upper Pennsylvanian Middle Pennsylvanian Lower Pennsylvanian	65 million	
	*Mississippian	Late Mississippian Early Mississippian	Upper Mississippian Lower Mississippian		345 million
	Devonian	Late Devonian Middle Devonian Early Devonian	Upper Devonian Middle Devonian Lower Devonian	60 million	405 million
	Silurian	Late Silurian Middle Silurian Early Silurian	Upper Silurian Middle Silurian Lower Silurian	20 million	425 million
	Ordovician	Late Ordovician Middle Ordovician Early Ordovician	Upper Ordovician Middle Ordovician Lower Ordovician	75 million	500 million
	Cambrian	Late Cambrian Middle Cambrian Early Cambrian	Upper Cambrian Middle Cambrian Lower Cambrian	100 million	600 million
	Precambrian	Informal subdivisions used locally		Over 3 billion	

*Considered subdivisions of the Carboniferous Rock System

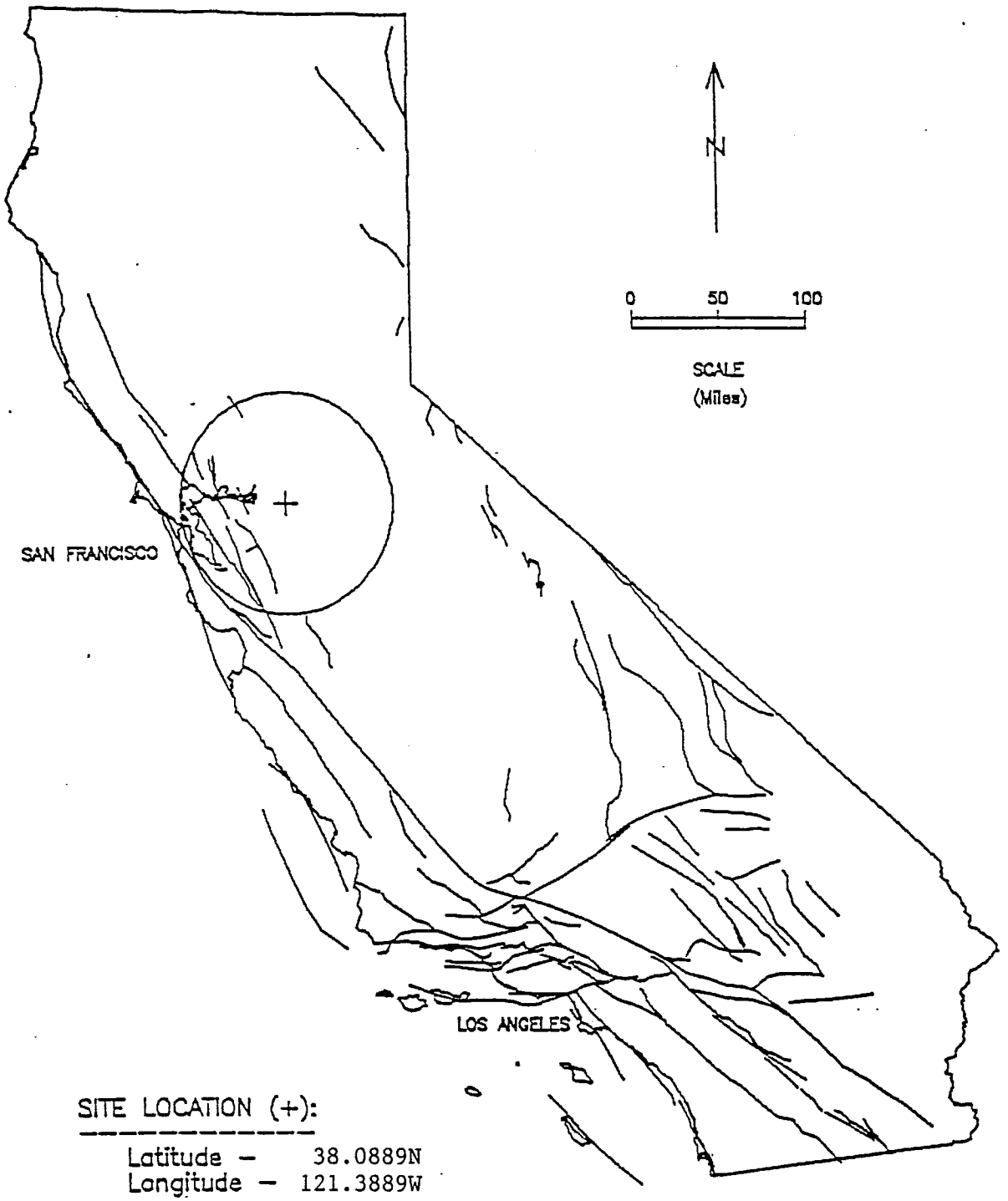
KLEINFELDER

GEOLOGIC TIME SCALE

PREPARED BY: DATE:

CHECKED BY: DATE:

