ANTELOPE VALLEY PUBLIC LANDFILL CUP

AMENDMENT TO DRAFT ENVIRONMENTAL IMPACT REPORT

(SCH #1990010988)

TECHNICAL APPENDICES VOLUME I

Prepared for:
City of Palmdale
Planning Department
38250 Sierra Highway
Palmdale, California 93550

Prepared by:
EDAW/AECOM
2737 Campus Drive
Irvine, California 92612

May 2010

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CUP

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VOLUME I

Lead Agency:

City of Palmdale
Planning Department
38250 Sierra Highway
Palmdale, California 93550
Contact: **Mr. Richard Kite, Assistant Director of Planning**
(661) 267-5200

Consultant:

EDAW/AECOM
2737 Campus Drive
Irvine, California 92612
Contact: **Ms. Jane Chang, Project Manager**
(949) 660-8044

May 2010

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Initial Study/NOP

CITY OF PALMDALE

PLANNING DEPARTMENT

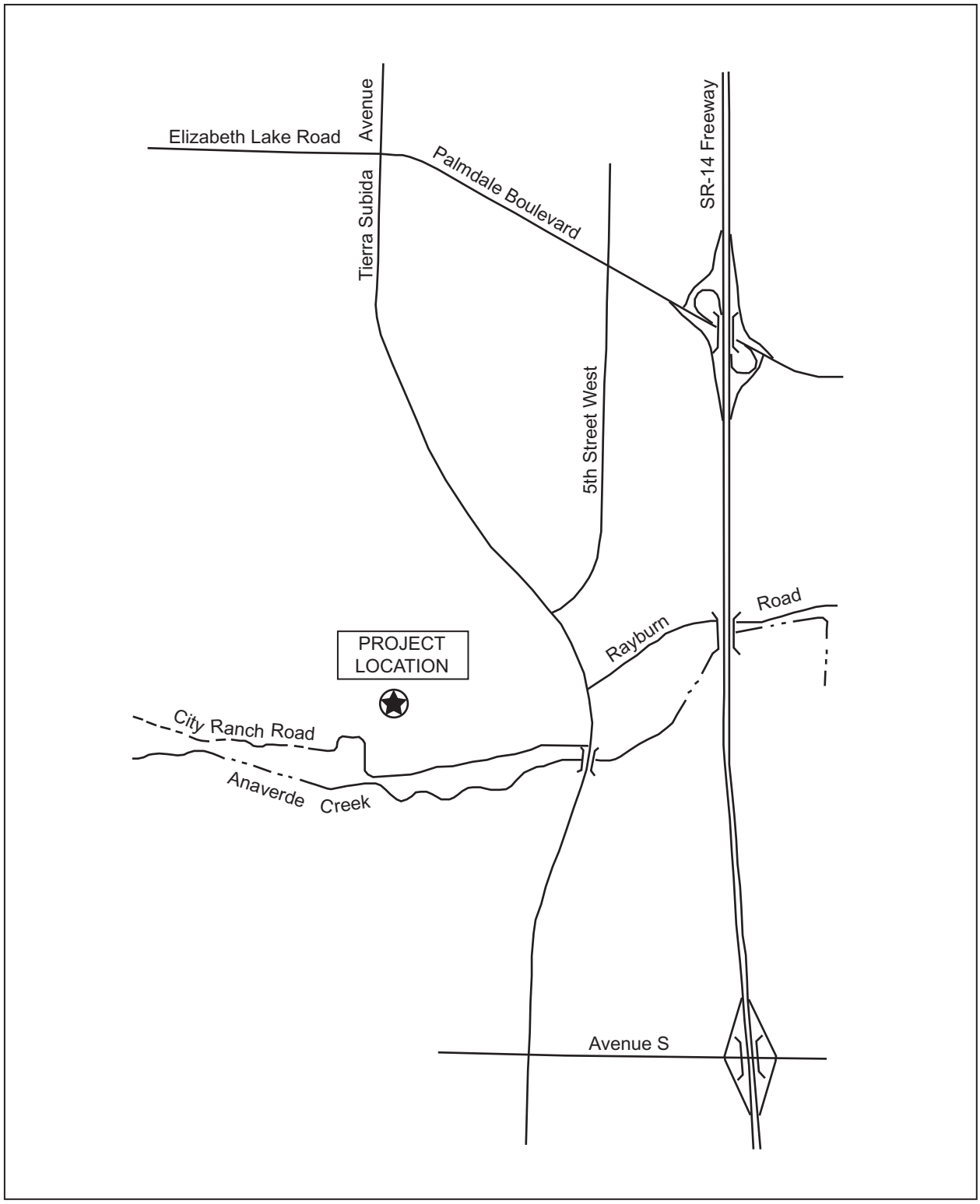
INITIAL STUDY

QUESTIONNAIRE

APPLICATION NO:	Conditional Use Permit (CUP) # 98-12
NAME OF APPLICANT:	Antelope Valley Recycling & Disposal Facility
LEAD AGENCY:	City of Palmdale
CONTACT PERSON:	Richard Kite Associate Planner Planning Department 38250 Sierra Highway Palmdale, CA 93550
LOCATION OF PROJECT:	1200 W. City Ranch Road, Palmdale, CA 93590
EXISTING GENERAL PLAN LAND USE DESIGNATION:	PF (Public Facility)
PROPOSED GENERAL PLAN LAND USE DESIGNATION:	N/A
EXISTING ZONING:	PF-PZ (Public Facility – Pre-Zone) and PF-Landfill (Public Facility Landfill)
PROPOSED ZONING:	N/A
PRESENT LAND USE:	Landfill Operation

LOCATION MAP: The proposed project site is located in the northeastern portion of Los Angeles County. The project area is located directly west of the Antelope Valley Freeway (SR-14) and the City of Palmdale adjacent to City Ranch Road in an area known as the Anaverde Valley. The site lies at the existing terminus of City Ranch Road, west of Tierra Subida Avenue (**Exhibit 1**, Project Location).

February 2004



N.T.S.

Exhibit 1

EDAW February 2004

Project Location

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

I. APPLICABILITY OF THE INITIAL STUDY

A. Is the proposed action a "project" as defined by CEQA? (See Section I. of the City's CEQA Guidelines. If more than one application is filed on the same site, consider them together as one project.)
☒ Yes ❑ No

1. If the project qualifies for one of the Categorical Exemptions listed in Section 6.C. of the City's CEQA Guidelines, is there a reasonable possibility that the activity will have a significant effect due to special circumstances? ❑ Yes ❑ No ☒ N/A

II. INITIAL STUDY REVIEW

A. Does the project require a 30-day State Clearinghouse review?
☒ Yes ❑ No

The following are other responsible agencies for the project:

- Integrated Waste Management Board (IWMB)
- Local Enforcement Agency (LEA)
- Regional Water Quality Control Board (RWQCB)
- Antelope Valley Air Quality Management District (AVAQMD)

III. PROJECT ASSESSMENT

A. Project Description: The project proposes certain modifications to the existing County-approved Conditional Use Permit (CUP) (**Figure 1,** Exhibit "A," contained in **Attachment A**, Project Narrative). These modifications primarily include, 1) expanding the aggregate 114-acre refuse footprint by approximately 11 acres in order to combine the two landfills into one disposal area (**Figure 2**, Site Plan, contained in **Attachment A**, Project Narrative); 2) increasing the facility boundary from 180 to 185 acres to accommodate additional ancillary facilities (**Figure 2a**, Ancillary Facilities, contained in **Attachment A**, Project Narrative); and 3) updating the legal boundary of the combined facility as shown on **Figure 3**, Project Boundaries, contained in **Attachment A**, Project Narrative. These modifications will provide an enhancement of 14 million cubic yards of capacity.

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B. Description of the Project Site: The Antelope Valley Public Landfill (Landfill I), located in the City of Palmdale (the City), consists of approximately 72 acres (eastern portion of Exhibit "A," **Figure 1**, contained in **Attachment A**, Project Narrative). Of the 72 acres, the northern 65-acre parcel, located within the City limits, is approved for landfill operations under the current Solid Waste Facilities Permit (SWFP) No. 19-AA-0009.

Immediately adjacent and to the west is a 108-acre area comprising the Antelope Valley Public Landfill II (Landfill II), previously located in the unincorporated portion of the County and annexed into the City of Palmdale as of November 21, 2003 (western portion, as outlined on the Exhibit "A" presented on Figure 1). Of the 108 acres, a Conditional Use Permit (CUP) for Landfill II was granted by the Regional Planning Commission, County of Los Angeles (Regional Planning) on April 8, 1992. An amendment to the CUP was approved on December 1, 1993. This landfill was issued SWFP No. 19-AA-5624 and has not been constructed. Of the 108 acres (per the Exhibit "A"), approximately 57 acres were approved for disposal of refuse (refuse footprint). Of the 108 acres, 10 acres were approved and are shown on Exhibit "A" (south and southeast portions of the landfill boundary) for ancillary facilities. The total combined area currently approved for landfill operations (including Landfills I, II, and ancillary facilities) is approximately 180 acres. For additional description, please refer to **Attachment A**, Project Narrative.

C Surrounding Land Uses:

North: Vacant land/R-1 (Single Family Residential 1 acre minimum lot size)/LDR (Low-Density Residential). Approximately ½ of a mile to the north is an existing residential development at Avenue Q8.

East: Vacant land/M-4 (Planned Industrial)/BP (Business Park). To the east is the existing landfill, and across from Tierra Subida on the east is the Sports Complex.

South: Vacant land/M-4 (Planned Industrial)/BP (Business Park). Anaverde Creek running along the southern and southwestern boundary of the site. Approximately, 2,000 feet to the south is the California Aqueduct.

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West: BP (Business Park)/SP-2 (City Ranch Specific Plan). Anaverde Creek running along the southern and southwestern boundary of the site.

D. Is the proposed project consistent with:

	Yes	No	N/A
City of Palmdale General Plan	☒	❑	❑
Applicable Specific Plan	❑	❑	☒
City of Palmdale Zoning Ordinance	☒	❑	❑
Air Quality Management Plan	☒	❑	❑
Congestion Management Plan	☒	❑	❑
Regional Comprehensive Plan	☒	❑	❑

E. Have any of the following studies been submitted?

- ☒ Geology Report
- ☒ Hydrology Report
- ❑ Soil Report
- ☒ Traffic Study
- ☒ Noise Study
- ☒ Biological Study
- ❑ Native Vegetation Preservation Plan
- ❑ Solid Waste Generation Report
- ❑ Public Services/ Infrastructure Report
- ❑ Historical Report
- ☒ Archaeological Report
- ☒ Paleontological Study
- ☒ Line of Sight Exhibits
- ☒ Visual Analysis
- ❑ Slope Map
- ❑ Fiscal Impact Analysis
- ☒ Air Quality Report
- ❑ Hazardous Materials/ Waste

(Studies may be reviewed by contacting the case planner at (661) 267-5200.)

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IV. DETERMINATION

On the basis of this initial evaluation:

> I find that the proposed project MAY have a significant effect(s) on the environment, but at least one effect: 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards; and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets, if the effect is a "potentially significant impact" or "potentially significant unless mitigated". A supplemental ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

This initial study was prepared by:

_____
Richard Kite
Associate Planner

_____
Date

_____
Asoka Herath
Assistant Director of Planning

_____
Date

_____
Laurie Lile
Director of Planning

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V. EARLIER ANALYSIS

Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, one or more effects have been adequately analyzed in an earlier EIR or (mitigated) negative declaration. In this case, a discussion should identify the following:

A. Earlier analyses used.

Palmdale Disposal Company, Inc. has been operating the Antelope Valley Public Landfill at its present location since 1956. Landfill I has been operating under a permit issued by the Los Angeles County Department of County Engineers Office. In 1984 an application for expansion project was submitted to the Los Angeles County Department of Regional Planning. Initial Study No. 84-012 was prepared by the Regional Planning to determine the project's potential impacts to the environment. The Initial Study was completed on October 31, 1984. It was determined that the landfill expansion may have a significant effect on the environment. Consequently, Los Angeles County required preparation of an EIR. The Draft EIR (SCH No. 85111312) was circulated for 45-day public review. Comments received were responded to in the Addendum to the Draft EIR (March 1985). A Supplemental Response to Comments document was prepared in August 1987.

Kleinfelder and Associates worked with the RWQCB in conducting detailed geotechnical analyses to determine the presence of a possible Holocene fault under the project site. The resultant information proved that the area underlying the proposed expansion site was not a Holocene fault, but rather a fracture. In 1990 RWQCB concurred with the Kleinfelder and Associates' findings and concluded that the basic conceptual design of the landfill expansion was adequate for the protection of water quality. Based on the new information, in 1991 the applicant proceeded with a request for approval of a CUP for the landfill expansion project. The landfill expansion project proposed in 1984 was not different from the expansion proposed in 1991. Draft EIR (SCH No. 90010988) was prepared and circulated in October 1991, and the Final EIR was prepared in February 1992 and was certified by the Los Angeles County Regional

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Planning Commission, on April 8, 1992. An amendment to the CUP was approved along with a Mitigated Negative Declaration (MND) (including a revised traffic study) on December 1, 1993. These previously approved County environmental documents are available for review at the City of Palmdale Planning Department located at 38250 Sierra Highway.

The EIR to be prepared for the currently proposed project (i.e., the CUP) is an update to the 1992 certified EIR and 1993 adopted Mitigated Negative Declaration (MND) and intends to use that document for purposes of focusing the current analysis.

B. Impacts adequately addressed.

The effects that were adequately analyzed within the previously certified EIR and were addressed by mitigation measures are as follows:

- Geotechnical
- Flooding
- Noise
- Water quality
- Air quality
- Biota
- Cultural Resources*
- Visual qualities
- Traffic/access
- Environmental safety

* This issue area has been adequately mitigated (see below) and will not be further analyzed within the EIR.

It should be noted that circumstances surrounding the 1992 certified EIR and 1993 approved MND, related to the above asterisk issue areas, are still the same. There has been no change in circumstances or new information that would change the previous impact determination for Cultural Resources.

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C. Mitigation Measures.

The following mitigation measures are from the CEQA Mitigation Monitoring Program originally adopted by the County in April 1992 and re-adopted in December 1993. These mitigation measures have been implemented by the project applicant and approved by the appropriate enforcement agency.

Archaeological Resources

44. In accordance with Sections 15064.5 and 15126.4 of the California Environmental Quality Act, if engineering or other project parameters will not allow preservation, the applicant shall subject the onsite deposits of shell and lithic material detected during the reconnaissance of site Ca-LAn-876 *and site AVL-1, subsequently designated CA-LAN-1917* to a data recovery excavation and recordation. The applicant shall be responsible for all costs incurred for archaeological excavation and reporting. The data recovery excavation and recordation shall be performed prior to the issuance of a *Solid Waste Facilities Permit* and include the development of a mitigation plan.

45. All material collected during the above recommended work shall be donated to an institution which has adequate facilities for curation, display and use by interested scholars and the general public.

46. A qualified archaeologist shall be present during clearing and initial grading of the property to monitor any additional deposits obscured by brush or buried by alluvial material. The monitoring archaeologist shall be prepared to document and recover any significant material that appears as quickly as possible using standard archaeological field practice.

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VI. EVALUATION OF ENVIRONMENTAL IMPACTS

A. Earth:

Based on the geotechnical or soils study for the project, review by the City's Engineering Department, and/or the General Plan Update:

1. Soils

a. Are there any areas of potential differential settlement on the project site which could significantly impact development of the proposed project?

☐	☐	☐	☒

b. Is the site in an area of high shrink/swell (hydrocompaction) potential which could significantly impact development of the proposed project?

☐	☐	☐	☒

c. Is the site in an area of potential subsidence?

☐	☐	☒	☐

d. Will the project result in a significant increase in wind or water erosion of soils, either on- or off-site?

☐	☒	☐	☐

e. Could the project result in siltation deposition, or erosion which may modify a stream channel, or adversely affect downstream flood control facilities?

☐	☒	☐	☐

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The prior environmental analysis stated that during storm events the active fill areas would be subject to erosion. The expansion site design evaluated in the 1992 certified EIR included perimeter drainage channels and the desiltation basin to manage site erosion. Based upon an updated hydrology analysis currently under preparation, similar design techniques will be proposed for the proposed project. The increase in height anticipated for Landfill II could change the landfill slope. However, because the expansion area would include specific design characteristics that are intended to control soil transport on the site, a change in slope is not anticipated to substantially affect site erosion.

The currently proposed project has the potential to result in siltation or erosion impacts which may adversely affect downstream flood control facilities without the proper mitigation.

Mitigation measures identified in the previously certified EIR, pertaining to surface runoff, increased erosion, and sediment transport will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to avoid or reduce the potential adverse impacts to a level of less than significant.

The prior environmental analysis also assumed that expansive soil impacts and hydrocompaction, differential settlement, and subsidence impacts would not be anticipated on the expansion site for the proposed project. These conclusions would still be applicable to the current proposal. No impacts would be anticipated.

2. Earthquakes

Based on the Alquist-Priolo Earthquake Fault Zoning Map (as amended 1994) and California Division of Mines and Geology Special Publication 42 (1997), or the geotechnical report for the project site:

a. Is the site in a fault rupture hazard zone? ☒ Yes ❑ No
If yes:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

i. Is there an active or potentially active fault on the project site? ☒ Yes ❑ No

ii. Does the project include a school, emergency or public facility, day care center, nursing home, or high rise building? ❑ Yes ☒ No

b. Is the site in a zone subject to seismic ground shaking, ground failure, or liquefaction?

❑	☒	❑	❑

According to the previously certified EIR, the western half of the expansion site is located within the Alquist-Priolo Zone for the San Andreas Fault. However, the prior environmental analysis concluded that expanding the landfill would not create an increased exposure to seismic activity. According to the previously certified EIR, there is no evidence for Holocene activity associated with the fault fractures and the Little Rock Fault within the project site. The proposed project would have seismic impacts similar to those anticipated in the prior environmental analysis, because none of the proposed project changes would affect the seismic hazards of the expansion site. Additionally, implementation of the proposed project would not create increased exposure to seismic activity. Seismic hazards constitute an existing safety condition experienced by all developments in the southern California region. The new Seismic Hazard Zones map for Ritter Ridge Quadrangle, dated August 14, 2003 indicates that there may be a potential for seismic related liquefaction.

The proposed project does not include a school, emergency or public facility, day care center, nursing home, or high rise building. No adverse impacts would be anticipated.

Mitigation measures identified in the previously certified EIR, pertaining to seismic hazards/faulting will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant.

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Related effects of severe ground shaking may include liquefaction. The new Seismic Hazard Zones map identifies the landfill area as having potential for liquefaction and/or ground displacement. However, based upon the previous studies included in the certified EIR, due to the relatively shallow depth to bedrock, high relative density of the onsite alluvial soils, and deep groundwater, the potential for liquefaction is considered negligible. No impacts are anticipated.

3. Slopes

Based on the U.S.G.S. Topographic Map, the slope map submitted for the project, the geotechnical report for the project, and/or a site inspection:

a. Does the project site contain slopes of 10% or greater?

❑	☒	❑	❑

b. Is any significant modification of major landforms proposed?

❑	☒	❑	❑

c. Is the project in an area of landslide risk, or are landslides present on the project site?

❑	❑	❑	☒

d. Will project grading create slopes, on- or off-site, that could be subject to landslides, mud slides, or erosion?

❑	☒	❑	❑

The proposed project would have slope stability impacts similar to those anticipated in the prior environmental analysis. The proposed modifications include an enlargement of the refuse footprint and the

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

proposed final contours of the landfill would be slightly higher than previously anticipated; however, these modifications would not substantially alter the landfill slopes. Mitigation measures identified in the previous certified EIR, pertaining to slope stability will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant. Additionally, the prior environmental analysis stated that the natural slopes within the expansion area appear satisfactory, and there is no evidence of gross or deep-seated landslides on the project site. No impacts related to landslides are anticipated.

4. Quarry Zone

Based on a site inspection, the City's General Plan Land Use Map, and/or the Significant Gravel Resource Area Maps of the State Department of Mines and Geology:

a. Would development of the project impede the extraction of significant mineral resource deposits?

❑	❑	❑	☒

The previously certified EIR did not discuss this issue, as there are no known mineral resources present on the project area according to the City's General Plan Land Use Map and/or the Significant Gravel Resource Area Maps. No impacts related to mineral resources are anticipated.

B. Air:

Based on the criteria in the South Coast Air Quality Management Handbook for the Preparation of EIRs (1993), the Air Quality Study prepared for the proposed project, the South Coast Air Quality Management Plan, and EIR (1991), and/or the land use proposed:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

1. Emissions

a. Will the project result in significant air emissions or deterioration of ambient air quality either from stationary or mobile sources?

❑	☒	❑	❑

b. Could the proposed project produce potentially toxic air emissions?

❑	☒	❑	❑

c. Will the project potentially result in the creation of objectionable odors?

❑	☒	❑	❑

d. Could the project result in the alteration of air movement, moisture or temperature, or any change in climate either locally or regionally?

❑	❑	❑	☒

Air quality impacts were discussed in the prior certified EIR and adopted Mitigated Negative Declaration. The prior environmental analyses concluded that project-specific impacts associated with onsite vehicle emissions, fugitive dust emissions, landfill gas emissions, methane gas migration and odors are mitigated to a level of insignificance. The landfill expansion project would not result in the alteration of air movement, moisture or temperature or any change in climate either locally or regionally. No significant project specific impacts resulting from off-site vehicle emissions or total emissions have been identified. The proposed project in conjunction with the existing environment, other past, present and reasonably foreseeable future projects may have a significant

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

cumulative regional air quality impact that will be considered in the Supplemental EIR.

Because the new CUP does not propose an increase in daily tonnage intake from the 1993 County approval of 3,600 tons/day, the new proposed project would not be expected to increase the mobile source air quality impacts anticipated in the prior environmental analysis. The existing landfill briefly experienced subsurface migration of landfill gas in 2002. The migration was at sufficient depth that no surface emissions occurred. To mitigate the migration, a landfill gas extraction and flare system was permitted by the Antelope Valley Air Quality Management District and subsequently constructed.

Giroux and Associates is preparing an air quality impact analysis for the proposed expansion, updating all previously developed information on landfill gas (LFG) emission, fugitive dust from site operations, airborne release of sub-surface LFG migration, and odor impact potential. The updated analysis will be incorporated in the EIR. The updated analysis will estimate area-wide smog precursor emissions (hydrocarbons and oxides and nitrogen) for the project. The air pollutants of most concern in the area are ozone (O_3) and particulate matter (PM_{10}), since the air basin has a non-attainment status for these pollutants. Accordingly, the analysis will place particular emphasis on emissions of reactive organic compounds (ROC), and oxides of nitrogen (NOX). The local atmospheric setting will be characterized based upon available climatic data and on Air Quality Management District (AQMD) air quality monitoring summaries from the monitoring site located in the City of Lancaster. It is currently anticipated that the “combined” landfill facility proposed with the CUP will require the installation of at least one (1) LFG flair system as mitigation for compliance with AQMD standards. The updated analysis will address the proposed project’s compliance with AQMD standards related to LFG. Long-term air emissions associated with the proposed project’s operational phases will also be assessed using the California Air Resources Board (CARB)-approved models including the Air Resources Board’s URBEMIS 2001 Model.

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Temporary construction impacts, including fugitive dust emissions (PM_{10}) from roadway construction and from cut and fill operations will be evaluated. Construction emissions resulting from construction equipment, grading operations and other related aspects of the construction process will be examined. Construction equipment emissions of ROC and NOX will be quantified on a pounds-per-day and tons-per-quarter basis. Feasible Mitigation measures to reduce emissions of fugitive dust, ROC, and NOX will be considered and adopted.

Cumulative regional air quality impacts deriving from mobile sources associated with the proposed project will be compared to the air quality attainment status of the individual pollutants to determine the significance of the impact of the project. Stationary source emissions associated with project natural gas and electrical consumption will be estimated based upon available information provided by the EPA or local utility providers. These emissions will be compared to adopted representative significance thresholds.

Since the project requires a CUP, an analysis of the conformity with the Mojave Desert Air Basin Air Quality Management Plan (AQMP) will be prepared. Discussion will be held with the AVAQMD to determine AQMP conformity requirements to be built into the proposed project.

The proposed project is not anticipated to conflict with any applicable air quality plans. The proposed project would not change the types and/or quantity of equipment currently utilized at the landfill and the working face is not proposed to increase in size. The operational life of the landfill would be extended with the proposed refuse footprint enlargement, but significant increases in daily air pollutants are not anticipated. As stated above, the off-site vehicle emissions would not be expected to increase because the anticipated daily volume of waste would not change from the currently approved CUP. The issue (i.e., exposure of sensitive receptors to substantial pollutant concentrations) was not identified as an impact in the prior environmental analysis; however, it will be revisited in the SEIR. The prior certified EIR identified odors as an adverse impact, which could be mitigated to less than significant level. Although the operational life of the landfill would be extended with the proposed refuse footprint

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enlargement, increasing the capacity, the same finding would be applicable to the currently proposed project.

Mitigation measures identified in the previous certified EIR pertaining to fugitive dust and landfill gas emissions, methane gas migration, and odor will be reviewed and updated, and new mitigation measures incorporated, as appropriate, to reduce the potential impacts to a level of less than significant.

Since the previous approval, a publicly accessible Liquefied Natural Gas (LNG) fueling station has been constructed on the site. This station is part of a regional plan to replace diesel-powered vehicles with cleaner burning alternative-fuel vehicles. A program to convert refuse trucks over to LNG is in progress.

C. Water:

1. Natural Streams, Springs, and Wetlands

Based on the type of project, the U.S.G.S. Topographic Maps, the exhibits and studies submitted for the project, and/or a site inspection:

a. Does the project site contain a blue-line stream, spring, seep, or wetland?

❑	❑	☒	❑

b. Will the project include changes in the course or volume of water in a local stream or wetland which require Department of Fish and Game or Army Corps of Engineers permits?

❑	❑	☒	❑

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c. Will the project result in the loss of, or changes to, significant stands of riparian vegetation?	❑	❑	☒	❑

The prior environmental analysis indicated that there is a blueline stream in the project area. However, subsequent to the certification of the prior EIR, the mitigation measure listed below was implemented, and no additional permits were required by the Department of Fish and Game and Army Corps of Engineers for the existing approved CUP. The documentation(s)/correspondence(s) dated October 18, 1996, October 22, 1998, and March 2001 (revised April 9, 2001) have been attached to this IS as **Attachments B**, **C**, and **D**. The applicability of this decision in light of the current proposed expansion, which includes erosion protection measures, will be verified with the Department of Fish and Game.

43. Pursuant to Section 1601-1603 of the California State Fishing and Game Code, the California Department of Fish and Game should be notified prior to any alteration of the blue line drainage traversing the property. The purpose of this notification is to allow the state to regulate alterations to streamed habitats, including, but not necessarily limited to, those drainages which are shown by a "blue line" in U.S.G.S. 7.5 minute quad sheets.

2. Other Surface Waters

Based on a site inspection, and review of the Map of Aqueduct Facilities (Dept. of Water Resources, East Branch Hydrology Palmdale Area), and/or the General Plan:

If the project is adjacent to or near the California Aqueduct:

a. Could the project result in a significant increase in runoff of storm or nuisance water toward the aqueduct?	❑	❑	❑	☒

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b. Will the project be significantly affected by storm or nuisance water runoff flowing through aqueduct culverts or pools?	❑	❑	❑	☒

The proposed project would not result in a significant increase in runoff of storm or nuisance water toward the aqueduct. The proposed project is located downstream from the aqueduct; therefore, no adverse impacts to the aqueduct would result. The prior environmental analysis identified the potential impact that could occur if the California Aqueduct should fail. In the event of such failure, although the landfill overall would not be impacted, the portion of the site (non-landfill property) adjacent to the Anaverde Creek may experience some soil erosion. The proposed project would not change the boundaries of the landfill expansion site in a manner that would be affected by the failure of the California Aqueduct. No impacts are anticipated.

Based on a review of the General Plan and/or a site inspection:

c. Is the project located above Lake Palmdale where urban runoff could significantly impact the lake?	❑	❑	❑	☒
d. Is the project located in an inundation area below Lake Palmdale dams, or Littlerock Dam?	❑	❑	❑	☒

While the topographic elevation of the project is higher than the topographic elevation of Lake Palmdale, the project area is not located in the Lake Palmdale watershed; therefore, no runoff impact would occur to the Lake. No impacts are anticipated. Additionally, the project area is not located in an inundation area below Lake Palmdale dams or Littlerock Dam. No impacts are anticipated.

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Based on review of the FIRM Map, the Master Plan of Drainage and/or review by the Department of Public Works/Engineering:

e. Is the site in an area of flood hazard as shown on the FIRM Map, or as identified by the Engineering or Public Works Departments?

❑	❑	☒	❑

f. Will the project result in a significant increase in peak runoff that could increase flood hazard off-site?

❑	☒	❑	❑

g. Would development of the project impede the implementation of the City's Master Plan of Drainage or Drainage Management Plan?

❑	☒	❑	❑

The certified EIR states that according to the Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA), the site is located in Zone C, which is the area outside a 100-year flood plain with minimal flooding. Additionally, according to the certified EIR, drainage channels are provided to collect runoff from the adjacent watershed and landfill fill slopes. The drainage channels running along the limit of refuse would flow into debris basins (please refer to **Figure 2**, Site Plan, contained in **Attachment A**, Project Narrative). The drainage channels prevent uncontrolled runoff to adjacent properties.

The flooding impacts of the proposed project would not substantially differ from those identified in the prior environmental analysis. The proposed project would enlarge the landfill footprint and ancillary area and slightly increase the landfill height; however, these modifications would have no significant effect on the volume of peak runoff during storm events (please refer to **Figure 4**, Base Grading Plan, Contained in **Attachment A**). The

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

project engineers, Golder Associates have prepared an on-site hydrology report dated August 2003, which documents the changes in the expansion site's drainage characteristics and proposes measures to ensure that the project peak runoff does not pose off-site flood hazard. Per the City's standard requirement, post-development flows must not exceed 85% of the pre-development flows. Golder Associates is also evaluating the project's potential effects on the regional drainage improvements which were analyzed in the May 2002 URS Corporation Study titled "Final Report Upper Ana Verde Watershed Detention Storage Alternatives".

Based on the above requirements and the analysis to be included in the EIR, the proposed project will not impede the implementation of the City's Master Plan of Drainage or Drainage Management Plan.

The City of Palmdale is currently studying methods to control flooding caused by runoff from the Upper Anaverde Creek water shed. Based on current conditions, a 50-year storm event could cause flooding of property within the City of Palmdale. The URS Corporation was commissioned to develop options to significantly reduce the potential for flooding. The options require future developments such as Anaverde LLC, Ritter Ranch, and the proposed project to contribute resources to detain the peak flows caused by rainfall events and reduce the potential for down stream flooding. The proposed project will contribute proportionally to the flood control project.

The Mitigation measures identified in the previously certified EIR, pertaining to flooding and increased runoff, will be reviewed, updated, and applied to the currently proposed project to reduce the potential adverse impacts to a level of less than significant.

h. Will any aspect of the project result in discharge of materials into surface waters, or in any alteration of surface water quality, including but not limited to, temperature, dissolved oxygen, or turbidity?

❑	☒	❑	❑

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
i. Will the project result in the significant alteration of the direction or rate of flow of groundwater?	❑	❑	☒	❑

As indicated in response to item g above, Golder Associates have prepared an on-site hydrology report, which documents the changes in the expansion site's drainage characteristics and provides measures to ensure that the project peak runoff does not pose off-site flood hazard or cause a substantial alteration of surface water quality.

According to the certified EIR, groundwater depths measured from the landfill monitoring wells are highly variable ranging from 24 to 74 feet below ground level. South of the San Andreas Fault, groundwater depths range from 1 foot to 60 feet below ground surface. Regionally, depths to groundwater north and south of the San Andreas Fault do not vary significantly. Groundwater quality near the expansion area is considered poor; however, the existing landfill has not affected groundwater quality within the adjacent basins. Additionally, according to the certified EIR, a groundwater monitoring system, composed of a number of monitoring wells will be in place to yield groundwater samples that would represent the background water quality and the quality of groundwater passing the points of compliance. The groundwater monitoring system would be designed, constructed, and operated in accordance with the State Water Resources Control Board (SWRCB) regulation as enforced by the Regional Water Quality Control Board (RWQCB).

The mitigation measures identified in the previously certified EIR, pertaining to ground and surface water flows and quality will be reviewed (by the project engineers) and updated, and new mitigation measures incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant.