PROJECT NO. 3693-01.001 PLATE NO. A-26

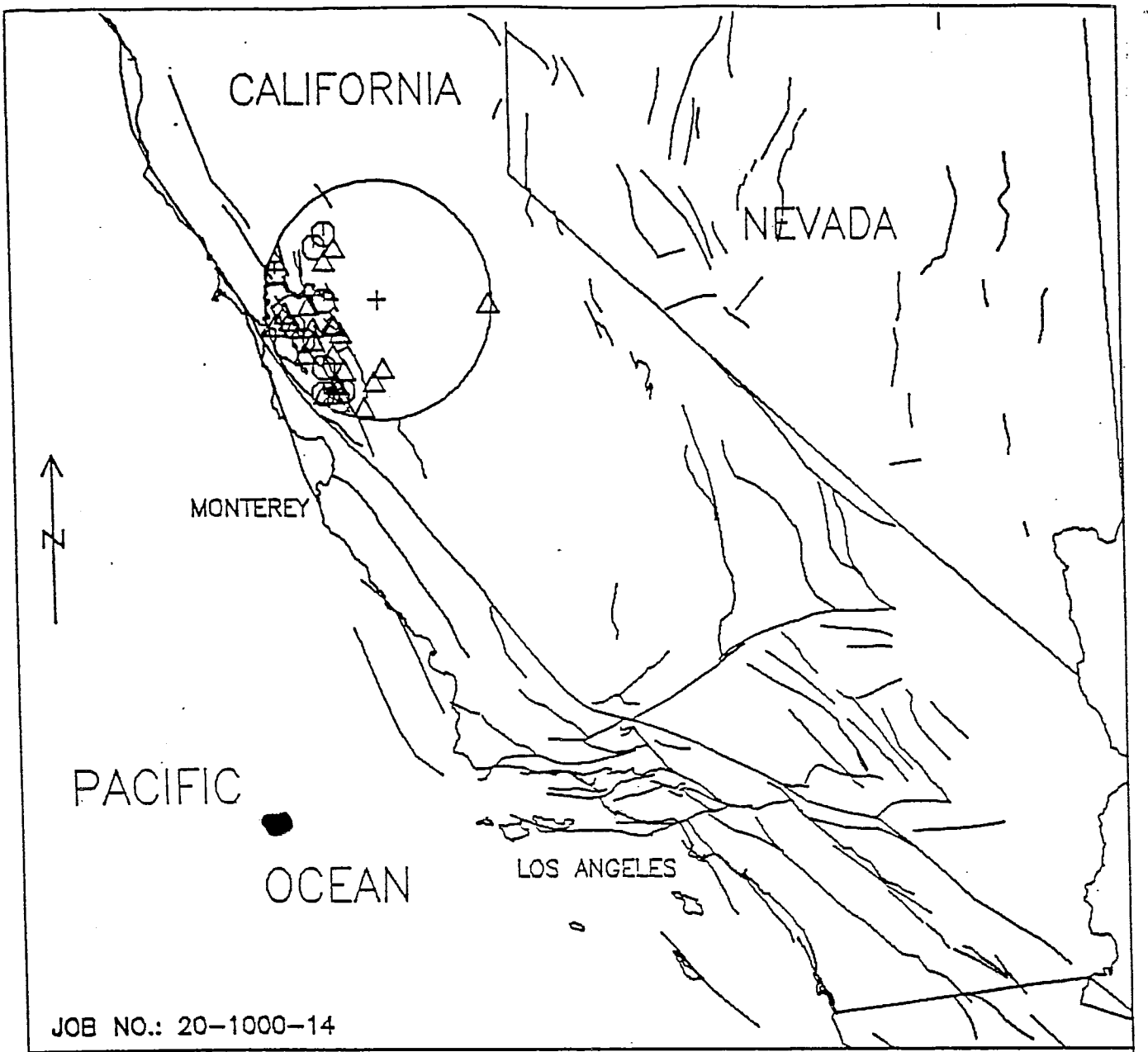


SITE LOCATION (+):

Latitude – 38.0889N
Longitude – 121.3889W

CALIFORNIA FAULT MAP

KLEINFELDER	COMBUSTION TURBINE PROJECT NO. 1 LODI, CALIFORNIA	PLATE A-27
PROJECT NO. 20-3693-01.001		



HISTORICAL EARTHQUAKES 1800 TO 1990

EXPLANATION

- M = 8.0 +
- M = 7.0–7.9
- M = 6.0–6.9
- M = 5.0–5.9
- M = 4.0–4.9

0 50 100

SCALE (Miles)

SITE LOCATION (+):

Latitude – 38.0889N
Longitude – 121.3889W

KLEINFELDER	COMBUSTION TURBINE PROJECT NO. 1 LODI, CALIFORNIA	PLATE A-28
PROJECT NO. 20-3693-01.001		

Land Use (18–25)

Background

As stated in section 5.6.2.2.4 of the Application for Certification (AFC) the proposed natural gas pipeline would cross seven parcels that are either under Williamson Act contracts or Farmland Security Zones. The affected parcels are Assessor's Parcel Numbers (APN) 055-180-06, 055-190-02, 055-190-03, 055-220-05, 055-220-35, 055-220-39, and 055-220-40. The AFC does not state whether an easement exists that would allow the proposed PG&E gas line to cross these parcels.

Data Request

18. Please provide the owner of record and the contract number for each APN listed above.

Response: A correction is noted to Table 5.6-2 on page 5.6-6 of the AFC submittal. That table indicates that Assessor's Parcel Numbers (APNs) 055-220-05 and 055-220-35 are both Williamson Act and Farmland Security Act parcels. This is incorrect; parcels are enrolled in only one program, not both. Those two parcels are Farmland Security Act parcels only. Table DR18-1 lists the APNS of the five Williamson Act contract parcels and the two Farmland Security Act contract parcels, as well as the contract number and owner of record for each APN.

TABLE DR18-1
Williamson Act Contract and Farmland Security Act Contract and Owner of Record by Assessor's Parcel Number

Assessor's Parcel Number	Contract Number[a]	Owner of Record[b]
Williamson Act		
055-180-06	75-C1-71	Davilla Lodi Family PTP 21550 Eden Cyn Road Hayward, CA 94552
055-190-02	75-C1-71	Davilla Lodi Family PTP 21550 Eden Cyn Road Hayward, CA 94552
055-190-03	74-C1-179	Rego Ranch Partnership LP 13579 N De Vries Road Lodi, CA 95242-9504
055-220-39	71-C1-155	M & K Phillips Family LP P.O. Box 1658 Woodbridge, CA 95258
055-220-40	71-C1-155	M & K Phillips Family LP P.O. Box 1658 Woodbridge, CA 95258

TABLE DR18-1
Williamson Act Contract and Farmland Security Act Contract and Owner of Record by Assessor's Parcel Number

Assessor's Parcel Number	Contract Number[a]	Owner of Record[b]
Farmland Security Act		
055-220-05	990117	James & Susan Van Ruiten 3380 W. Turner Road Lodi, CA 95242-9685
055-220-35	990117	James & Susan Van Ruiten 3380 W. Turner Road Lodi, CA 95242-9685

[a]Source: Goold, Loree, Appraiser III / San Joaquin County. 2009. Personal communication with Wendy Haydon/CH2M HILL. January 8.

[b]Source: Ball, Frances, Supervisor, Boats, Aircraft, Exemptions / San Joaquin County. 2009. Personal communication with Wendy Haydon/CH2M HILL. January 15.

Data Request

19. Please provide evidence of an easement(s) from each owner of record that would allow the proposed PG&E gas pipeline to cross the affected parcels.

Response: It has come to the attention of the Applicant that a small portion of the proposed gas line route presented in the AFC is not located within the current PG&E easement. Supplement C to the AFC is currently under preparation and will be submitted to Staff in March 2009 and will address this gas pipeline change. The revised gas line route will be located within the PG&E easement for the existing gas line currently in place for the existing STIG plant. The natural gas line will be owned, operated, and constructed by PG&E and will be constructed immediately adjacent to the existing gas pipeline servicing the STIG plant.

Data Request

20. If no easement exists, please explain how the applicant (or PG&E) intends to procure permission from each owner of record to allow the gas line to cross the affected parcels.

Response: Please see response to Data Request 19.

Background

Section 5.11.2.2 of the AFC states that the pipeline installation would not convert farmland to a non-agricultural use because the pipeline would be installed deep enough to allow future cultivation, and the topsoil removed during excavation would be used to restore the land to its original condition before construction.

Data Request

21. Please provide the number of acres that would be temporarily disturbed by the pipeline installation.

Response: A correction is noted to the last paragraph on page 5.6-5 of the AFC submittal. That paragraph erroneously indicates that a 900-foot-wide disturbance area would be needed. To construct the proposed pipeline, a 50-foot-wide construction corridor (25 feet on both sides of the pipeline alignment) would be needed. The proposed pipeline is 2.5 miles long. A 50-foot-wide construction corridor along the entire length of the proposed alignment, along with 50 feet added to both ends of the proposed alignment, would result in approximately 15.3 acres of land that would be temporarily disturbed during proposed pipeline construction.