Based on the type of project, project submittals and exhibits, and/or a site inspection:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
j. Could the project result in a change in the quantity or quality of groundwater, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?	❑	☒	❑	❑
k. Could the project result in a substantial reduction in the amount of water otherwise available for public water supplies?	❑	❑	❑	☒

The certified EIR identified that surface water coming into contact with refuse by infiltration could saturate the fill and become contaminated. The proposed expansion would also include a Leachate Collection Removal System (LCRS) to control potential surface and groundwater contamination from leachate. No increase in the severity of this impact would be anticipated with the proposed project.

As indicated in response to item i above, according to the certified EIR, a groundwater monitoring system, composed of a number of monitoring wells will be in place to yield groundwater samples that would represent the background water quality and the quality of groundwater passing the points of compliance. The groundwater monitoring system would be designed, constructed, and operated in accordance with the State Water Resources Control Board (SWRCB) regulation as enforced by the Regional Water Quality Control Board (RWQCB).

The mitigation measures identified in the previously certified EIR, pertaining to ground water quality will be reviewed (by the project engineers) and updated, and new mitigation measures incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant.

Due to the nature of the project, it does not generate a substantial demand for potable water. The certified EIR did not identify any impacts to

substantial reduction in amount of water otherwise available for public water supplies. The proposed expansion would not result in any impacts to the amount of water available for public water supplies.

D. Plant Life:

Based on a site inspection, the biological report, and/or the Native Vegetation Preservation Plan submitted for the project:

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
1. Is there a significant stand of desert vegetation on the site which will be adversely impacted by the project?	☐	☒	☐	☐
2. Will the project result in a reduction of the numbers of any unique, rare, or endangered species of plants?	☐	☒	☐	☐
3. Will the project result in the introduction of invasive, non-native species of plants into an area; or will the project create a barrier to the normal replenishment of existing native plant species?	☐	☐	☐	☒
4. Will the project result in a significant reduction in acreage of native vegetation?	☐	☐	☒	☐

Impacts to biological resources were identified in the prior certified EIR. It is anticipated that the biota impacts of the proposed project would be similar to those identified in the prior environmental analysis for the site. Although the proposed project modifications include enlargement of the landfill footprint by 11 acres and ancillary facility area by 5 acres, this acreage was included in the prior certified EIR biological survey report.

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

Because the area of the expansion site would not substantially change with the proposed project, the severity of these impacts is not expected to substantially differ with the proposed project. Similar to the impacts identified in the prior environmental analysis, the proposed project would cause the removal of desert vegetation (i.e., Joshua trees protected by City ordinance). The SEIR will update the analysis of the prior EIR to determine if any new species of concern have been listed and will consider mitigation measures to reduce new significant impacts, if any, of the project on biotic resources to less than significant levels.

Because the original biological survey is ±10 years old, Frank Hovore and Associates (FH&A) will conduct a walk-over survey of the proposed project site to determine if any biological conditions have changed. EDAW will summarize the updated biological report prepared for the project by (FH&A). The FH&A reconnaissance-level biological survey, combined with a thorough review of available background information, will determine on-site vegetation, and whether suitable habitat exists for any sensitive species. The findings of this and other surveys (discussed below) conducted by FH&A will be incorporated in the SEIR.

FH&A will collect data and relevant background information, which will include review of the California Natural Diversity Data Base (CNDDB), California Native Plant Society sensitive species lists, existing environmental impact reports for past projects in the project vicinity, and technical literature related to local biotic resources. Local authorities on the area's native plants will be contacted where appropriate.

FH&A will prepare a biological constraints report that will update the prior 1991 biological report and will include a discussion of all potential biological issues associated with the site. All natural habitats associated with the site will be mapped and/or characterized. A list of observed vascular plants within the project area will also be included as appendices. The report will include all appropriate lists, tables, and maps depicting general locations of sensitive habitats, or habitats of special status species.

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

Upon landfill closure, the final fill grades will be revegetated with native plant species to assist in returning the topography to its pre-landfill condition.

Mitigation measures identified in the previous certified EIR pertaining to removal of vegetation will be reviewed and updated, and new feasible mitigation measures incorporated, as appropriate, in an attempt to reduce any significant impacts to a level of less than significant.

E. Animal Life:

Based on the biology report submitted for the project and/or a site inspection: Will the proposal result in:

1. Will the project result in a significant loss of biological diversity?

☐	☐	☒	☐

2. Will the project result in the reduction of the numbers of any unique, rare, or endangered species of animals?

☐	☐	☒	☐

3. Is the project located in a Significant Ecological Area where the introduction of animals associated with urbanization could adversely affect native species; or where the project will result in a barrier to the migration or movement of animals?

☐	☐	☒	☐

4. Will the project cause significant deterioration of, or loss of, existing fish or wildlife habitat?

☐	☒	☐	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

The prior certified EIR did not identify any impacts to a loss of biological diversity or the reduction of unique, rare, or endangered species. The project site is not located in a Significant Ecological Area.

As indicated under item D1- D4 (Plant Life) above, FH&A will prepare a biological constraints report that will update the prior 1991 biological report and will include a discussion of all potential biological issues currently associated with the site. Additionally, the SEIR will discuss any new species of special concern that have been added since the preparation of the previous biological study of the site. The findings of this and other surveys conducted by FH&A will be incorporated in the SEIR.

F. Noise:

1. If the project is residential or noise sensitive, will it expose people to severe noise levels because it is located:

a. adjacent to the Freeway?

❑	❑	☒	❑

b. within 200 feet of the railroad?

❑	❑	☒	❑

c. adjacent to an existing or future arterial street?

❑	❑	☒	❑

The prior certified EIR and adopted Mitigated Negative Declaration analyzed potential impacts related to noise. The proposed project would not alter the noise levels generated on the project site. The proposed project is an expansion of the refuse footprint by 11 acres to enable the two landfills to be connected, the addition of 5 acres of ancillary facility area, and an increase in height of the landfill expansion area by 60 feet (compared to Landfill II). According to the certified EIR, scattered housing

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

is located approximately ½ to 3 miles to the south, and large housing tracts are located about 1 mile to the north and northeast. Subsequent to the certification of the previous EIR, the City Ranch Project was approved and is currently under construction. The western edge of the landfill is within 600 feet of the City Ranch property; however, a 1,000-foot buffer between the westerly most edge of the landfill and the City Ranch project is established. This setback within the residential development in addition to an approximately 500-foot setback off-site will establish about 1,500 feet of buffer between the residential development and the landfill.

The landfill is separated from the existing residential development to the north by a small ridgeline. The existing landfill operation is not audible from this residential development. The existing condition, in addition to any potential impacts associated with the landfill expansion will be studied and updated by Giroux and Associates, and the findings will be incorporated in the SEIR.

2. Is the proposed project within the Plant 42 over-flight area, or the 65 CNEL boundary?

❑	❑	❑	☒

The proposed project is not located within an airport land use plan or in the vicinity of a private airstrip; therefore, no adverse impacts are anticipated. This issue was not addressed in the prior certified EIR.

3. Will the project generate a noise level exceeding 65 CNEL at the project boundary after construction that could significantly impact an adjoining land use?

❑	❑	☒	❑

The prior certified EIR and adopted Mitigated Negative Declaration analyzed potential impacts related to noise. According to the updated August 2003 traffic study for the proposed expansion, the number of truck trips and traffic noise associated with the truck trips will decrease compared to the April 1993 traffic study included in the County approved

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

MND (from 1,100 daily truck trips per day to 864 daily truck trips per day). The reduction in traffic related noise levels is attributed to the proposed use of more transfer trucks, with a typical capacity of 21.00 tons per truck versus a capacity of 4.00 tons per truck for municipal solid waste trucks. According to Mr. Hans Giroux of Giroux and Associates (a firm specializing in air quality and noise analyses) transfer trucks and municipal solid waste trucks produce the same noise levels. However, the SEIR will address noise issues relative to the project and mitigation will be provided.

G. Light or Glare:

Based on the type of project, and/or project submittals and exhibits:

1. Will the project produce significant new sources of light or glare that would disturb neighboring uses or significantly change the light environment visible from other areas of the City?

❑	❑	❑	☒

The prior Initial Study identified that the previously proposed project would not be expected to create a new source of light or glare that would adversely impact day or nighttime views in the area. The same finding would be applicable to the currently proposed project.

H. Land Use:

1. Will the project result in a substantial alteration of the present or planned land use of an area?

❑	❑	❑	☒

2. Are adjoining or planned land uses greatly different from that of the proposed project so that a potentially substantial interface problem would be created?

❑	❑	☒	❑

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
3. If the project is located within the Plant 42 AICUZ zone, does it conflict with the joint land use policies established for those zones?	❑	❑	❑	☒

This topical area was not evaluated in the previously certified EIR; however, issues pertaining to land use and planning were addressed in Section 2 of the prior certified EIR. The proposed project would maintain landfill activities at the project site and would not alter the land use of the area. The proposed project would not conflict with the General Plan land use designations or zoning for the site. The landfill is consistent with the City's current land use and zoning designations. Therefore, no conflicts with either City or County land use goals or policies would be anticipated with the proposed project revisions. The proposed project revisions would extend the duration of landfill activities on the project site but would not result in any new significant land use effects or substantial increases in the severity of previously identified land use effects. The proposed project would not divide an established community and would not conflict with any applicable habitat conservation plans or natural community conservation plan. No adverse impacts are anticipated; and therefore, this issue will be focused out of the SEIR.

As mentioned above, City Ranch residential development, located to the west of the landfill, is currently under construction. The western boundary of Landfill II is within 600 feet of the City Ranch property, and a portion of residential Planning Area 8 of the City Ranch project will be within 1,000 feet of the Landfill II boundary. Due to the close proximity to the landfill and potential impacts related to aesthetics, noise, odors, landfill gas migration, dust, blowing of litter, and vectors, mitigation measures are incorporated in the City Ranch Specific Plan and EIR to mitigate the potential impacts. These measures include establishing a 1,000-foot buffer between the western boundary of Landfill II and City Ranch residential development and recording a permanent easement which includes land within 1,000 feet of the northwest and southwest corners of Landfill II, where construction of residences will be prohibited. Additionally, the measures provide a landscape buffer which will include mature vegetation along the common boundary line between City Ranch

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

residential development (along the boundary of Planning Area 8) and the landfill. Lastly, in compliance with California Department of Real Estate disclosure format and procedures, the developer is required to notify all potential buyers in City Ranch within 1,200 feet of the landfill boundary about the landfill and associated issues. These measures reduce any potential impacts associated with land use compatibility to a level of less than significant. Therefore, this issue will be focused out of the SEIR.

I. Natural Resources:

1. Will the project result in a significant increase in the rate of use of any natural resources?

❑	❑	❑	☒

2. Will the project result in the substantial depletion of any non-renewable natural resources?

❑	❑	☒	❑

The previously certified EIR did not discuss natural resources. There are no known natural resources of regional or statewide importance onsite, and the proposed project would not result in loss of any such resources. No adverse impacts are anticipated; and therefore, this issue will be focused out of the SEIR.

Additionally, the proposed expansion project would not impact Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. It would not conflict with existing zoning for agricultural use, or a Williamson Act contract, and the proposed project does not involve any changes in the existing environment that could result in conversion of Farmland to non-agricultural use. No impacts associated with the above identified farmland issues are anticipated.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

J. Risk of Upset:

1. Will the project result in a risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation) in the event of an accident or upset condition?

❑	☒	❑	❑

The prior environmental analysis for the project site, under the topic of environmental safety, identified the inclusion of household hazardous waste in the landfill waste stream as a significant environmental safety impact prior to mitigation. The potential inadvertent acceptance of decommissioned radioactive waste was also identified as a potentially significant impact. These environmental safety impacts would be similar for the proposed project. A City-initiated/approved Household Hazardous Waste (HHW) facility is included as an ancillary facility to be located within the existing parking area (refer to **Figure 2a**, Ancillary Facilities, contained in **Attachment A**, Project Narrative). Additionally, as part of the proposed project, the entrance to the facility is equipped with monitors to detect radioactive waste. Mitigation measures identified in the previously certified EIR, will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant.

2. Will the project result in possible interference with any emergency response plan or emergency evacuation plan?

❑	❑	❑	☒

As was concluded with the prior environmental analysis, the proposed project would not be expected to physically interfere with an adopted emergency response plan or emergency evacuation plan. No adverse impacts are anticipated.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
3. Is the site included on any known State Hazardous Waste Site list?	❑	❑	❑	☒

The proposed project is not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. No adverse impacts would be anticipated.

4. Is the project within or adjacent to a high fire hazard area as shown in the General Plan, identified by the Los Angeles County Fire Department or based on a site inspection?	❑	❑	❑	☒

This issue was not addressed in the prior certified EIR. According to the General Plan, no hazards related to wildland fire are anticipated for this project site. This issue will be focused out of the environmental document for the proposed modifications to the landfill.

K. Population:

Based on the type of project:

1. Will the project significantly alter the location, distribution, density, or growth rate of the human population of an area?	❑	❑	❑	☒

The previous Initial Study and certified EIR did not address this issue. The project proposes an 11-acre refuse footprint expansion to an existing and previously approved landfill and does not include a residential component. Additionally, the proposed project would not introduce a significant number of employees as it would include a maximum of five new employees as a result of the expansion. Therefore, the proposed project would not induce population growth in the area. No adverse

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

L. Housing:

Based on the type of project?

1. Will the project create a significant demand for additional housing?

❑	❑	❑	☒

2. Will the project result in displacement of people from existing housing on the site?

❑	❑	❑	☒

The previous Initial Study and certified EIR did not address this issue. The project proposes an 11-acre refuse footprint expansion to an existing and previously approved landfill and does not include a residential component. Therefore, the proposed project would not displace any existing housing or people and would not create demand for additional housing in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

M. Transportation/Circulation:

Based on review of the type of project, project exhibits, a site inspection, and/or review of the Institute of Transportation Engineers, Trip Generation or the applicant's traffic study:

1. What is the estimated number of average daily vehicle trips, and a.m. and p.m. peak hour trips, generated by the proposed project?

   1,324 ADT: 118 a.m. peak, 108 p.m. peak

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
2. Will the traffic generated by this project cause a reduction of Level of Service at an intersection or on a street segment?	❑	❑	☒	❑

The previously certified EIR and adopted Mitigated Negative Declaration identified an increase in refuse truck and passenger car traffic average daily trip as well as cumulative increase in traffic congestion. The updated traffic study (August 2003) reflects updated truck tonnage capacity figures and background projections from the April 1993 study. The updated analysis assumed that the existing landfill operation would increase to 3,613 tons per day, which would be the maximum daily quantity of waste that would be received at the facility.

The project site's existing traffic generation is outlined in the Table below. The intersections in the vicinity of the site currently operate at Level of Service B or better during the peak hours. Traffic signals appear to be warranted at Tierra Subida Avenue (NS) at, 5th Street west (EW); Rayburn Road (EW); and Avenue S (EW). This daily intake, however, does not represent an increase from the 1993 traffic study and prior County approvals. The study identified that if the project's operation is increased to 3,600 tons per day, all intersections continue to operate at LOS B or better for existing plus project traffic conditions.

PROJECT TRAFFIC GENERATION

Time Period	Existing Volume (1,372 Tons/Day)			Future Volume (3,613 Tons/Day)			Difference
	Trucks	Cars	Total	Trucks	Cars	Total	
Morning Peak Hour (8:00 AM – 9:00 AM) Total	39	14	53	98	20	118	65
Evening Peak Hour (4:00 PM – 5:00 PM) Total	24	36	60	48	60	108	48
Daily	416	210	626	864	460	1,324	698

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

The landfill expansion's projected traffic volumes are also shown in the Table above. This table indicates that the total existing plus project future traffic volume is projected at 1,324 ADT, which includes 864 truck trips and 460 vehicle trips and assumes the landfill operations are increased to 3,613 tons per day. Roadway links in the vicinity of the site are projected to continue to operate within acceptable Levels of Service for existing plus project traffic conditions. For existing plus project traffic conditions, the intersections in the vicinity of the site are projected to continue to operate at Level of Service B or better during the peak hours.