Data Request

22. Please state the type of crop planted where the pipe installation would occur.

Response: Crops being cultivated along the proposed pipeline alignment include primarily alfalfa, hay, and vineyards.

Background

The Kingdon Airport is a small, general aviation facility located approximately 2.5 miles from the LEC site. Section 5.6.4 of the AFC states that the applicant will file a request for consistency determination with the San Joaquin County Airport Land Use Commission (ALUC) to determine what requirements would be necessary to support a finding of consistency for the pipeline that will be buried in the transition and runway approach zones of the Kingdon Airport.

Data Request

23. Please provide a copy of the request for the ALUC's findings for the consistency determination, the date the request is filed, and the expected date for the ALUC determination.

Response: NCPA has met with the owner of the Kingdon Airport and with the San Joaquin Council of Governments (SJCOG), the agency responsible for the Airport Land Use Plan. SJCOG has indicated that because there is already a gas line in the same vicinity as the new gas line, it can support a modification of the Airport Land Use Plan to remove any inconsistency. NCPA is continuing to work with the Kingdon Airport owner and SJCOG, and will provide an update in the monthly status reports on progress and future activities. It is important to note that it is common for airports to allow buried natural gas lines within runway protection zones. Such airports include Sacramento International Airport, San Jose International Airport, and Los Angeles County Airport (including LAX airport).

Background

Section 5.6.1.2 of the AFC states that the proposed project would include "a 900-foot-wide disturbance area around each facility." Figure 2.1-1 in the AFC does not show a 900-foot-wide disturbance area around the proposed facility.

Data Request

24. Please describe the nature and purpose of the “disturbance areas” that would be constructed around the proposed and the existing facility.

Response: As discussed in Data Response 21, the 900-foot-wide disturbance area was inadvertently included in the AFC. The facility will not require a disturbance area outside of the proposed boundaries for both the project site and construction laydown areas. The only area where there may be additional disturbance would be along the natural gas pipeline, which would result in a 50-foot-wide disturbed corridor (25 feet on either side of the gas line). The nature and purpose of the disturbance area alongside the natural gas pipeline includes the following types of activities: materials laydown, equipment storage, and soil stockpiling areas.

Data Request

25. Please state whether the 900-foot-wide disturbance areas (a total of 1,800 feet) would be restored after construction to its pre-construction condition, and provide an estimated schedule for the restoration process.

Response: As indicated in Data Response 21, a 900-foot-wide disturbance area is an error on page 5.6-5 of the AFC submittal. The areas that would be temporarily disturbed during project construction include only a 50-foot-wide corridor surrounding the natural gas pipeline. This area would be stabilized immediately upon completion of construction activities. The restoration process would begin immediately thereafter to return these areas to their pre-project condition.

Power Plant Reliability (26)

Background

One important aspect of power plant reliability is a secure supply of water. The AFC, Appendix 2D, states that a will-serve letter from the City of Lodi (see Soil and Water Resources background, page 12) for project water supply is being sent separately. Staff needs this letter in order to complete its evaluation of Reliability.

Data Request

26. Please submit an updated copy of the City of Lodi's water supply will-serve letter.

Response: A copy of the City of Lodi's water supply will-serve letter was provided in Supplement B, Attachment DA 5.15-5, docketed on October 24, 2008. An additional copy is provided here as Attachment DR26-1.

ATTACHMENT DR26-1

City of Lodi Water Supply Will-serve Letter

CITY COUNCIL

JOHN BECKMAN, Mayor
SUSAN HITCHCOCK
Mayor Pro Tempore
LARRY D. HANSEN
BOB JOHNSON
JOANNE L. MOUNCE

CITY OF LODI

PUBLIC WORKS DEPARTMENT

CITY HALL, 221 WEST PINE STREET
P.O. BOX 3006
LODI, CALIFORNIA 95241-1910
(209) 333-6706
FAX (209) 333-6710
EMAIL pwdept@lodi.gov
http:\\www.lodi.gov

BLAIR KING
City Manager

SUSAN J. BLACKSTON
City Clerk

D. STEPHEN SCHWABAUER
City Attorney

RICHARD C. PRIMA, JR.
Public Works Director

November 29, 2005

Randall Blank, Environmental, Health & Safety Manager
Northern California Power Agency
P.O. Box 1478
Lodi, CA 95241

SUBJECT: Water Supply for NCPA Electric Generating Plant at Lodi White Slough Water Pollution Control Facility at 12745 North Thornton Road, Lodi, CA, 95242

The City of Lodi is pleased to confirm availability of water for a new NCPA Electric Generating Facility adjacent to the existing NCPA STIG Plant located on City property at its White Slough Water Pollution Control Facility. Pursuant to City Council approval on November 16, 2005, the City can provide recycled water meeting State of California Title 22 requirements for tertiary treatment, approximately 2.5 MGD (million gallons per day) peak, 1.7 MGD normal

Current City policy requires the applicant to fund/construct the improvements necessary to reliably serve your project. While the quantities of water described above are available to NCPA, distribution facilities may need to be modified to actually deliver the water. Construction of new or modification of existing storage facilities may also be necessary to provide reliability. In addition, regular service charges for recycled water, as established by the City, would apply.

The City of Lodi wishes to fully cooperate with you on this project and trusts that Lodi will be given favorable consideration in project participation allocations. We look forward to working with you on the various details to make this project a success for all.

Sincerely,

Richard C. Prima, Jr.
Public Works Director

RCP/pmf

cc: Blair King, City Manager
David Dockham, Interim Electric Utility Director
Del Kerlin, Assistant Wastewater Treatment Superintendent

J:\WHITE SLOUGH\LNCPA_WILLSERVELETTERA.DOC

Soil and Water Resources (27–37)

Background

The City of Lodi (City) has provided the Northern California Power Agency (NCPA) a "Will Serve Letter" (dated November 29, 2005) stating that the City can provide Title 22 tertiary treated recycled water to the LEC at a peak delivery rate of approximately 2.5 million gallons per day (mgd) with an average delivery rate of 1.7 mgd. The City has conditioned the delivery of recycled water to the LEC on NCPA's construction of new or modified distribution facilities originating at the City's White Slough Water Pollution Control Facility (WSWPCF), which is located adjacent to the project site.

Data Request

27. Please describe the new or modified distribution facilities that will be required for the delivery of recycled water from the City's White Slough Water Pollution Control Facility (WSWPCF).

Response: The two existing 460V, 60 hp, 1,000 gpm vertical turbine pumps will be replaced with two 460V, 125 hp, 1,800 gpm vertical turbine pumps. No further modifications to pump basin are anticipated. The existing underground 8-inch-diameter supply line will be replaced with a 10-inch-diameter supply line. The new line will utilize the exiting utility corridor between the two facilities.