The roadway links in the vicinity of the site are projected to continue to operate within acceptable Levels of Service for the Year 2007 with and without project traffic conditions, except for Tierra Subida Avenue between 5th Street West and Rayburn Road. For Year 2007 with and without project traffic conditions, the intersections in the vicinity of the site are projected to operate at Level of Service D or better during the peak hours. Several studies were completed by Kunzman Associates in 2002 and 2003 to analyze different access alternatives for reaching Tierra Subida Road. The final August 2003 study concludes that rerouting a portion of R-5 to coincide with Rayburn Road is the preferred ultimate access route into the facility. Site-specific circulation and access recommendations are included within the study and will be explained in the EIR.

Mitigation measures identified in the previously certified EIR pertaining to traffic and circulation will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant. Mitigation measures will include roadway sizing recommendations, intersection controls, and special treatments such as left turn pockets and right turn lanes as might be required by the project.

3. Does circulation within the project prevent the safe and orderly flow of people and vehicles, including emergency vehicles?

❑	☒	❑	❑

The revised August 2003 traffic study analyzes this issue with respect to the sight distance issue at Tierra Subida Avenue/City Ranch Road.

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

Mitigation is recommended at the intersection of Tierra Subida Avenue/City Ranch Road. Because of restricted sight distance for southbound vehicles on Tierra Subida Avenue approaching City Ranch Road, there is an operational problem when a disposal truck is making a left turn out of City Ranch Road. Eventually, the sight distance needs to be increased at the discretion of the Department of Public Works. The final August 2003 study concludes that rerouting a portion of R-5 to coincide with Rayburn Road is the preferred ultimate access route into the facility. This new landfill access solution will eliminate the site distance issue.

Additionally, it should be noted that the City will be processing an amendment to the General Plan Circulation Element to re-align City Ranch Road to the alignment of Avenue R-8. This Circulation Element GPA is not part of the currently proposed CUP project.

4. Will the project create or experience access problems as designed, or create any obstruction to the safe flow of traffic?

☐	☒	☐	☐

Please refer to the above response to item 3.

5. Could the project result in a significant alteration to rail or air traffic?

☐	☐	☐	☒

The proposed project would not alter rail or air traffic patterns. No impacts are anticipated.

6. Will the project create a significant shortage of parking?

☐	☐	☐	☒

The proposed expansion would not result in inadequate parking. No impacts are anticipated.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

N. Public Services:

1. Fire Protection

What is the roadway distance and location of the nearest fire station: LA County Fire Station #24, located at 600 Rancho Vista Boulevard is 3.1 miles north of the landfill.

a. Will the project result in a need for significant additional fire protection services?

❑	❑	❑	☒

The prior Initial Study did not identify any impacts to fire protection services as a result of the proposed projects; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of new or altered fire protection services in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

2. Police Protection

Are there any aspects of the project that would create a significant impact to police protection?

❑	❑	❑	☒

The prior Initial Study did not identify any impacts to police protection services as a result of the proposed projects; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of new or altered police protection services in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

3. Schools

a. In what elementary and high school attendance area is the project? Palmdale School District
Antelope Valley Union High School District

b. Approximately how many students will the project generate? None.

c. Would the students generated by the project significantly contribute to the affected schools exceeding their designed capacity?

❑	❑	❑	☒

The prior Initial Study did not identify any impacts to school services as a result of the proposed project; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of new or altered school services in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

4. Parks and Recreation

Will the proposed project result in an impact on the quality or quantity of existing parks or recreational facilities, including trails or bicycle paths?

❑	❑	☒	❑

The prior Initial Study and certified EIR did not evaluate this issue. The proposed project would not include recreation facilities nor would it create a need for new facilities or expansion of existing facilities. No use of existing neighborhood and regional recreational facilities would be anticipated as a result of the proposed project. It should be noted however that since the original EIR and MND were approved, a Sports Complex was developed on the east side of Tierra Subida near the

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

landfill's existing entrance at City Ranch Road. As indicated in response to item M#3 above, the revised August 2003 traffic study analyzes the issue of safe circulation and specifically the sight distance issue at Tierra Subida Avenue/City Ranch Road. With the recommendation of moving the ultimate landfill entrance to Rayburn Road, the landfill entry traffic will be removed away from the park entrance. This will benefit the park users. No adverse impacts are anticipated based upon the analysis and recommendations. The issue of recreation and how it relates to the sight distance issue will be addressed within the Circulation Section of the SEIR.

5. Public Facilities

Will the proposed project have a significant impact on maintenance of public facilities, including roads, drainage facilities, slopes, open space and trails?

❑	❑	❑	☒

The prior Initial Study did not identify any impacts to public facilities as a result of the proposed projects; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of new or altered public facilities in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

6. Library Services

Will the project result in a significant impact to library services due to increased population?

❑	❑	❑	☒

The prior Initial Study did not identify any impacts to library services as a result of the proposed projects; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of new or altered library services in the area.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

7. Other Governmental Services

Will the project have a significant impact on a government service or agency not listed above?

❑	❑	❑	☒

The prior Initial Study identified no impacts to other governmental services as a result of the proposed projects; therefore, the issue was not addressed in the prior certified EIR. The proposed project would not create any additional needs for provision of other new or altered governmental services in the area. No adverse impacts are anticipated. This issue will be focused out of the environmental document for the proposed expansion.

O. Energy:

1. Will the project result in the use of substantial amounts of fuel or energy?

❑	❑	❑	☒

2. Will the project result in a substantial increase in demands upon existing sources of energy, or require the development of new sources of energy?

❑	❑	❑	☒

The issue was not analyzed in the previously certified EIR. Although the refuse footprint will be increased by 11 acres with the proposed CUP, the daily intake of refuse will not increase over what was approved by the County CUP. Thus, energy demands to transport refuse would not be increased over what's currently approved. In addition, as indicated above

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

(B. Air, 1. Emissions, Page 14), since the previous approval, a publicly accessible Liquefied Natural Gas (LNG) fueling station has been constructed on the site. This station is part of a regional plan to replace diesel-powered vehicles with cleaner burning alternative-fuel vehicles. A program to convert refuse trucks over to LNG is in progress. Therefore, no impacts are anticipated.

P. Utilities:

Will the proposal result in a need for new systems, or substantial alterations to the following utilities:

1. Power or natural gas?

❑	❑	❑	☒

2. Communications systems?

❑	❑	❑	☒

3. Water?

❑	❑	❑	☒

4. Sanitary sewer?

❑	❑	❑	☒

5. Solid waste disposal?

❑	❑	❑	☒

The prior Initial Study identified no impacts to utilities in the area as a result of the proposed project, and therefore, the topical area of utilities and service systems was not addressed in the prior certified EIR. The proposed project would not create any substantial needs for provision of

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

new or altered utilities and service systems such as power, communications, water, wastewater, and solid waste disposal in the area. No adverse impacts are anticipated. The issues of water, sewer, and solid waste disposal services will be focused out of the environmental document for the proposed expansion.

The proposed landfill expansion conforms to Los Angeles County-wide Siting Element. Both Landfills I and II are included in the Year 2002 Siting Element updates.

Q. Human Health:

Based on the type of project:

1. Will the project create any health hazard or potential health hazard (excluding mental health)?

❑	☒	❑	❑

2. Will the project result in the exposure of people to potential health hazards?

❑	☒	❑	❑

The prior environmental analysis for the project site, under the topic of environmental safety, identified the inclusion of household hazardous waste in the landfill waste stream as a significant environmental safety impact prior to mitigation. The potential inadvertent acceptance of radioactive waste was also identified as a potentially significant impact. These environmental safety impacts would be similar for the proposed project. Other potential human health hazards such as air quality and water quality impacts will be addressed within their respective sections of the SEIR. As part of the proposed CUP, a City-initiated/approved Household Hazardous Waste (HHW) facility is included as an ancillary facility to be located within the existing parking area (refer to **Figure 2a**, Ancillary Facilities, contained in **Attachment A**, Project Narrative). The

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

proposed project modifications would extend the life of the landfill by increasing the total volume of refuse intake. This CUP would also be viewed as having a positive impact on human health as it will provide for the continued safe/regulated disposal of solid waste. Additionally, as part of the proposed project, the entrance to the facility is equipped with monitors to detect radioactive waste. Mitigation measures identified in the previous certified EIR, will be reviewed and updated, and new mitigation measures will be incorporated, as appropriate, to reduce the potential adverse impacts to a level of less than significant.

R. Aesthetics:

1. Will the proposal result in the obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?

☒	❑	❑	❑

The proposed project would result in significant changes in the anticipated visual characteristics or quality of the project site. The proposed 11-acre increase in the landfill footprint would eliminate the creation of a valley between landfills I and II once they are both filled. Thus, a more natural transition between the two landfills would result, and this would create a more contiguous visual form consistent with the existing ridgeline. The project also proposes a height increase to the landfill overall. The currently permitted Landfills I and II have a maximum height of El 3205 and El 3140, respectively. The proposed project would result in a maximum height of El 3200. Upon landfill closure, the final fill grades will be revegetated with native plant species to assist in returning the topography to its pre-landfill condition; thereby helping it blend in with the adjacent topography.

The SEIR will include an analysis of the aesthetic impacts related to the landfill height in relationship to the height of the adjacent ridgelines to the north of the existing landfill. The visual modifications created by the currently proposed project will be analyzed through visual simulation studies, which will depict the proposed height increase in a realistic setting

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

utilizing a series of photographs from locations anticipated to be most impacted by the project. Based upon the results of the visual simulation, mitigation measures identified in the previously certified EIR will be reviewed, updated, and applied to the proposed project, and new feasible mitigation measures will be applied, as appropriate.

The prior certified EIR identified no significant impacts related to aesthetics with the incorporation of mitigation measures proposed to eliminate impacts from litter. Aesthetics issues related to Landfill II were discussed under the topic of visual qualities in the previously certified EIR. The only two scenic resources in the vicinity of the proposed project are Antelope Valley Freeway (SR-14) and Elizabeth Lake Road which are both defined by the County of Los Angeles as First Priority Scenic highways. As described in the prior certified EIR, the project is not visible from Elizabeth Lake Road and is visible from SR-14. The proposed project presents minor change to the landfill's current visibility from SR-14. This issue will be further studied and the findings incorporated in the SEIR.

S. Cultural Resources:

1. Will the proposal result in the alteration or destruction of a prehistoric or historic archaeological site, or historic structure(s)?

❑	❑	❑	☒

Site inspection performed by: Brian Dillon, Ph.D.

2. Will the proposal result in potential adverse impacts on paleontological resources?

❑	❑	☒	❑

The prior environmental analysis assumed that the on-site archaeological resources would be considered significant and that disturbance would be considered an adverse impact without mitigation. Although the proposed project modifications include enlargement of the landfill footprint by 11

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

acres, this acreage was included in the original archaeological survey report. The following mitigation measures were included in the prior EIR:

44. In accordance with Sections 15064.5 and 15126.4 the California Environmental Quality Act, In accordance with Appendix K in the California Environmental Quality Act, if engineering or other project parameters will not allow preservation, the applicant shall subject the onsite deposits of shell and lithic material detected during the reconnaissance of site Ca-LAn-876 *and site AVL-1, subsequently designated CA LAN-1917* to a data recovery excavation and recordation. The applicant shall be responsible for all costs incurred for archaeological excavation and reporting. The data recovery excavation and recordation shall be performed prior to the issuance of a *Solid Waste Facilities Permit* and include the development of a mitigation plan.

45. All material collected during the above recommended work shall be donated to an institution which has adequate facilities for curation, display and use by interested scholars and the general public.

46. A qualified archaeologist shall be present during clearing and initial grading of the property to monitor any additional deposits obscured by brush or buried by alluvial material. The monitoring archaeologist shall be prepared to document and recover any significant material that appears as quickly as possible using standard archaeological field practice.

Subsequent to the certification of the 1992 EIR, Mr. Brian Dillon, consulting archaeologist conducted a data recovery and excavation for the CA-LAN-876 site and site AVL-1 (**Attachment E**), subsequently designated CA-LAN-1917 and prepared a final report for County of Los Angeles approval. Please refer to the Final Report Executive Summary on Archaeological Compliance Work for CUP No. 85512 by Brian Dillon and the April 20, 2003 submittal letter to the County on file with the City of Palmdale. The initial County of Los Angeles, Department of Regional Planning correspondence, dated August 31, 2000 (**Attachment F**), stated

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

that upon receipt of the final report, the County would officially acknowledge the project compliance with conditions set forth in the Conditional Use Permit regarding archaeological resources protection. Based upon the April 20, 2003 letter (**Attachment G**) and submittal of the final report (executive summary) and delivery of the archaeological collections to California State University of Bakersfield, Department of Sociology/Anthropology for curation, compliance with the County CUP conditions has occurred. The attached County of Los Angeles, Department of Regional Planning correspondence (**Attachment H**), dated November 18, 2003 acknowledges receipt of the executive summary and that the project is in compliance with the CUP conditions. Therefore, through this Initial Study process, the archaeological resources issue will be focused out and will not be included in the Supplemental EIR.

Similarly, Mr. Bruce Landers was assigned to the project by the project proponent, as the expert on paleontological resources to carry out the implementation of previously identified mitigation measures. Refer to the attached correspondence to the County dated March 28, 2000 (**Attachment I**). These mitigation measures are as follows:

47. During *landfill excavation*, a qualified paleontologist shall be retained to perform periodic inspections of excavations and, if necessary, salvage exposed fossils. The frequency of inspections will depend on the rate of excavation, the materials being excavated, and the abundance of fossils. During grading, the paleontologist shall be allowed to divert or direct grading in the area of an exposed fossil to facilitate evaluation and, if necessary, salvage. Because of the small nature of some of the fossils possibly present in the study area, samples of the sediments shall be collected for processing through fine mesh screens.

48. All fossils collected during *landfill excavation* shall be donated to a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County. Provisions for preparation and curation shall be made before the fossils are donated to their final repository.

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

The above CUP mitigation measures identified in the previous certified EIR and adopted Mitigated Negative Declaration shall be applied to the currently proposed project to reduce potential impacts to a level of less than significant. The paleontological resources issue will be focused out and will not be included in the SEIR.

In addition, according to the surveys and written reports summarized in the prior certified EIR, there are no historical resources and no human remains onsite. Therefore, no adverse impacts would be anticipated as a result of the proposed project. The prior certified EIR did not address potential impacts of the previously proposed project on historical resources and potential disturbance of any human remains. This issue will not be included in the SEIR.

T. Public Controversy:

1. Is the project or action environmentally controversial in nature or can it reasonably be expected to become controversial upon disclosure to the public?

❑	☒	❑	❑

The proposed expansion of Landfill II (including an 11-acre addition to the refuse footprint and 5-acre addition of ancillary facilities) to the existing and County approved landfills is not an environmentally controversial project, and it is not expected to become controversial upon disclosure to the public. The existing landfill and the County approved expansion (Landfill II) have received no major controversy from public agencies and/or public interest groups. A total of nine (9) public comment letters and two (2) verbal comments at the Regional Planning Commission public hearing were received on the prior 1992 County certified EIR which analyzed a 75-acre expansion. The proposed expansion of the existing and County-approved landfill would continue to serve and enhance the solid waste disposal needs of the area. Most of the potentially significant environmental impacts of the proposed project are anticipated to be mitigable to a level of less than significant.

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

However, there is potential for public controversy as it relates to the impacts previously identified and included in the certified EIR. Additionally, although so far there is no public controversy related to the current application, all the issues discussed above in the checklist have the potential to cause public controversy due to their environmental impacts.

Therefore, the proposed project SEIR will be prepared to identify and explain the environmental impacts considered in the previous EIR as well as the potential impacts of the current proposal, and to propose mitigation measures to remedy any new significant impacts. Public controversy by itself has not caused preparation of the proposed project SEIR.

VII. MANDATORY FINDINGS OF SIGNIFICANCE

A. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

❑	❑	☒	❑

The certified EIR did not identify such adverse impacts on plant or wildlife and their habitats. The proposed expansion is not expected to threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animals or eliminate important examples of major periods of California history or prehistory. The potential impacts are considered less than significant.

B. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)

❑	☒	❑	❑

Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

The proposed expansion may have significant cumulative traffic and circulation and air quality impacts. However, with incorporation of mitigation measures from the certified EIR and new mitigation measures the potential adverse cumulative traffic impacts are anticipated to be reduced to a less than significant level. As previously indicated in Section VI, Evaluation of Environmental Impacts (B. Air) of this Initial Study, the cumulative air quality impacts may remain significant even after mitigation measures are applied.

C. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

❑	❑	☒	❑

The project proposes expansion of an existing landfill, and it would not result in any substantial effect on human beings. The project would not replace an existing community. No direct or indirect adverse impacts on human beings are anticipated.