Data Request

28. Please provide a list of the current recycled water customers that receive tertiary treated recycled water from the WSWPCF, their contractual delivery amounts, and a discussion of the long-term (30 to 35 years) recycled water supply reliability based on current and future supply and demand projections for tertiary treated recycled water from WSWPCF.

Response: Current uses of recycled water from the White Slough WPCF include irrigation of City-owned lands surrounding the plant, San Joaquin County Mosquito and Vector Control District facility mosquito ponds, and water supply for the existing NCPA STIG-1 plant. The White Slough WPCF's NPDES permit does not specify contractual delivery amounts or limits set forth by the Central Valley RWQCB (Kerlin, 2009, personal communication[2]). Current delivery amounts are estimated to be 150 to 200 million gallons per month for irrigation of City-owned land, 30 to 40 million gallons per month for the San Joaquin County Mosquito and Vector Control District facility mosquito ponds, and deliveries to the existing industrial use vary depending on demand (Kerlin, 2009, personal communication).

The White Slough WPCF discharges directly to surface water (Dredger Cut) from approximately September through April. As regulations within state policy become stricter with regards to discharges to surface water, the City of Lodi is looking toward wastewater

[2] Kerlin, Del / White Slough WPCF. 2009. Personal communication with Catherine Lambert / CH2M HILL. January 16.

reuse to eliminate or reduce surface water discharge from the White Slough WPCF. The City of Lodi identified water recycling as more favorable to extensive advanced treatment facilities and improvements to the WPCF (West Yost Associates, 2004[3]). Elimination of surface water discharge may be desirable by 2010 (West Yost Associates, 2004). In addition to current uses of recycled water, the City has begun planning ways to use the approximately 7.1 million gallons per day of recycled water capacity anticipated in 2010 (West Yost Associates, 2004). Total volume of tertiary recycled water is estimated to be 8.5 million gallons per day in 2020 (West Yost Associates, 2004).

Demand for supplies of recycled water are anticipated to include current uses (NCPA and the San Joaquin County Mosquito and Vector District), new development outside of the Stockton General Plan Urban Services Boundary, two planned development areas in Lodi, and an increase in irrigated lands surrounding the White Slough WPCF (West Yost Associates, 2004). Recycled water supply is sufficient to meet demand at the buildout level of development in 2020 (West Yost Associates, 2004).

Data Request

29. Please provide a discussion of the permitting and oversight requirements of the Central Valley Regional Water Quality Control Board (CVRWQCB), Department of Public Health (DPH), and the City of Lodi for the supply and use of recycled water at the LEC and whether water recycling requirements would be prescribed by CVRWQCB prior to the delivery of recycled water to the LEC.

Response: The California State Water Resources Control Board (State Water Board) shares jurisdiction over the use of recycled water with the RWQCBs and with the California Department of Public Health (CDPH) through a 1996 Memorandum of Agreement (MOA). The State Water Board exercises general oversight over recycled water projects, including review of the RWQCBs' permitting practices. The CDPH is charged with the protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water.

State statutes and regulations pertaining to the use of recycled water in California can be found in the California Water Code (CWC), California Code of Regulations (CCR), and California Health and Safety Code. It is State policy to promote the use of recycled water to the maximum extent in order to supplement existing surface and groundwater supplies to help meet water needs (CWC sections 13510-13512). One of the primary conditions on the use of recycled water is protection of public health (CWC sections 13521, 13522, 13550(a)(3)). The Central Valley RWQCB's Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan) implements the policy set forth by the State Water Board and CDPH by identifying the need to develop and use recycled water (CWC section 13241).

Any person who proposes to produce or use recycled water must file a report (CWC section 13522.5) and obtain water reclamation requirements (CWC section 13523) or a master reclamation permit (CWC section 13523.1) from the appropriate RWQCB. The CWC (sections 13500-13529.4) requires that CDPH establish criteria for each type of use of recycled water. CDPH has promulgated regulatory criteria in Title 22, Division 4, Chapter 3,

[3] West Yost Associates. 2004. Joint City of Stockton, City of Lodi Effluent Disposal and Reuse Study. October 28.

section 60301 et seq. of the CCR. The provisions of Title 22 are incorporated in the permits that are enforced by the RWQCB. All systems where recycled water is used are regulated by the RWQCB. Permits can be issued to the producer, distributor, or user of the recycled water (Water Code Sections 13263, 13523, 13523.1).

The current State of California Water Recycling Criteria (adopted in December 2000) require the submission of an engineering report to the RWQCB and CDPH before recycled water projects are implemented. These reports must also be amended prior to any modification to existing projects. The engineering report is to describe the manner by which a project will comply with the Water Recycling Criteria. The Water Recycling Criteria are contained in Sections 60301 through 60355, inclusive, of the California Code of Regulations, Title 22. The Criteria prescribe:

- Recycled water quality and wastewater treatment requirements for the various types of allowed uses,
- Use area requirements pertaining to the actual location of use of the recycled water (including dual plumbed facilities), and
- Reliability features required in the treatment facilities to ensure safe performance.

Section 60323 of the Water Recycling Criteria specifies that the engineering report be prepared by a properly qualified engineer, registered in California and experienced in the field of wastewater treatment. The report shall contain the necessary information to assure the regulatory agencies that the degree and reliability of treatment is commensurate with the requirements for the proposed use, and that the distribution and use of the recycled water will not create a health hazard or nuisance. The City of Lodi has no requirements or permitting process for the use of recycled water outside of those implemented by the Central Valley RWQCB and the CDPH.

Data Request

30. Please provide the names and telephone numbers of the CVRWQCB and DPH personnel who are responsible for recycled water permitting and use.

Response: Personnel responsible for recycled water permitting and use are identified in Table DR30-1.

TABLE DR30-1
Agency Contacts for Recycled Water Permitting

Agency (Department)	Name	Telephone Number
California Department of Public Health (Recycled Water Unit)	Jeff Stone	(805) 566-9767
Central Valley Regional Water Quality Control Board (Permitting)	Tim O'Brian	(916) 464-4616

Background

In Section 5.15.1.4.1 of the Application for Certification (AFC), NCPA states that no backup water supply for the LEC is required or planned at this time due to the high reliability level of the WSWPCF.

Data Request

31. In the event of a long-term outage at the WSWPCF and the facility is not capable of delivering recycled water to the LEC, please provide a discussion of the actions to be taken by NCPA for continued LEC operation.

Response: The LEC facility does not have a backup water supply. Recycled water from the White Slough WPCF is extremely reliable and there are few other users of the water source. Over the past 5 years, the White Slough WPCF has an availability of 100% and has met Title 22 Standards 98.8% of the time. Other higher priority users include only the STIG plant and the San Joaquin County Mosquito and Vector Control District facility. In the event recycled water is not available from the White Slough WPCF, the LEC will be able to operate for approximately 8 to 12 hours utilizing onsite storage. The White Slough WPCF is equipped with a backup diesel generator capable of supplying the full electrical needs of the facility in the event of a power outage. In the unlikely event that the White Slough WPCF becomes unreliable in the future, NCPA will present mitigation measures to the CEC for review and approval.