Attachments to the Initial Study

A. Project Narrative with Figures, Revised January 2004.

B. Department of Fish and Game correspondence dated October 18, 1996 re: Streambed Alteration Agreement 5-354-94 Ana Verde Creek, Los Angeles County.

C. Department of Fish and Game correspondence dated October 22, 1998 re: 9/20/98 site visit and the proposed alteration to a small wash on the property.

D. 404 and 1603 Jurisdictional Delineation for Palmdale Landfill, dated March 2001, Revised April 9, 2001.

E. Archaeological Clearance Letter dated August 19, 2000.

F. Los Angeles County, Department of Regional Planning correspondence dated August 31, 2000 re: CUP 85512 (Antelope Valley Landfill Expansion Project).

G. Brian Dillon's Correspondence to the County of Los Angeles regarding submittal of the Executive Summary, April 20, 2003.

H. Los Angeles County, Department of Regional Planning correspondence dated November 18, 2003 re: CUP 85512 (project's compliance with mitigation measures in the adopted MMP).

I. March 28, 2000 correspondence re: Retention of Paleo Environmental Associates, Inc., by Waste Management, Inc., to conduct paleontological monitoring program at Antelope Valley Public Landfill Site No. 2.

A. Project Narrative with Figures Revised February 2004

- Figure 1, Original Exhibit “A”, 12/16/91
- Figure 2, Site Plan, 2/19/04
- Figure 2a, Ancillary Facilities Layout Plan, 2/19/04
- Figure 3, Project Boundaries, 2/19/04
- Figure 4, Base Grading Plan, 2/19/04
- Figure 5, Phase V-A Fill Plan, 2/19/04
- Figure 6, Phase V-B Fill Plan, 2/19/04
- Figure 7, Phase V-C Fill Plan, 2/19/04
- Figure 8, Landfill Cross Sections, 2/19/04

PROJECT NARRATIVE

INTRODUCTION

The current project applicant, Antelope Valley Recycling & Disposal Facility, is submitting the revised application for Conditional Use Permit (CUP) for the Antelope Valley Landfill project. The original application was filed by the former owners, the Arklin Brothers Enterprises on November 2, 1998. Subsequent to filing the original application, a lot line adjustment facilitating sale of the landfill, was conducted by the Arklin Brothers and approved by the County of Los Angeles in April 1999. Waste Management purchased the property in May 1999. Per direction by the City of Palmdale, this project narrative is prepared to support the revised application for the CUP of Palmdale Landfill project.

BACKGROUND

The Antelope Valley Public Landfill (Landfill I), located in the City of Palmdale (the City) consists of approximately 72 acres (eastern portion). Of the 72 acres, the northern 65-acre parcel is approved for landfill operations under the current Solid Waste Facilities Permit (SWFP) No. 19-AA-0009. Of these 65 acres, 57 acres are approved for disposal of refuse under the SWFP Permit. The remaining 7 acres (southern portion) has been historically used for offices and hauling company operations ancillary to the approved landfills. This landfill has served the Antelope Valley since the 1950s and has a remaining life of approximately six years.

Immediately adjacent and to the west is a 98-acre area comprising the Antelope Valley Public Landfill II (Landfill II), previously located in the unincorporated portion of the County and annexed into the City of Palmdale as of November 21, 2003 (western portion, as outlined on the Exhibit “A” presented on Figure 1). A Conditional Use Permit (CUP) for Landfill II was granted by the Regional Planning Commission, County of Los Angeles (Regional Planning) on April 8, 1992. An amendment to the CUP was approved on December 1, 1993. This landfill was issued SWFP No. 19-AA-5624 and has not been constructed. Of the 98 acres (per Figure 1, Exhibit "A"), approximately 57 acres were approved for disposal of refuse (refuse footprint). Additionally, 10 acres were approved and are shown on Figure 1, Exhibit “A” (south and southeast portions of the landfill boundary) for ancillary facilities. Refer to the shaded/cross hatched areas on the attached Exhibit “A”. The total combined area for landfill operations (including Landfills I, II, and ancillary facilities) is approximately 180 acres.

The applicant is applying for certain modifications to the aforementioned CUP. The primary modifications sought are: 1) to enlarge the approved 114-acre refuse footprint by approximately 11 acres in order to reconfigure the two landfills into one contiguous disposal area (Figure 2, Site Plan) and 2) to update the legal boundary of the entire facility to 185 acres (adding 5 acres of ancillary facilities and other landfill property to the total 180-acre area), as shown on Figure 3, Project Boundaries.

The expansion area of the landfill is located within City of Palmdale jurisdiction. An expansion would require Conditional Use Permits by the City Planning Department. To simplify and expedite the project, the applicant has had substantial discussions with the Planning Department of the City about the concept of annexing the subject property and surrounding properties into the City with the understanding that the City would adopt the County's CUP with appropriate modifications. As of November 21, 2003, the portion of the landfill within the County of Los Angeles is annexed into the City of Palmdale.

PROPOSED CUP MODIFCATION PROJECT

As briefly mentioned above the primary modifications to the County approved CUP are to connect the two landfills and to add approximately 5 acres to the overall facility to reflect the current property boundary subsequent to the 1999 lot line adjustment.

Refuse Footprint Modification:

Since the earlier designs of Landfill II did not maximize the capacity potential of the site and given the long-term need for landfill capacity, the project proponent has re-examined the potential for improving the capacity on what is currently permitted. The currently permitted design of the eastern most refuse footprint of Landfill II and the western most refuse footprint of the existing Landfill I are approximately 400 feet apart. If the landfills are built as currently permitted, a valley would exist between the two landfills. Based on the long-term disposal needs of Antelope Valley and Los Angeles County, the highest and best use of this area is a landfill. This application proposes enlarging the aggregate 114-acre refuse footprint by approximately 11 acres in order to reconfigure the two landfills into one contiguous disposal area. This reconfiguration will provide an enhancement of 14 million cubic yards of capacity. In doing so, the proposed landfill footprint will remain within the currently approved CUP boundaries and maintain a 100-foot setback from property not under the applicant's ownership. This modification would include the relocation of the existing Southern California Edison's electric transmission lines and light duty poles. A more detailed description of this relocation is provided later in the narrative.

Ancillary Facilities and Other Landfill Property Modifications:

The other primary modification to the CUP is to add approximately 5 acres of ancillary facilities and other landfill property to the existing 180-acres to capture the new property configuration resulting from the 1999 lot line adjustment, as shown on Figure 3, Project Boundaries.

In addition to the acreage modification, other changes are proposed as part of this CUP (refer to Figure 2). Figure 1, Exhibit "A" shows existing and proposed ancillary facilities as they were envisioned in 1991, and Figures 2 and 2a depicts the existing and proposed ancillary facilities as currently planned in 2004. Impacts of the proposed ancillary facilities (shown on Figures 2 and 2a) that were not covered by Exhibit "A" will be analyzed in the environmental document for the new CUP.

The new proposed permanent facilities are located in areas that will not impact or be impacted by Anaverde Creek. This area has been historically used for landfill operations and is currently included as part of the CUP modification.

Revised Traffic Studies

Traffic Impact Analysis

The applicant is requesting an increase in the daily tonnage limitation to 3,600 tons per day for disposal. Concurrent with the 1998 CUP modification application, a traffic study was prepared that updated truck tonnage capacity figures and background projections from the April 1993 study prepared by Kunzman Associates. The 1998 updated analysis assumed that the landfill operation would increase to 3,600 tons per day of waste for disposal. Table 1 of the study revealed that if the project's operation increased to 3,600 tons per day today, all intersections would continue to operate at Level of Service B or better for 1998 traffic conditions. For year 2005 traffic conditions all intersections would operate at level of Service D or better with or without the project.

The applicant proposes to update the 1998 study to accommodate the potential of transfer trucks as part of the proposed CUP. The study will be prepared by Kunzman Associates. Based upon Bill Kunzman's August 22, 2002 on-site meeting with Mr. Bill Padilla, Kunzman and Associates will prepare a revised traffic study, which will quantify existing traffic conditions, traffic conditions upon project completion, and recommend mitigation measures. Specifically, the traffic impact analysis will consist of (1) conducting a field survey; (2) documenting existing traffic conditions; (3) determining project traffic generation; (4) distributing the project traffic generation to the street system; (5) determining the project's traffic impacts; (6) mitigating the impacts, and (7) preparing a written report. Traffic generation will be determined based on the tons per day and the type and size of the vehicles (i.e., transfer trucks) utilized for transfer of materials to the landfill. Mitigation measures identified in the previous certified EIR will be updated, and applied to the currently proposed project, as applicable. Mitigation measures would include roadway sizing recommendations, intersection controls, and special treatments such as left turn pockets and right turn lanes as might be required by the project.

The traffic impact analysis will include calculation of intersection capacity utilization (ICU) at 11 intersections in the project vicinity during the weekday morning and evening peak hours for (1) existing 2002 traffic conditions, and (2) at project opening year such as 2007 traffic conditions. To account for background traffic growth, a growth factor will be used and applied to existing volumes.

The intersections to be analyzed are as follows:

1. Tierra Subida and Palmdale Boulevard
2. Tierra Subida Avenue and 5th Street
3. Tierra Subida Avenue and Rayburn Road / Avenue R
4. Tierra Subida Avenue and City Ranch Road / Park Entrance
5. Tierra Subida Avenue and Avenue R-8 / Park Entrance
6. Tierra Subida Avenue and Avenue S
7. Palmdale Boulevard and 5th Street West

8. Palmdale Boulevard and SR 14 Southbound Ramps
9. Palmdale Boulevard and SR 14 Northbound Ramps
10. Avenue S and SR 14 Southbound Ramps
11. Avenue S and SR 14 Northbound Ramps

Circulation Alternative Studies

Over the past several years Kunzman Associates have completed Antelope Valley Traffic Impact Analysis with four revisions, the most recent being August 7, 2003. Various access routes into the facility have been investigated. The most recent study examines and concludes that rerouting a portion of R-5 to coincide with Rayburn Road is the preferred access route into the facility. EDAW will incorporate the findings of the access analysis into the EIR.

Visual Impact

The application proposes a height increase to the landfill. The currently permitted Landfill I and II has a maximum height of El 3205 and El 3140, respectively. The proposed landfill will have a height of El 3200 ft. The environmental document will include an analysis of the aesthetic impacts related to the landfill height in relationship to the height of the adjacent ridgeline to the north of the landfill.

Phasing

Consistent with the currently permitted design of Landfill II, the proposed enlarged Landfill II will be developed in phases as broadly indicated on Figures 5 through 7. A more detailed phasing plan will be developed when revised permits from the Regional Water Quality Control Board and California Integrated Waste Management Board are granted. In any event, phasing will consist of excavating a 20- to 30-acre refuse disposal cell (the cell). Please refer to Figure 4, Base Grading Plan. The cell will then be lined with impermeable soil and plastic layers and contain a Leachate Control and Removal System in accordance with Federal and State regulations. As refuse is being placed in one cell another cell will be excavated (refer to Figures 5 through 7, Phasing Plans and Figure 8, Cross Sections). The excavated soils of the next cell will be used for covering the refuse in the previous lined cell as well as will be used for soil berms, stockpile and related activities. This process will continue until all cells are excavated and properly lined. It should be noted that, as each of the proposed phases are completed, they will be brought up to final grade and closed.

Other infrastructure

The realignment of City Ranch Road to Avenue R-8, as part of a City initiated amendment to the Circulation Element of the City of Palmdale General Plan, is currently contemplated.

Additionally, Southern California Edison currently has 12,000 and 66,000 volt transmission lines mounted on light duty poles located in the expansion area between Landfill I (existing) and Landfill II. The transmission lines and poles will be relocated to the east and north of Landfill I, possibly off-site to an area that would have the least amount of impact on the existing habitat and other resources.

HDR

Hennington, Durham & Richardson, Inc.

ANTELOPE VALLEY LANDFILL
EXISTING AND PROPOSED LANDFILL AREAS

SCALE 1" = 200'

PLOT PLAN
PROJECT NUMBER 85512
CUP 85162

8713788184283

12/16/91

HAW

CRR

CRR

PROPOSED EXPANSION - LIMIT OF REFUSE

APPROXIMATE ALIGNMENT OF NEW CITY RANCH ROAD

PROPOSED ACCESS ROAD

EXISTING ACCESS ROAD

NOTES

1. LOCATION OF CITY RANCH ROAD EXPANSION IS STILL CONCEPTUAL. IT IS PLANNED TO BE LOCATED SOUTH OF THE EXISTING AND PROPOSED LANDFILL AREAS AND NORTH OF THE CALIFORNIA AQUEDUCT. THE ROADWAY WILL BE 4 LANES UNDIVIDED WITH AN 80 FOOT RIGHT OF WAY.
2. FENCING SURROUNDING THE EXPANSION AREA WILL BE A 6 FOOT HIGH CHAINLINK TOPPED WITH BARBED WIRE.
3. FENCING SURROUNDING THE PROPOSED ENLARGEMENT AREA WILL BE A 6 FOOT HIGH CHAINLINK TYPE
4. THE PROPOSED ACCESS ROAD WILL MERGE WITH THE EXISTING DIRT ROAD AS SHOWN

LEGEND

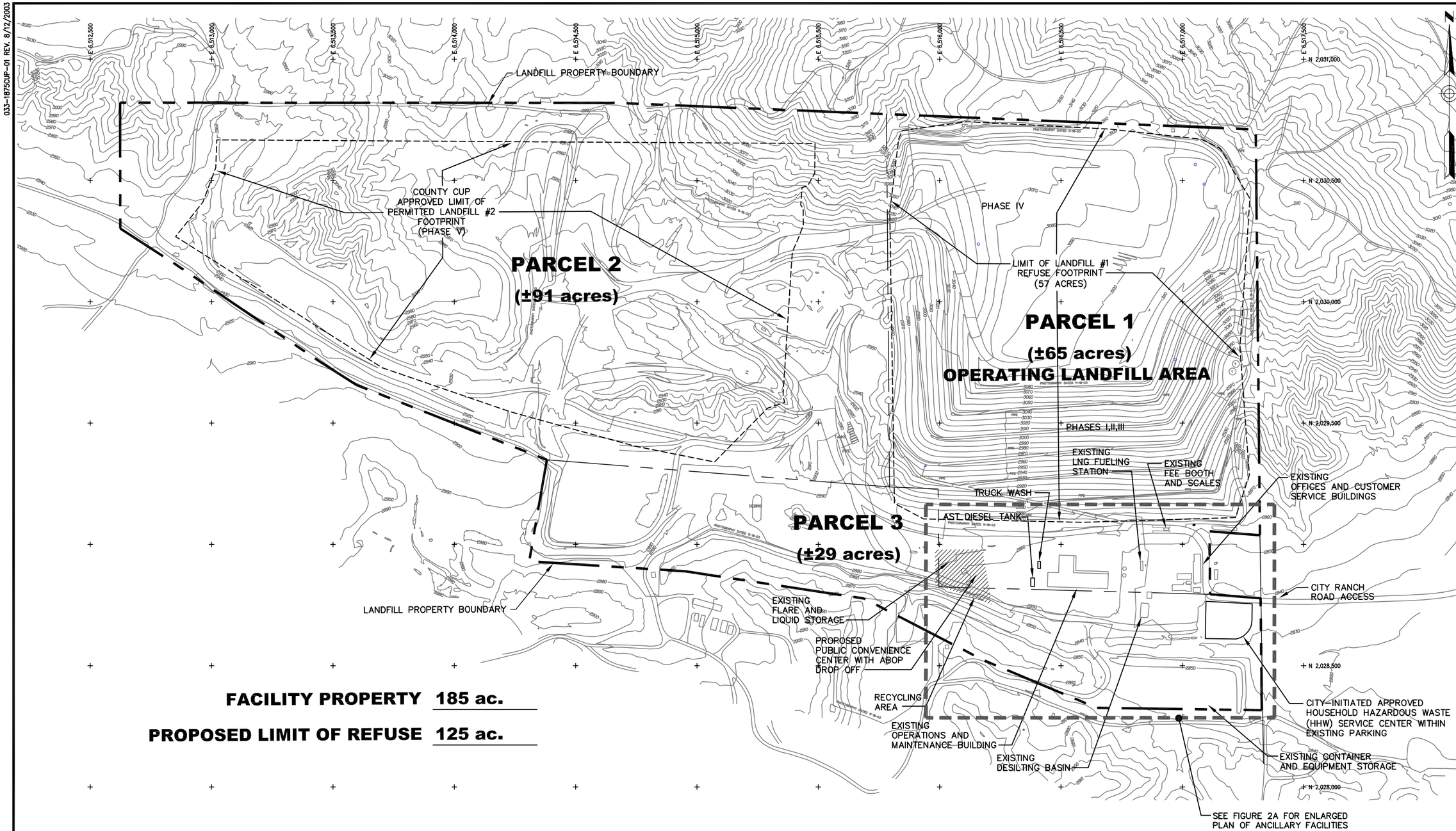
- PROPOSED LIMIT OF REFUSE
- 2040 EXISTING GRADE
- EXISTING STRUCTURES
- PROPOSED FACILITIES
- PROPOSED NEW CITY RANCH ROAD
- PROPOSED ACCESS ROAD FOR EXPANSION
- 2000 PROPOSED EXPANSION FINAL GRADE
- PROPERTY LINE (170 acres)
- APPROVED ANCILLARY FACILITIES (10 acres)

FIGURE 1

EXHIBIT "A"

As approved by FPC

033-1875CUP-01 REV. 8/12/2003



FACILITY PROPERTY 185 ac.