Data Request

32. Please provide a discussion of potential backup water suppliers that includes: a. the location of the water suppliers; b. the sources and quality of the water to be supplied, and c. the timeframe a backup water supply would be available for LEC operation.

Response: Please see the response to Data Request 31.

Background

Within the AFC (Section 5.15.1.3), NCPA states that the project site is in the 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA). In Data Response 21 of the LEC's Supplement B – Data Adequacy Responses, NCPA proposes to elevate the project site above the 100-year flood elevation.

Data Request

33. Please provide the elevation of the lowest and highest points on the LEC project site as determined by a licensed civil engineer or land surveyor.

Response: The proposed highest point on the LEC is approximately elevation 8.75 feet (see Supplement B, Preliminary Drainage Study, Attachment DA 5.15-7, paragraph III, B, on page 2/6, and also Supplement B, Attachment DA 5.15-6, Figure EX2). This highest point elevation is referring to the highest surface grade, and not the finished floor elevations of various structures. The proposed lowest point is approximately elevation 6.7 feet, located near the southeast corner of the site (see Supplement B, Attachment DA 5.15-6, Figure EX2).

Data Request

34. Per the requirements of the National Flood Insurance Program, please provide a discussion of the procedure for requesting a revision or amendment of the 100-year floodplain map for removal of the LEC site from the floodplain and provide the expected timeframe or schedule for submitting an application to FEMA for this purpose.

Response: The National Flood Insurance Program (NFIP) requires that a Conditional Letter of Map Revision (CLOMR)[4] be submitted to FEMA before a project can be built for projects that meet either of the following situations:

1. Project is on a stream or river that has been studied through detailed hydrologic and hydraulic analyses and for which base flood elevations have been specified, but a floodway has not been designated, and the community proposes to allow development that would result in more than a 1.0 foot increase in the base flood elevation.

2. Project is on a stream or river for which detailed analyses have been conducted and base flood elevations and a floodway have been designated, and the community proposes to allow development totally or partially within the floodway that would result in any (greater than 0.0 foot) increase in the base flood elevation.

The LEC project does not fall under either situation described above and therefore is not required to submit a CLOMR to FEMA under the NFIP. Although the two situations described above are the only requirements to obtain a CLOMR prior to permitting development, FEMA will review and comment and, if appropriate, issue a CLOMR for any proposed project when requested by a participating community. Therefore, a CLOMR is not required for the LEC project unless the City of Lodi has set it as a condition of approval for the flood development permit.

Data Request

35. In the event that the FEMA designated 100-year flood elevation rises due to climate change, please provide a discussion of the methods to be employed to keep the LEC site from flooding.

Response: There is no evidence that FEMA will be redesignating its 100-year flood elevation due to climate change and, therefore, any design to accommodate such a speculative event has not been performed. Because the CEC is charged with determining whether or not the project will comply with LORS, it is important to note that it is impossible to anticipate all the future changes to LORS that might occur in the future. Therefore, the CEC has a long history of ensuring compliance with those LORS at the time of its Decision. Future LORS changes might require modifications by a project; however how and when that occurs is

[4] A CLOMR comments on whether the proposed project meets the minimum floodplain management criteria of the National Flood Insurance Program and, if so, what revisions will be made to the community's NFIP map if the project is completed as proposed. A Letter of Map Revision (LOMR) is an official revision to a community's current flood map. It is used to change flood zones, flood elevations, mapping features, and floodplain and floodway delineations. Request for revisions to a single property that will be raised by fill dirt necessitates a Letter of Map Revision Based On Fill (LOMR-F), which can revise the flood map for a single property. Applications for a LOMR-F require a MT-1 form, including documentation and payment to the National Flood Insurance Program (NFIP). For a LOMR-F, FEMA requires a Community Acknowledgement Form to be completed by a community official. Applications for a LOMR-F are sent to the FEMA Letter of Map Amendment (LOMA) Depot. For single-building or single-lot determinations that do not involve changes to base flood elevation (BFEs) or floodways, a LOMR-F generally can be issued within 4 weeks.

determined by the applicability of future LORS. For example, projects approved some time ago met the air quality BACT requirements that were in effect at the time of approval. Any subsequent changes in air quality emission standards are dealt with under District rules that dictate if and how such new standards apply to existing facilities. While NCPA will ensure that the LEC complies with LORS, future compliance will depend entirely on the applicability of those changes to existing facilities.

Background

In the Geotechnical Report located in Appendix 2C of the AFC, the authors of the report recommend the over-excavation of approximately 5 feet of the existing soil from the project site then recompacting the soil as engineering fill (Section 4.9). Recompaction of the existing soil may further lower the project site elevation resulting in the need for additional imported soil to elevate the project site above the 100-year flood level.

Data Request

36. Please provide the cross sections and volume calculations for the amount of soil to be cut and over-excavated from the LEC project site and the amount of soil to be used as fill to elevate the site above the 100-year flood level.

Response: The estimated volume of fill necessary to elevate the site so that the "top of foundation" elevation is 9.00 is shown in Supplement B, Attachment DA 5.15-6, Figure EX2. This indicates a net fill of 8,747 cubic yards. The preliminary cross section associated with this estimate is shown in Supplement B, Attachment DA 5.15-6, Figure EX1. The estimated volume of soil that will be "overexcavated and recompacted" is 19,656 cubic yards and is based on the preliminary calculation provided as Attachment DR36-1.

Background

In Response 17 of the LEC's Supplement B – Data Adequacy Responses, NCPA has submitted both a draft construction Storm Water Pollution Prevention Plan (SWPPP) and a Preliminary Drainage Study (Attachments DA 5.15-1 and DA 5.17-7). Both documents only cover the 4.4 acres of the LEC plant footprint and provide no delineation or description of the 9.8 acres of proposed construction and laydown areas or the 2.5-mile natural gas pipeline. The information provided by NCPA is incomplete and does not provide sufficient information for a CEQA analysis.

In Response 17, NCPA proposes to submit a Construction Drainage, Erosion, and Sediment Control Plan (DESCP)/SWPPP prior to site mobilization. A draft DESCP/SWPPP is required to properly delineate the entire LEC Project and to provide a discussion of potential impacts and proposed mitigation measures for protection of soil and water resources during construction of the LEC.

Data Request

37. Please provide a draft DESCP/SWPPP containing elements A through I below outlining site management activities and erosion/sediment control best management practices (BMPs) to be implemented during site excavation, elevation, construction, and post-construction activities. The level of detail in the draft DESCP/SWPPP should be commensurate with the current level of planning for site elevation, grading, and drainage. Please provide all conceptual storm water pollution and erosion

control information for those phases of construction and post-construction that have been developed or provide a statement when such information will be available.

A. Vicinity Map – A map(s) at a minimum scale 1”=100’ shall be provided indicating the location of all project elements (construction site, laydown areas, pipelines, etc.) with depictions of all significant geographic features including swales, storm drains, and sensitive areas.

B. Site Delineation – All areas subject to soil disturbance for the LEC (project site, laydown area, all linear facilities, landscaping areas, and any other project elements) shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, pipelines, roads, and drainage facilities. The Site Delineation shall be at a minimum scale 1”=100’.

C. Watercourses and Critical Areas – On the Site Delineation, the location of all nearby watercourses including swales, storm drains, and drainage ditches shall be shown. Indicate the proximity of those features to the LEC construction, laydown, landscape areas, and all transmission and pipeline construction corridors.

D. Drainage Map – The DESCP/SWPPP shall provide a topographic site map(s) at a minimum scale 1”=100’ showing all existing, interim and proposed drainage systems, and drainage area boundaries. On the map, spot elevations are required where relatively flat conditions exist. The spot elevations and contours shall be extended off site for a minimum distance of 100 feet.

E. Drainage of Project Site Narrative – The DESCP/SWPPP shall include a narrative of the drainage measures to be taken to protect the site, downstream facilities and watercourses. The narrative shall include the summary pages from the hydrologic and hydraulic analyses prepared by a professional engineer or erosion control specialist. The narrative shall state the watershed size(s) in acres used in the calculation of drainage control measures and text included that justifies their selection. The hydrologic and hydraulic analyses should be used to support the selection of BMPs and structural controls to divert off site and on-site drainage around or through the LEC construction and laydown areas.

F. Clearing and Grading Plans – The DESCP/SWPPP shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross sections or other means. The on-site locations of any disposal areas, fills, or other special features shall also be shown. Illustrate existing and proposed topography tying in proposed contours with existing topography.

G. Clearing and Grading Narrative – The DESCP/SWPPP shall include a table with the quantities of material excavated or filled for the site and all project elements of the LEC (project site, lay down area, transmission corridors, and pipeline corridors) whether such excavations or fill is temporary or permanent, and the amount of such material to be imported or exported.

H. Best Management Practices Plan – The DESCP/SWPPP shall identify on a water pollution control drawing (WPCD) the location of the site specific BMPs to be employed during each phase of construction (initial elevation, grading, linear excavation and construction, and final grading/stabilization). Treatment control BMPs used during construction should enable testing of storm water runoff prior to

discharge to the storm water system. BMPs shall include measures designed to prevent wind and water erosion in areas with existing soil contamination.

I. Best Management Practices Narrative – The DESCP/SWPPP shall show the location (as identified on the WPCD), timing, and maintenance schedule of all erosion and sediment control BMPs to be used prior to initial grading, site elevation, and all project excavation and construction. Text with supporting calculation shall be included for each project specific BMP proposed for use prior to initial site elevation, grading, and project excavation and construction. Text with supporting calculation shall be included for each project specific BMP.

Response: A DESCP/SWPPP is currently being prepared and will be submitted to Staff in February 2009.

ATTACHMENT DR36-1

Soil Excavation Calculations

WorleyParsons
resources & energy

Date: 1/12/2009
By: B. Anders
Checked:

Overexcavation and Import Estimates
NCPA Lodi Energy Center (LEC)
Data Set No. 1, Request No 36

The data request is restated below for reference
"Please provide the cross sections and volume calculations for the amount of soil to be cut and over-excavated from the LEC project site and the amount of soil to be used as fill to elevate the site above the 100-year flood level."

1) The total volume of overexcavation is based on the preliminary Geotechnical Study included in Appendix 2C, wherein it is stated that 5' of overexcavation is recommneded.
2) The "finish floor" elevations are assumed to be at elevation 9.0 feet. This is depicted in the Conceptual Grading Plan, sheet EX2, included in Attachment DA 5.15-6. The "finish floor" can also be referred to as the "top of concrete". Per the FEMA Flood Zone Map (figure DA 5.15-1) the flood elevation is 8.0 feet. Therefore the proposed finish floor elevations for this calculation are at 1 foot above the noted flood elevation.

Power Plant Structure	Length (feet)	Width (feet)	Total Area (sq feet)	Depth (feet)	Average Elevation at Structure (feet)	Excavation Depth to bottom of foudnation (feet)	Overexcavation Depth (feet)	Total Estimated Excavation Volume (CY)
CTG	112	60	6720	5	6	2	5	2,214
STG	140	45	6300	5	6	2	5	2,139
SCR	185	57	10545	4	6	1	5	2,903
GSU	75	40	3000	5	6	2	5	1,102
Aux Boiler	40	40	1600	4	5	0	5	463
Pipe Rack	250	50	12500	4	7	2	5	4,044
Gas Compressors	100	35	3500	4	6	1	5	1,100
Water Treatment Bldg	105	60	6300	2	7	0	5	1,491
PDC	60	20	1200	3	6	0	5	389
PDC	60	20	1200	3	5	-1	5	311
PDC	60	20	1200	3	8	2	5	544
Miscellaneous and incidental items	50	100	5000	3	8	2	5	1,711
CTG to GSU Power Line up	150	20	3000	3	8	2	5	1,244
			62065					19,656

Transmission System Engineering (38–47)

Background

The California Environmental Quality Act (CEQA) requires the identification and description of the "Direct and indirect significant effects of the project on the environment." The Application for Certification (AFC) requires discussion of the "energy resource impacts which may result from the construction or operation of the power plant." For the identification of impacts on the transmission system resources and the indirect or downstream transmission impacts, staff relies on the System Impact and Facilities Studies for insuring the interconnecting grid meets the California Independent System Operator (California ISO) reliability standards. The studies analyze the effect of the proposed project on the ability of the transmission network to meet reliability standards. When the studies determine that the project will cause a violation of reliability standards, the potential mitigation or upgrades required to bring the system into compliance are identified. The mitigation measures often include the construction of downstream transmission facilities. CEQA requires the analysis of any downstream facilities for potential indirect impacts of the proposed project. Without a complete System Impact Study (SIS) or Facilities Study (FS), staff is not able to fulfill the CEQA requirement to identify the indirect effects of the proposed project.

Data Request

Section 3.3.1 of the AFC indicated that NCPA/Lodi Energy Center, California ISO, and Pacific Gas and Electric (PG&E) have agreed to expedite the transmission interconnection study process. The Facilities Study would include elements from the System Impact Study. Also as stated in the AFC, NCPA, and PG&E have agreed to include elements from the SIS in the interconnection Facilities Study, which was due to be completed in December 2008.

38. Provide the Facilities Study.

Response: The Interconnection Facilities Study Report is provided as Attachment DR38-1. Due to the size of the document, 5 hard copies and one electronic copy have been provided to the CEC. Additional copies will be provided upon request.

Data Request

39. Identify major assumptions in the base cases including imports to the system, major generation and load changes between the peak and partial peak cases.