PROPOSED LIMIT OF REFUSE 125 ac.

EXPLANATION

- LANDFILL PROPERTY BOUNDARY / CUP BOUNDARY
- LIMIT OF PERMITTED LANDFILL
- LANDFILL PARCEL BOUNDARY
- EXISTING BUILDINGS
- PROPOSED FACILITY
- E 4,500 COORDINATE GRID

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	11/26/02	ISSUED FOR CUP APPLICATION	MLR	JWS	SGS
B	2/19/04	REVISED FOR CUP	KJK	KJK	SGS

Golder Associates
2300 Commerce, Suite 200
Irvine, California 92602
(714) 508-4400

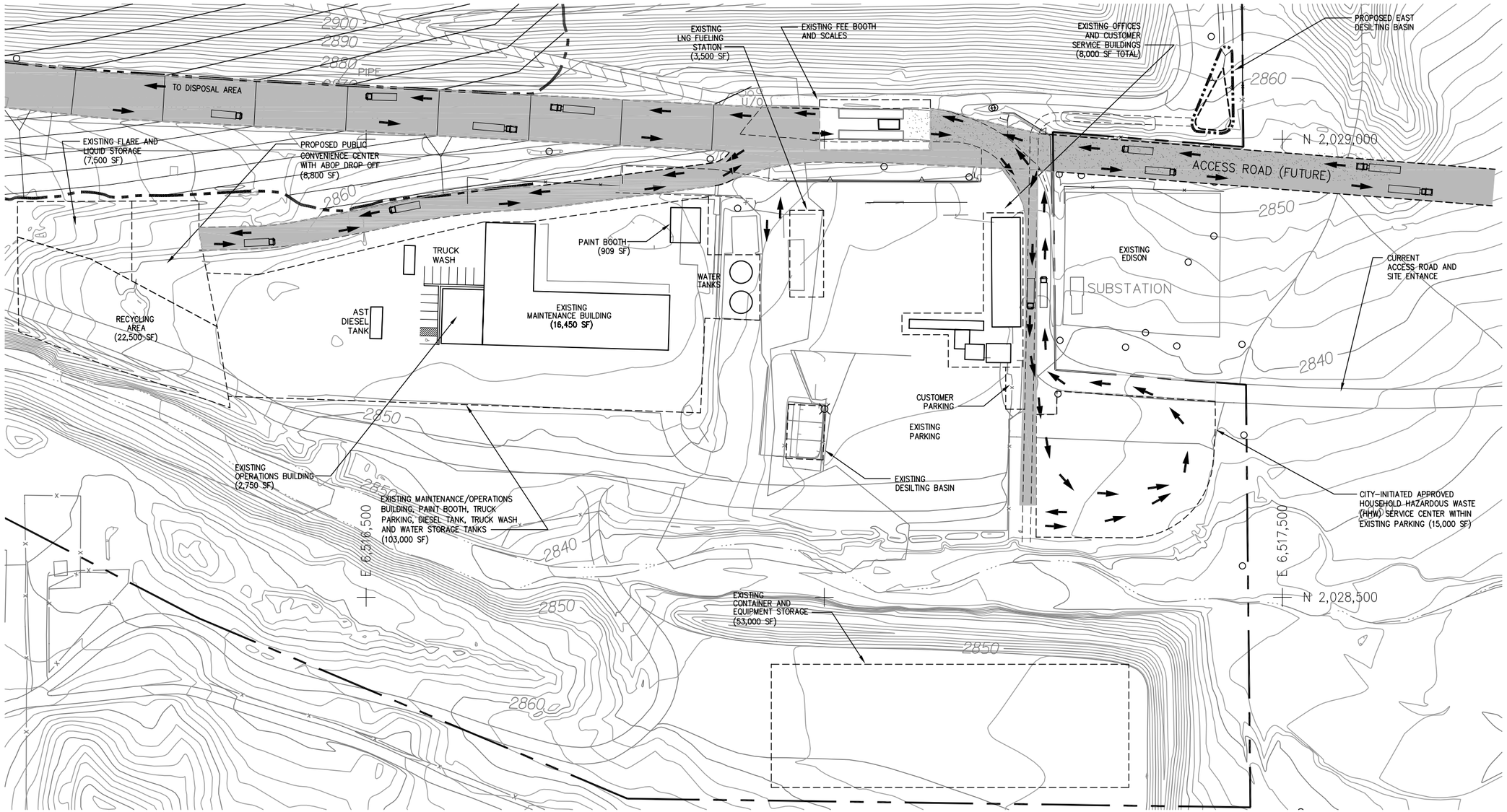
WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

SITE PLAN

FIGURE

2



SURVEY REF: WALKER & ASSOC. (NOV. 18, 2002)

PLAN VIEW

60 0 60 120
scale feet

NOTE:
FACILITIES ARE SHOWN FOR PLANNING PURPOSES, EXACT LOCATION AND SIZE MAY VARY.

EXPLANATION

- LANDFILL PROPERTY BOUNDARY
- EXISTING INDEX TOPOGRAPHIC CONTOUR
- PROPOSED LANDFILL TRAFFIC FLOW
- PROPOSED ACCESS ROAD
- ANCILLARY FACILITY BOUNDARY
- TRANSFER TRAILER
- 35-FOOT HAUL TRUCK

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	04/03	ISSUED FOR CUP APPLICATION	JLB	JWS	SGS
B	06/23/03	REVISED PER CUP COMMENTS	JLB	JWS	SGS
C	02/19/04	REVISED FOR CUP	KJK	KJK	SGS

Golder Associates
230 Commerce, Suite 200
Irvine, California 92602
(714) 508-4400

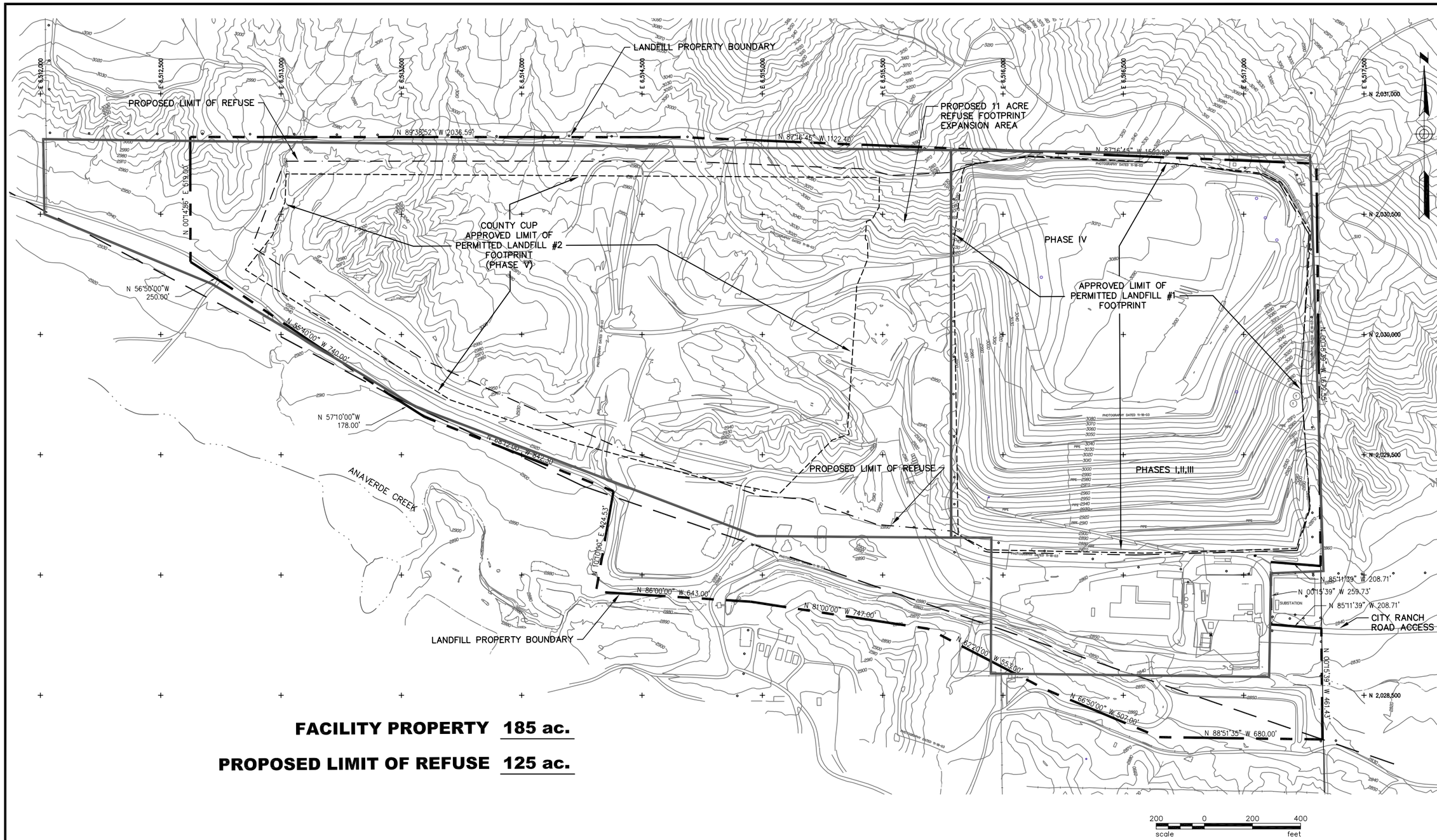
WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

ANCILLARY FACILITIES LAYOUT PLAN

FIGURE

2A



FACILITY PROPERTY 185 ac.

PROPOSED LIMIT OF REFUSE 125 ac.

EXPLANATION

- PROPOSED LANDFILL PROPERTY BOUNDARY (185 ACRES)
- ORIGINAL COUNTY CUP SITE BOUNDARY (180 ACRES)
- GEOLOGIC FAULT LINE
- 3020 EXISTING INDEX TOPOGRAPHIC CONTOUR
- EXISTING UNIMPROVED ROAD
- EXISTING PAVED ROADS
- EXISTING BUILDINGS
- HISTORICAL "BLUE" LINE
- E 6,515,000 COORDINATE GRID
- EXISTING UTILITY POLES
- EXISTING FENCE LINE
- EXISTING VEGETATION FEATURE
- PROPOSED LIMIT OF REFUSE

NOTE

TOPOGRAPHIC BASE MAP FROM WALKER AND ASSOCIATES, INC., SURVEY FLIGHT DATED NOVEMBER 18, 2003.

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	11/26/02	ISSUED FOR CUP APPLICATION	MLR	JWS	SGS
B	2/19/04	REVISED FOR CUP	KJK	KJK	SGS

Golder Associates
2300 Commerce, Suite 200
Irvine, California 92602
(714) 508-4400

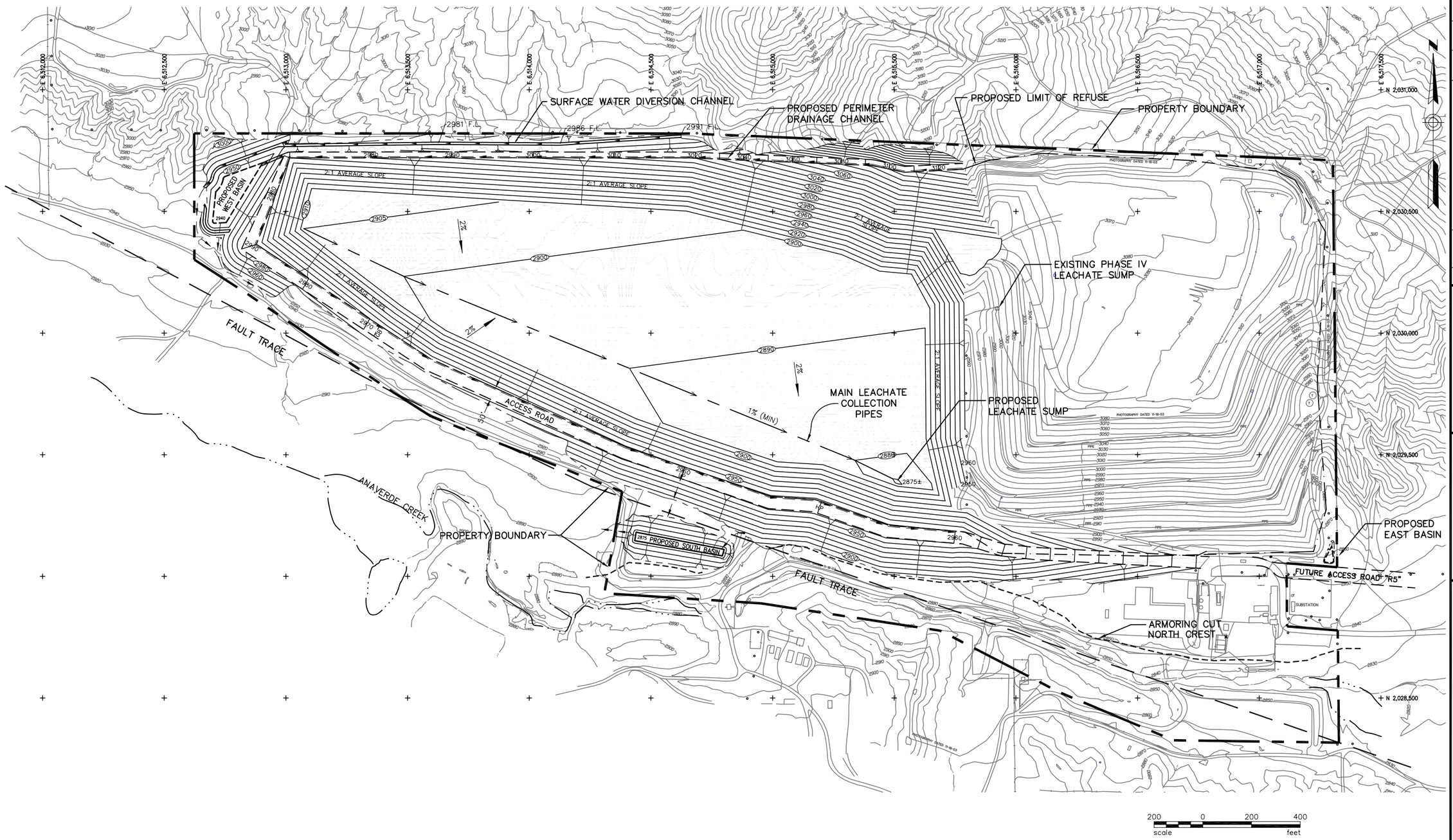
WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

PROJECT BOUNDARIES

FIGURE

3



EXPLANATION

- LANDFILL PROPERTY BOUNDARY
- GEOLOGIC FAULT LINE
- PROPOSED LIMIT OF REFUSE
- 3230 PROPOSED BASE GRADE CONTOURS
- 3230 PROPOSED REFUSE FILL GRADE CONTOURS
- PROPOSED ACCESS ROAD
- EXISTING UNIMPROVED ROAD
- EXISTING PAVED ROADS
- EXISTING BUILDINGS
- EXISTING UTILITY POLES
- EXISTING FENCE LINE
- 2900 EXISTING INDEX TOPOGRAPHY CONTOUR
- HISTORICAL "BLUE" LINE
- E 6,516,000 COORDINATE GRID
- 3:1 SLOPE INDICATOR
- 5.0% GRADE INDICATOR

NOTE

TOPOGRAPHIC BASE MAP FROM WALKER AND ASSOCIATES, INC., SURVEY FLIGHT DATED NOVEMBER 18, 2003.