Response: Please see Sections 4 and 5, as well as Appendix D of Attachment DR38-1.

Data Request

40. Analyze system for N-0, important N-1 and critical N-2 contingency conditions and provide a list of criteria violations in a table showing the loadings before and after adding the MLGS.

Response: Please see Sections 1 and 7 of Attachment DR38-1.

Data Request

41. Provide a Short Circuit Duty Analysis.

Response: Please see Section 8 of Attachment DR38-1.

Data Request

42. Provide a Dynamic Stability Analysis.

Response: Please see Section 8 of Attachment DR38-1.

Data Request

43. Provide a Reactive Power Deficiency Analysis.

Response: Please see Section 10 of Attachment DR38-1.

Data Request

44. Provide system protection and substation evaluation.

Response: Please see Sections 9 and 12 of Attachment DR38-1.

Data Request

45. List mitigation measures considered and those selected for all criteria violations.

Response: Please see Section 13 of Attachment DR38-1.

Data Request

46. Provide electronic copies of *.sav and *.drw PSLF files.

Response: In conversations between the Applicant and CAISO, the Base Case *.sav and Base Case drawing *.drw may be obtained by Staff submitting a Non Disclosure Agreement with PG&E for these records. The request may be submitted to the PG&E Grid Interconnection Services, Attention Barbara Madrid, 415-973-8033, bjm5@pge.com.

Data Request

47. Provide power flow diagrams (megawatt, % loading & per unit voltage) for base cases with and without the project. Power flow diagrams must also be provided for all N-0, N-1 and N-2 studies where overloads or voltage violations appear.

Response: Please see Appendix D of Attachment DR38-1.

ATTACHMENT DR38-1

Interconnection Facilities Study Report

ATTACHMENT DR38-1

Interconnection Facilities Study Report

Due to size, five hard copies and one electronic copy of the Interconnection Facilities Study Report have been provided to the CEC. Additional copies will be provided upon request.

Visual Resources (48–49)

Background

The Lodi Energy Center will be clearly visible from Interstate 5 (I-5), a county-designated scenic highway (See KOP 1); the White Slough wildlife and recreational area (see KOP 2); and a housing development to the south (see KOP 3). Landscaping would assist the LEC in blending into the scenic environment and providing a buffer for the residential area.

Data Request

48. Please provide a landscaping plan with vegetative screening to buffer the view from I-5; the White Slough wildlife and recreational area; and the residential area to the south. b. Along with the landscaping plan above, please provide a simulation of growth (1) after five years and (2) at maturity, and whether the new landscaping would potentially impact threatened and endangered species located within the proposed project site.

Response: No landscaping plan is being prepared for this site. The City of Lodi indicated that no landscaping would be required for this project. The visual analysis indicated that there would be no visual impacts in any of the views from KOPs 1, 2, or 3 (from I-5, White Slough, and 8 Mile Road, respectively). There is, therefore, no CEQA rationale for developing a landscape plan. Should CEC Staff determine that there are significant impacts in any of these views, a landscaping plan could be required as a Condition of Certification.

Background

Second-story housing developments are located on Eight Mile Road, south of the project site. Residents of those developments would have a long, clear view of the Lodi Energy Center when looking north from second-story windows.

Data Request

49. To account for the view those highly sensitive viewers would have from the second story, please reshoot KOP 3 from at least 10 feet above ground and provide both a current view and simulated view of the Lodi Energy Center.

Response: A basic tenet of visual analysis is that the simulations include views from publicly accessible viewpoints. For sensitive locations, the Applicant has selected a conservative viewpoint that adequately represents the view from nearby residences. However, it is inappropriate to approximate private views, and artificially create viewpoints, such as the elevated viewpoint requested in the data request.

Waste Management (50–56)

Background

The size of the project site is reported as 4.4 acres in the project description for the Lodi Energy Center Project's Application for Certification (AFC) and 2.6 acres in the Waste Management Section of the AFC. The Phase I Environmental Site Assessment (ESA) was completed for a 2.6 acre site.

Data Request

50. Please explain why there is a difference in the size of the proposed project in the AFC Project Description, the Waste Management section, and the Phase I ESA.

Response: The AFC Project Description lists the project acreage as 4.4 acres. The Waste Management section lists the project as 2.6 acres. The Phase I ESA list the project as 2.6 acres in section 3.1 and as 5.4 acres in section 8.2.

The correct project size is 4.4 acres. Examination of Figure 2 of the Phase I ESA shows a plan view of the site with marked boundaries of the reviewed area. The entire LEC project site falls within area marks. The review area marked is in fact larger than the project site. This would indicate that the 5.4 acres in Section 8.2 is the correct number. A letter provided by the preparers of the Phase I ESA identifying the acreage error in section 3.1 of the Phase I ESA is provided as Attachment DR50-1. The preparers of the Phase I ESA have confirmed that the entire project site was reviewed.

Data Request

51. Assuming the project will occupy 4.4 acres, please supplement the Phase I ESA to address review of the specific project site.

Response: Please see the response to Data Request 50.

Background

The Phase I ESA found that in the past the proposed project site was used for agricultural purposes. The property was also used in the late 1980s and 2003 for stockpiling biosolids/sludge removed from the White Slough Water Pollution Control Facility treatment and holding ponds (page 2-1). Common agricultural practices can result in residual concentrations of fertilizers, pesticides or herbicides in near-surface soil. To ensure that the concentrations of various chemicals do not pose a potential health risk or hazard, the project owners should provide soil sampling of the parcel/project site.

The Phase I Environmental Site Assessment (ESA) did not identify any recognized environmental conditions, thereby eliminating the need for a Phase II ESA. Although a Phase II ESA was not completed, staff believes that given these past land uses and proposed construction the project owner should verify that no harmful concentrations of any contaminants will be encountered at the proposed project site. The California Department of Toxic Substances Control (DTSC) has prepared the "Interim Guidance for Sampling

Agricultural Fields for School Sites (Second Revision August 26, 2002)". Staff believes this guidance or equivalent may be appropriate and useful for further site analysis.

PROTOCOL

The project owner should determine if there is any analytical characterization data for the agriculture chemicals and biosolids that were applied to the land. Samples should be assessed for persistent agricultural chemicals, such as organochlorine pesticides and other analyses that might be indicated by a review of the characterization data associated with the sludge that was applied to the project property. These data would be used to determine a reasonable analytical suite for samples. The project owner should sample for CAM 17 metals (the 17 California regulated metals), and organochlorine pesticides in addition to the other chemicals. The AFC describes the size of the project as either 2.6 or 4.4 acres. Sampling protocol for projects that are between two to four acres in size require a sample frequency of eight locations, evenly spaced across the site. For sites greater than four acres and up to 20 acres, discrete samples should be collected on ½-acre centers. Each location should be sampled to include one surface sample (0 to 6 inches) and one subsurface sample (2 to 3 foot range).