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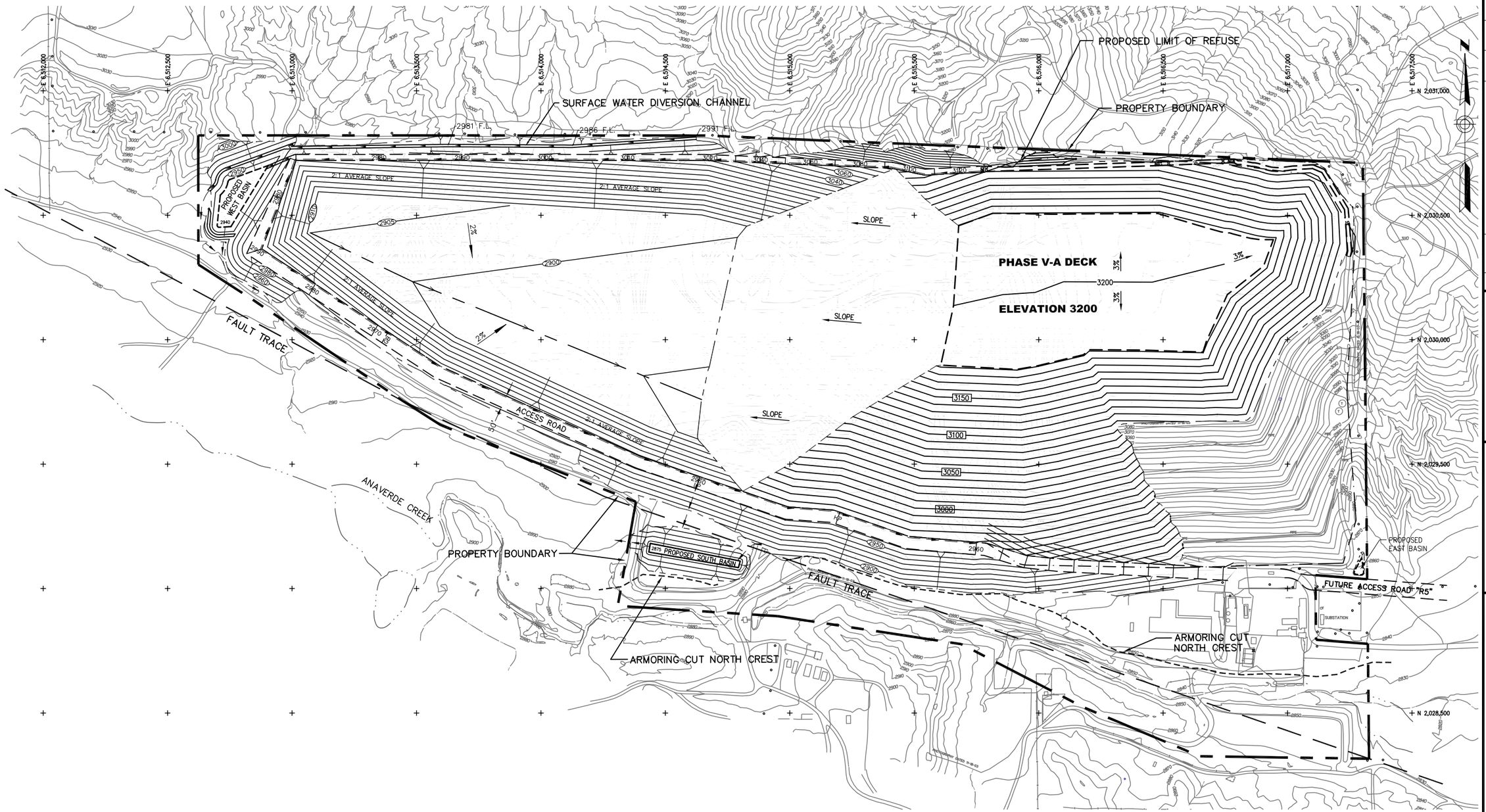
BASE GRADING PLAN

FIGURE

4



EXPLANATION

- LANDFILL PROPERTY BOUNDARY
- GEOLOGIC FAULT LINE
- EXISTING UNIMPROVED ROAD
- EXISTING PAVED ROADS
- EXISTING INDEX TOPOGRAPHIC CONTOUR
- EXISTING FENCE LINE
- EXISTING VEGETATION FEATURE
- PROPOSED LIMIT OF REFUSE
- PROPOSED BASE GRADE CONTOURS (3230)
- PROPOSED REFUSE FILL GRADE CONTOURS (3230)
- PROPOSED ACCESS ROAD
- EXISTING BUILDINGS
- EXISTING UTILITY POLES
- HISTORICAL "BLUE" LINE
- E 6,515,000 COORDINATE GRID
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NOTE

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ANTELOPE VALLEY PUBLIC LANDFILL
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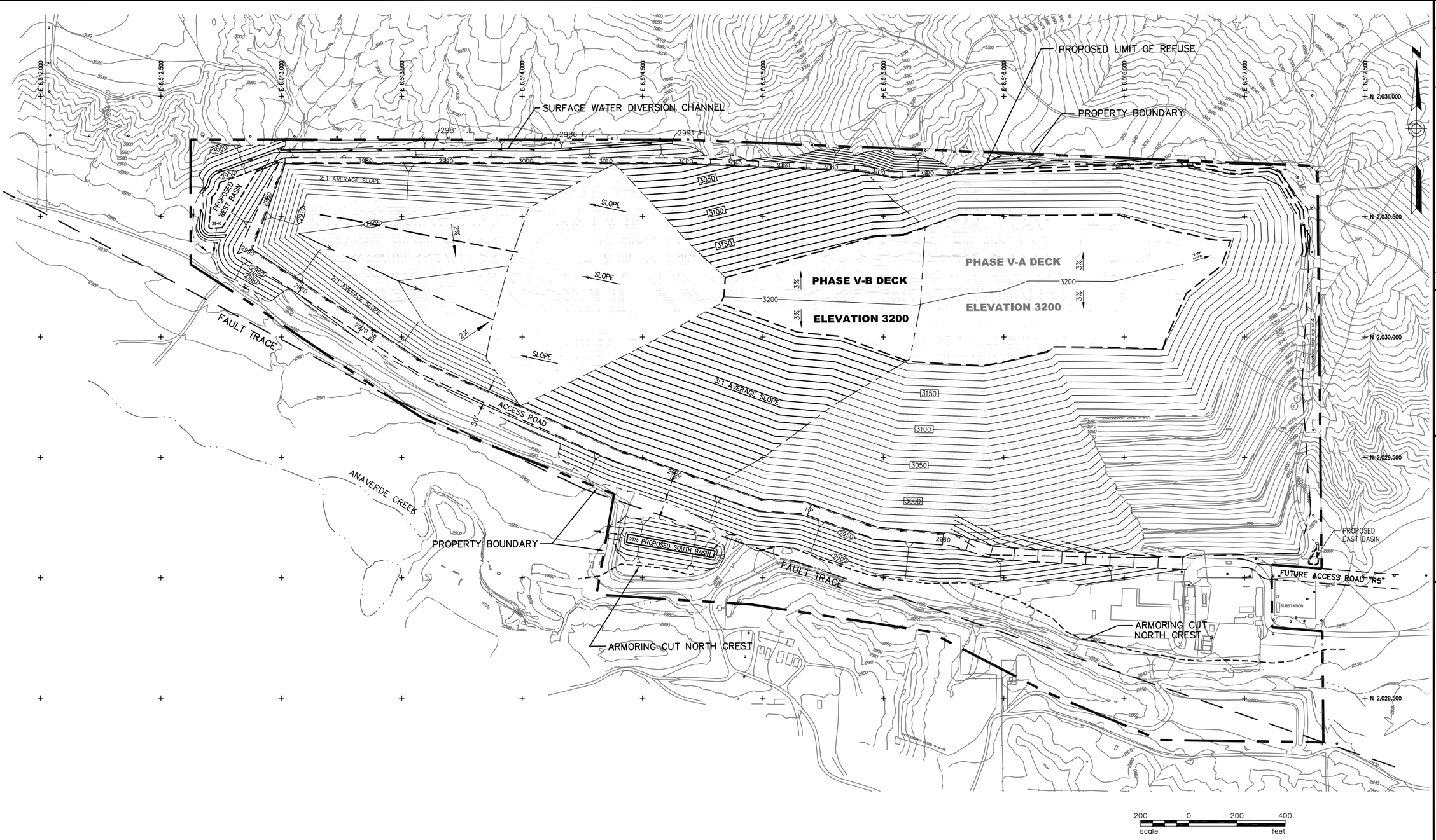
CUP

PHASE V-A FILL PLAN

FIGURE

5



EXPLANATION

LANDFILL PROPERTY BOUNDARY	PROPOSED LIMIT OF REFUSE		HISTORICAL "BLUE" LINE
GEOLOGIC FAULT LINE	PROPOSED BASE GRADE CONTOURS (3230)	E 6,515,000	COORDINATE GRID
EXISTING UNIMPROVED ROAD	PROPOSED REFUSE FILL GRADE CONTOURS (3230)	3:1	SLOPE INDICATOR
EXISTING PAVED ROADS	PROPOSED ACCESS ROAD	5.0%	GRADE INDICATOR
EXISTING INDEX TOPOGRAPHIC CONTOUR (3020)	EXISTING BUILDINGS		
EXISTING FENCE LINE	EXISTING UTILITY POLES		
EXISTING VEGETATION FEATURE			

NOTE

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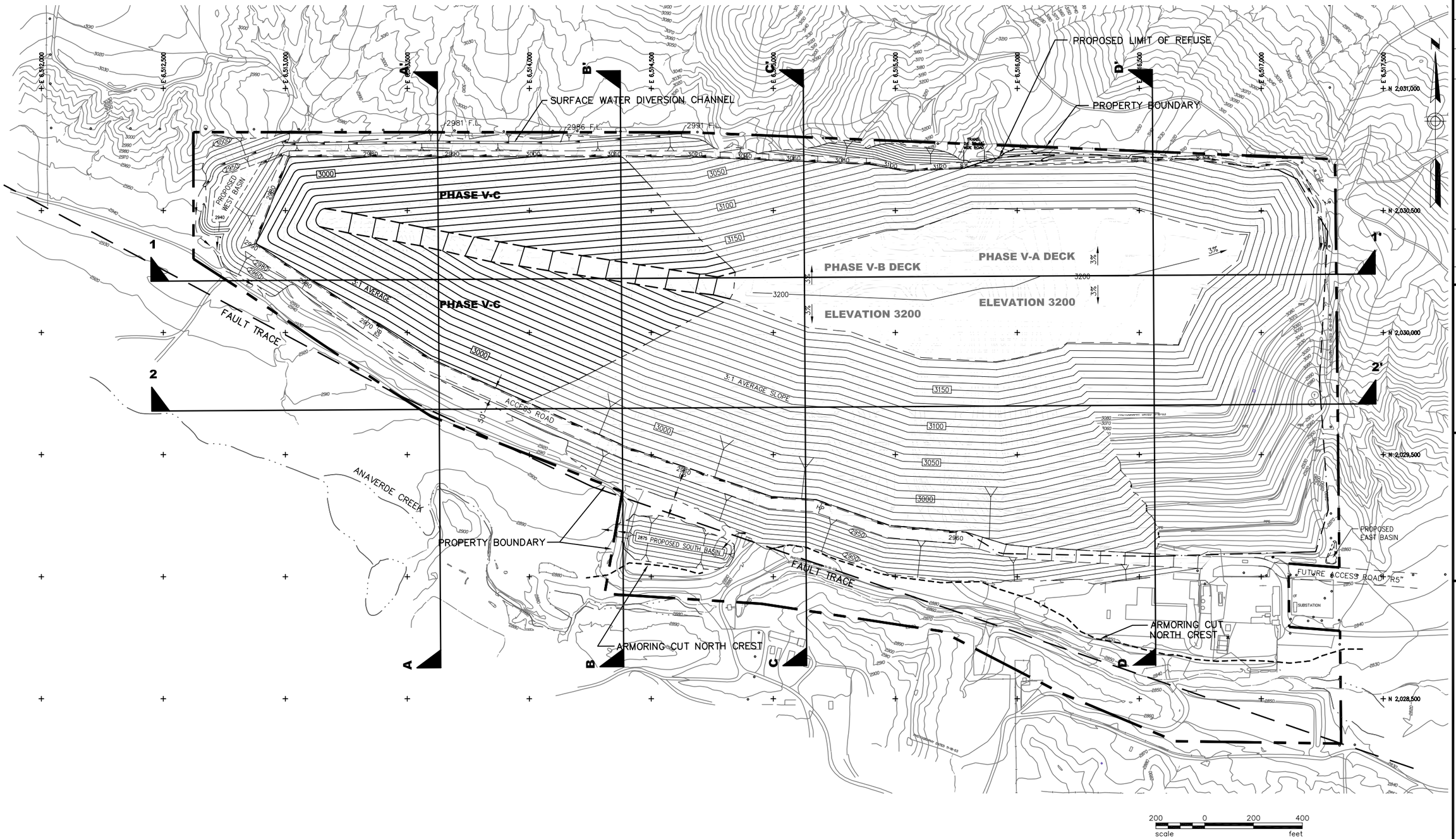
ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

PHASE V-B FILL PLAN

FIGURE

6



EXPLANATION

LANDFILL PROPERTY BOUNDARY	PROPOSED LIMIT OF REFUSE	HISTORICAL "BLUE" LINE
GEOLOGIC FAULT LINE	PROPOSED BASE GRADE CONTOURS (3230)	E 6,515,000 COORDINATE GRID
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EXISTING PAVED ROADS	PROPOSED ACCESS ROAD	5.0% GRADE INDICATOR
EXISTING INDEX TOPOGRAPHIC CONTOUR (3020)	EXISTING BUILDINGS	
EXISTING FENCE LINE	EXISTING UTILITY POLES	
EXISTING VEGETATION FEATURE		

NOTE

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WASTE MANAGEMENT, INC.