Data Request

52. a. Please provide results of field sampling and analysis which adequately characterize the presence of harmful chemicals or conditions.

    b. Please discuss whether there will be any risk to construction or plant personnel due to the presence of these chemicals.

Response: Field sampling at the project site occurred on February 2, 2009. Analysis of these samples is currently underway, and results from the investigation will be provided to Staff as soon as they are available. Once sample results have been received, a discussion can be provided as to any possible risk to construction or plant personnel.

Background

The Integrated Waste Management Act of 1989 (AB 939) established landfill waste diversion goals of 50 percent by the year 2000 for state and local jurisdictions. To meet the solid waste diversion goals, many local jurisdictions have implemented Construction and Demolition Waste Diversion Programs.

Data Request

53. Please identify whether the city of Lodi or county of San Joaquin operates a Construction and Demolition Waste Diversion Program, and cite the jurisdiction to which the LEC Project would be accountable.

Response: San Joaquin County currently operates the Construction and Demolition (C&D) Waste Diversion Program. The only reported jurisdiction with a passed C&D ordinance is the City of Stockton. In conversations with Robert McClellon, Program Coordinator (Solid Waste and Recycling) at the San Joaquin County Environmental Health Department, the City of Lodi does not have a current C&D ordinance; however, a draft ordinance similar to the City of Stockton's ordinance is currently underway. An effective date for the City of Lodi's ordinance is not known, thus the LEC project is not currently accountable to any C&D waste diversion program. When the City of Lodi ordinance becomes active, permitting

would be accomplished through the City of Lodi in accordance with the San Joaquin County program.

Data Request

54. Please describe how project operations will meet each of the requirements of the program cited in the previous data request.

Response: As discussed in the response to DR#53, the LEC project is not currently accountable to a construction and demolition waste diversion program.

If the draft ordinance for the City of Lodi is passed before the permits for the LEC project are issued, then the LEC project will be required to comply. The current ordinance for the City of Stockton is similar to the draft ordinance for the City of Lodi. For Stockton, the ordinance reads as follows:

> *"The construction and demolition (C&D) ordinance applies to all persons seeking a new building or demolition permit. Permit applicants are required to identify all materials expected to be generated as a result of the building or demolition project when they apply for the permit. Applicants for all new building construction projects and complete building demolition projects are required to recycle at least 50 percent of the waste generated by the project. Within 60 days following project completion, the applicant must submit a C&D debris recycling report with the appropriate documentation demonstrating the diversion goal was met for the project. For more information, see Chapter 7, Part II, Division 3 of the city's municipal code."*

Background

A Phase I (ESA) needs to be conducted for all proposed project linear facilities. The LEC applicant is proposing a 2.5-mile natural gas pipeline that has not been evaluated in a Phase I ESA.

The following types of businesses warrant investigation if they are located on, adjacent to, or in proximity to the proposed linear facility routes. Proximity is defined as within a path of migration from these businesses.

a. Automobile dealerships, maintenance /repair, and storage and salvage lots.

b. Golf courses (fertilizers and pesticides).

c. Machine /equipment /appliance servicing operations.

d. Commercial printing operations.

e. Oil distribution facilities.

f. Any industry engaged in the storage /transport /disposal of hazardous waste or the use of hazardous materials.

g. Schools, daycare centers and hospitals.

Data Request

55. Please provide a Phase I ESA for the 2.5-mile natural gas pipeline, according to ASTM Standard E1527-05 Standard Practice for Environmental Site Assessments.

Response: The natural gas pipeline will follow the existing natural gas pipeline route for the existing STIG facility and is located adjacent to agricultural fields and farmhouses. No industrial facilities are adjacent to the natural gas pipeline with the exception of the STIG plant and the White Slough WPCF, which are both located adjacent to the proposed project site and are discussed in the Phase I ESA provided with the AFC.

Data Request

56. Please identify the type of crops grown over as long a period as records indicate, the historical use and identity of pesticides (including organic and inorganic pesticides as well as herbicides), and a statement of the likelihood of finding levels of pesticides along the pipeline/transmission route that might present a risk to pipeline workers and/or the public.

Response: Current crops along the gas line route include hay, alfalfa, and a small area of vineyards. The San Joaquin County Agricultural Commission has been contacted to provide historical crop and pesticide use for the properties along the gas line route. The information will be provided to Staff in mid/late February 2009.

Due to the agricultural nature along the gas pipeline route, it is possible that pesticides may be present in the soils surrounding the pipeline. However, since the gas pipeline will be constructed, owned, and operated by PG&E and not NCPA, appropriate PG&E worker health and safety guidance will be followed.

ATTACHMENT DR50-1

Phase I ESA Letter Identifying Project Size

January 12, 2009

CARLTON
Engineering Inc.

Michael DeBortoli
Electrical / IT Engineer V
Northern California Power Agency
651 Commerce Drive
Roseville, CA 95678-6420

Subject: **Phase I Environmental Site Assessment**
Lodi Energy Center Property - Clarification
San Joaquin County Assessor's Parcel No. 055-130-16
12745 N Thornton Road
Lodi, San Joaquin County, California
Carlton Project 6300-01-08

Dear Mr. DeBortoli,

Carlton Engineering, Inc. (Carlton) has prepared this clarification to our June 2008 Phase I Environmental Assessment (ESA) in order to confirm that the area addressed in the ESA included the entire 4.4-acre parcel that is proposed for development as a power generation facility, and to correct discrepancies between the study area acreages cited in the ESA and those of the Project Description.

The ESA report's study area was based on site extent information obtained during the assessment process (approximately 5.4 acres) and was portrayed on the survey map prepared at the time of the assessment. Section 3.1 of the ESA report incorrectly stated the study area to consist of 2.6 acres. The ESA study area shown as the site on Figure 2 of the report (approximately 5.4 acres) encompasses the complete facility development area indicated in the Project Description (4.4 acres), and the ESA addresses environmental conditions within those boundaries.

We appreciate the opportunity to assist the NCPA on this project and look forward to serving you again in the near future. Should you have any questions or need any additional information, please contact us at (530) 677-5515.

Sincerely Yours,
CARLTON ENGINEERING, INC.

Michael Vander Dussen, P.G., C.E.G.
Senior Project Engineering Geologist

Robert Kull, P.E.
Environmental Department Manager

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION FOR THE *Lodi Energy Center*

DOCKET NO. 08-AFC-10

PROOF OF SERVICE
(Revised 2/2/09)

INSTRUCTIONS: All parties shall 1) send an original signed document plus 12 copies OR 2) mail one original signed copy AND e-mail the document to the web address below, AND 3) all parties shall also send a printed OR electronic copy of the documents that shall include a proof of service declaration to each of the individuals on the proof of service:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-03
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

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DECLARATION OF SERVICE

I, Mary Finn, declare that on February 5, 2009, I deposited copies of the attached Data Response Set 1A, in the United States mail at Sacramento, CA with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

OR

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

Mary Finn

Attachments