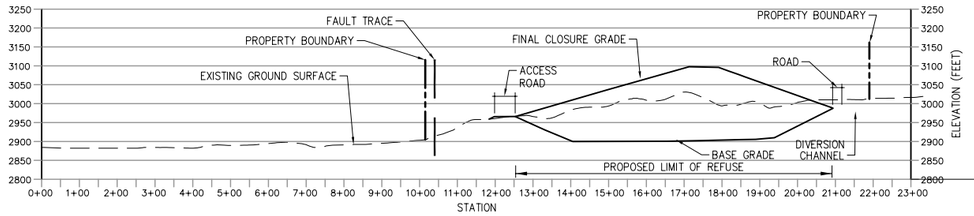
ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

PHASE V-C FILL PLAN

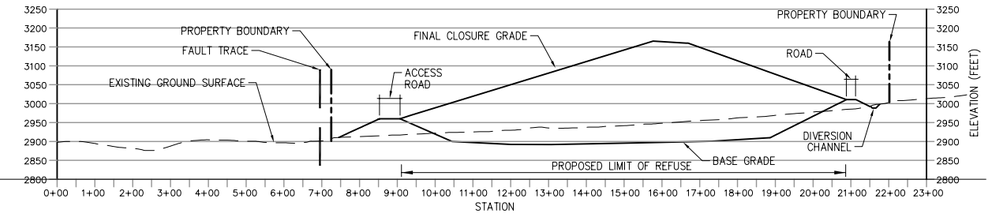
FIGURE

7

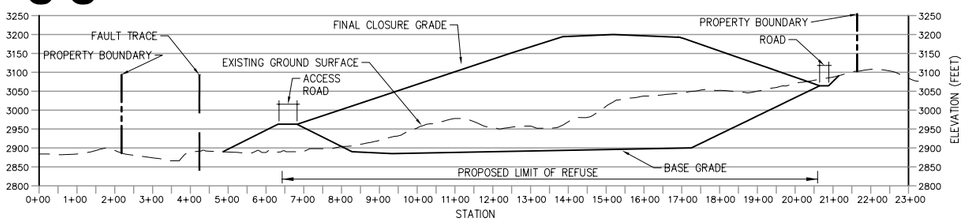
A-A'



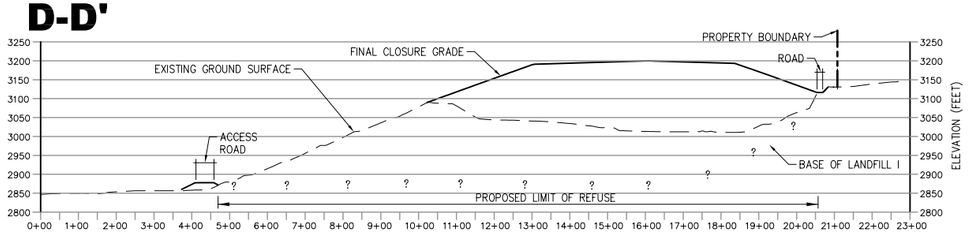
B-B'



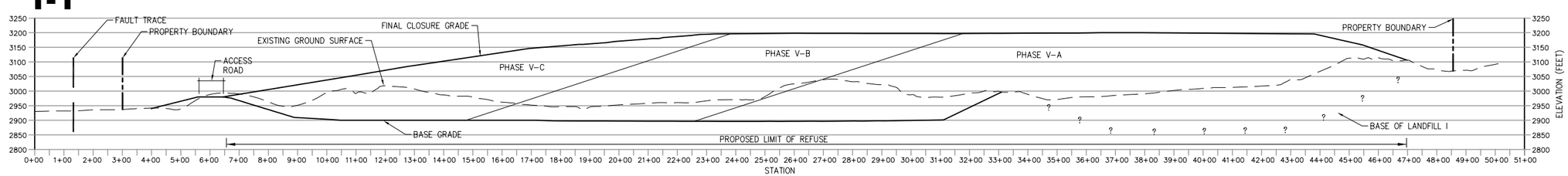
C-C'



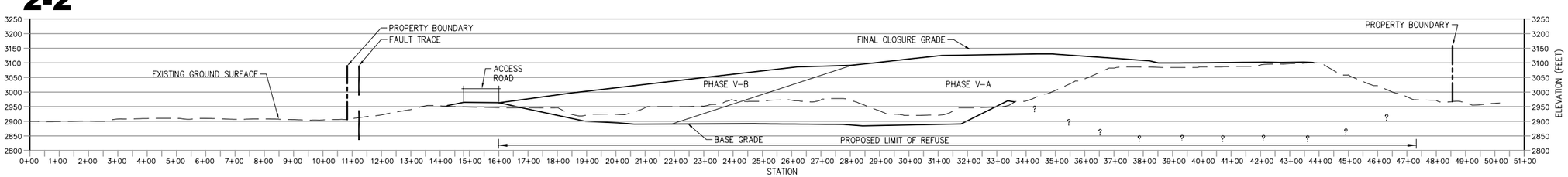
D-D'



1-1'



2-2'



200 0 200 400
scale feet

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(714) 508-4400

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ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
CUP

LANDFILL CROSS SECTIONS

FIGURE

8

B. Department of Fish and Game Correspondence Dated October 18, 1996

Re: Streambed Alteration

Agreement 5-354-94

Ana Verde Creek, Los Angeles County

STATE OF CALIFORNIA - THE RESOURCES AGENCY

PETE WILSON, *Governor*

DEPARTMENT OF FISH AND GAME
Region 5
330 Golden Shore, Suite 50
Long Beach, California 90802
(310) 590-5137

RECEIVED
OCT 25 1996
EDAW, INC., IRVINE, CA

October 18, 1996

Ms. Jayna Morgan
EDAW, Inc.
1920 Main Street, Suite 450
Irvine, California 92714

Dear Ms. Morgan:

Streambed Alteration Agreement 5-354-94
Ana Verde Creek
Los Angeles County

This is in response to your letter dated September 1, regarding Streambed Alteration Agreement 5-354-94 and restoration of Ana Verde Creek for Palmdale Disposal.

Since the area has revegetated naturally and the 5-year monitoring plan to remove exotic species will enhance the area; the Department agrees that the terms of the agreement will be satisfied provided the conditions in the plan are met, copies of the Annual Success reports are submitted to the Department and no asphalt is in the fill which was placed within the creek.

If you have any further questions regarding this matter, please call me at (805) 538-1464.

Sincerely,

Felix I. Martinez
for Rebecca Jones
Environmental Specialist III
Region 5

C. Department of Fish and Game Correspondence Dated October 22, 1998

Re: 9/20/98 Site Visit and the Proposed Alteration to a Small Wash on the Property

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor
DEPARTMENT OF FISH AND GAME
330 GOLDEN SHORE, SUITE 50
LONG BEACH, CA 90802

(562) 590-5137

October 22, 1998

Mr. Craig Eomurian
Antelope Valley Public Landfill
P.O. Box 4040
Palmdale, CA 92550

Dear Mr. Eomurian:

This letter is regarding the site visit to the landfill on September 20nd, and the proposed alteration to a small wash on your property.. It has been determined that no Streambed Alteration Agreement will be needed for this project, since there should be no substantial adverse impact to wildlife, provide the following conditions are met.

1) Equipment shall not be operated in wetted areas (including but not limited to ponded, flowing, or wetland areas).

2) No debris, soil, silt, sand bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any maintenance, construction, or associated activity of whatever nature shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the state. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any stream.

3) If the proposed project changes from the original plans the Department shall be notified for addition review.

This letter does not authorize the "take" of any listed species. This letter is not an authorization of water rights since the Department has no jurisdiction to do so. The State Water Board is the one who deals with water rights.

If you have any further questions regarding this matter, please contact me at (805)285-5867.

Sincerely,

Rebecca Jones

Rebecca Jones
Region 6

D. 404 and 1603 Jurisdictional Delineation for Palmdale Landfill, Dated March 2001, Revised April 9, 2001

404 and 1603
JURISDICTIONAL DELINEATION
for PALMDALE LANDFILL

Prepared for:

Waste Management, Inc.
1200 West City Ranch Road
Palmdale, California 93551

Prepared by:

LISA M. KEGARICE
Tom Dodson & Associates
2150 North Arrowhead Avenue
San Bernardino, California 92405

CERTIFICATION: I certify the statements furnished in this report and in the attached exhibits presents the data and information required for this delineation, and the facts, statements, and information presented are true and complete to the best of my knowledge.

Lisa M. Kegarice
Ecologist

RECEIVED
APR 10 2001
EDAW, INC., IRVINE, CA

March 2001

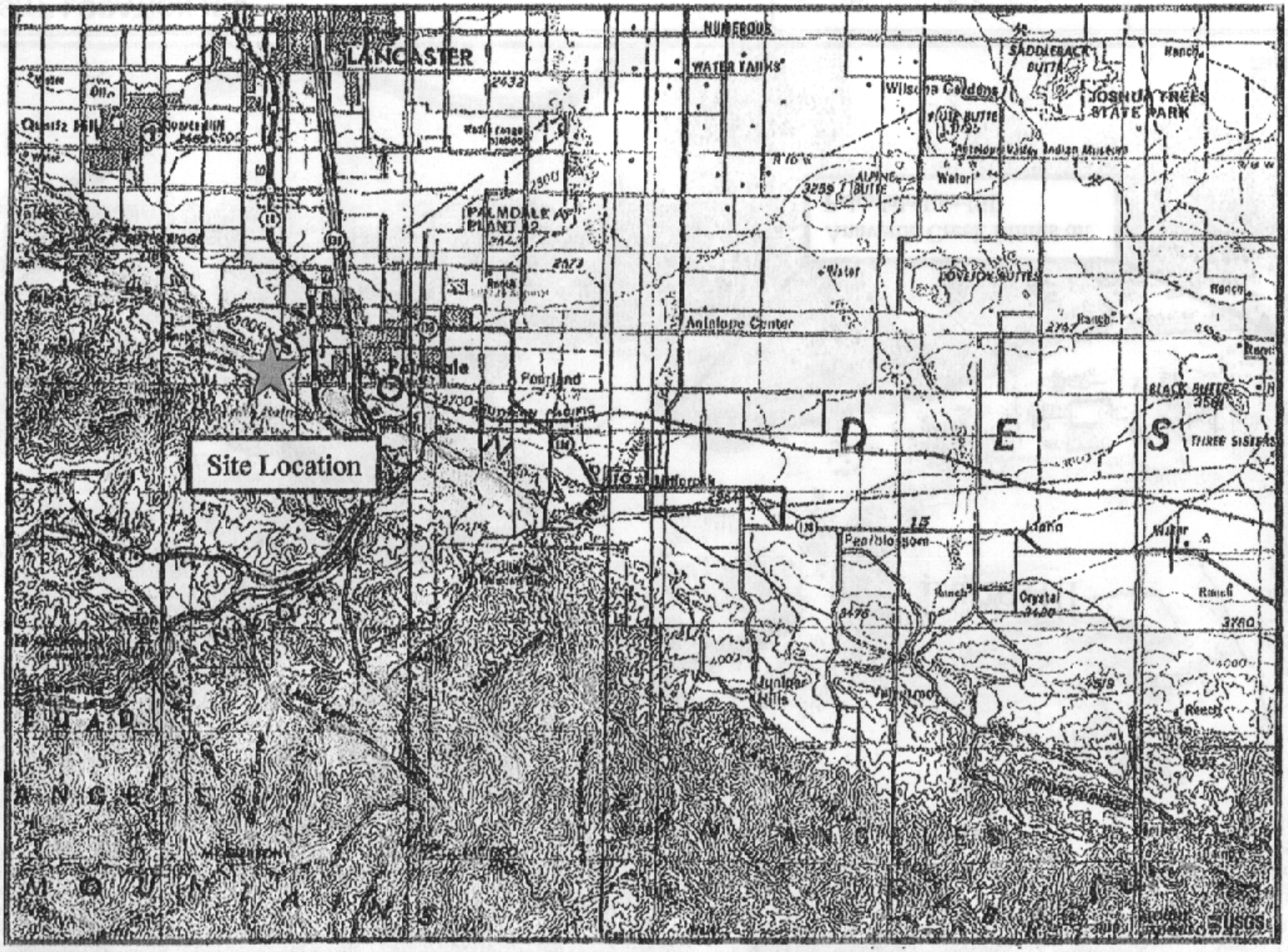
(Revised: April 9, 2001)

INTRODUCTION AND SUMMARY OF FINDINGS

The following is a Jurisdictional Wetland, Waters, and California Streambed Delineation for Waste Management on Palmdale Landfill located in Palmdale, California. The landfill property is situated west of Interstate 14 just outside of Palmdale, Los Angeles County, California (see Figures 1 and 2 for site location). Anaverde Creek traverses the southern boundary of the landfill property, and is the subject of this delineation. This report discusses the general background information, methodology used to determine the Jurisdictional Wetlands, Waters, Streambed, and a discussion of the rational for the delineated areas.

Anaverde Creek is an isolated water body, and light of the Supreme Court Decision regarding Solid Waste Association of Northern Cook Counties *vs.* United States Corps of Engineers (SWANCC) issued on January 9, 2001; the Supreme Court held that the Corps could not extend it jurisdiction to isolated waters or wetlands based solely upon the use of such waters by migratory water fowl. Because the channel originally deemed a "Water of the United States" by the Corps does not have any type of hydrological connection with another "Water of the United States" there by being isolated; it may no longer subject to Corps jurisdiction under Section 404. The ultimate decision regarding jurisdiction is the Corps' [personal communication with David Castanon, North Coast Section Chief, U.S. Army Corps of Engineers, Regulatory Branch (3-13-2001)]. They may exert jurisdiction on some segments of the Creek where endangered species are expected to occur.

The result of this delineation is approximately 0.9 acre of the channel may be "Waters of the United States", and 1.9 acres are subject to California Department of Fish and Game under Section 1600 of the Fish and Game Code. Figure 3 is a map of the project site with the areas that meet Streambed criteria indicated.

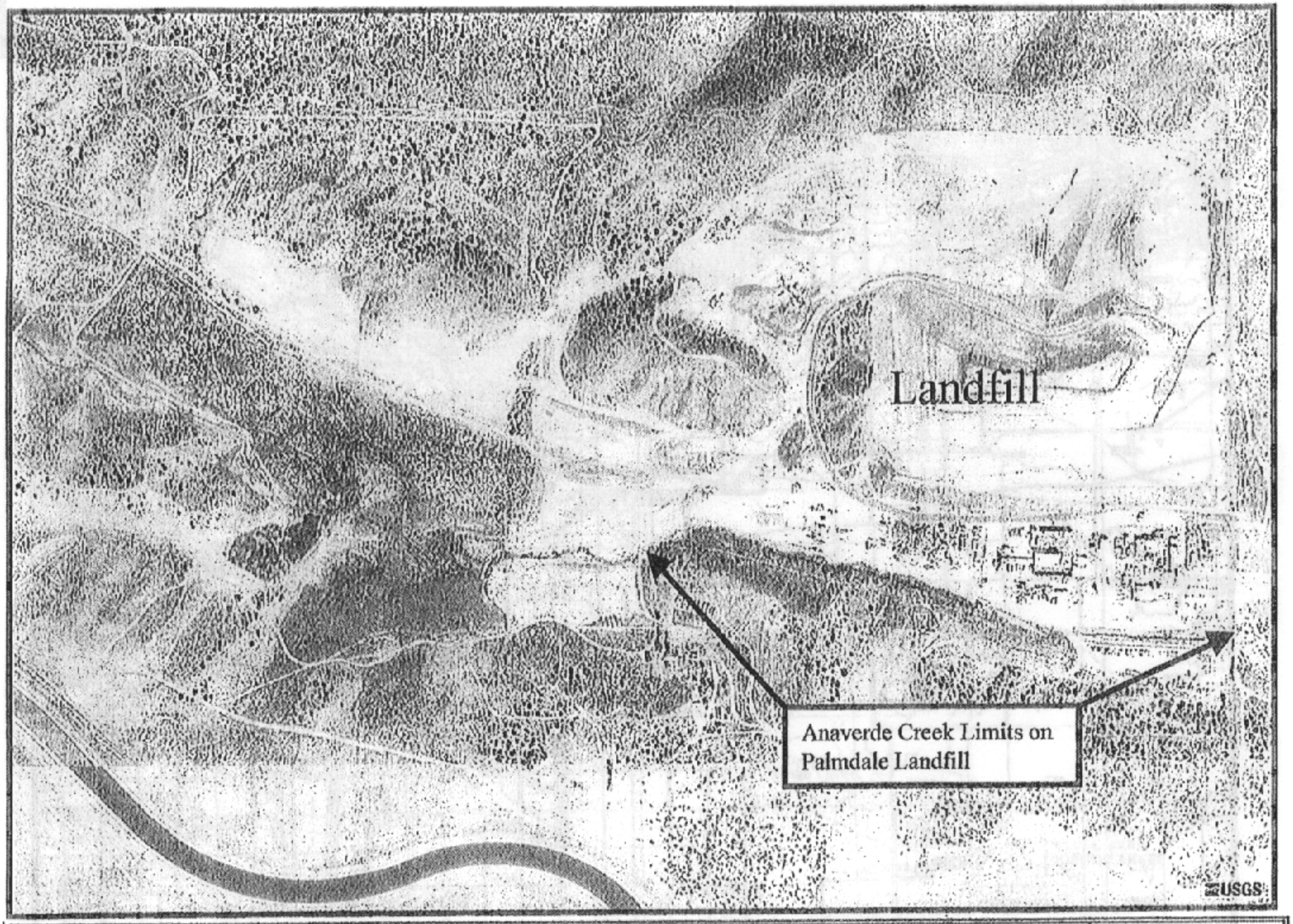


REGIONAL LOCATION MAP

Source: TierraServer.com

TOM DODSON & ASSOCIATES
Environmental Consultants

FIGURE 1



SITE LOCATION MAP

Source: TierraServer.com

TOM DODSON & ASSOCIATES
Environmental Consultants

FIGURE 2

METHODOLOGY

California Department of Fish and Game Section 1603

The California Department of Fish and Game takes jurisdiction over water flow areas, i.e., streams. These water flow areas are identified in the code as:

> "...natural flow or bed, channel or bank of any river stream of lake designated by the department in which there is at any time an existing fish aor wildlife resource or from which these resources derive benefit or will use material from the streambeds..."

> Although river is never defined in the Fish and Game Code; a river is defined by Webster as: "A natural stream of water larger than a creek and emptying into an ocean, lake or another river". Further Webster defines a stream as a small river.

In order to quantify the acreage of "Streambed" the channel was walked and survey stakes of the discernable bed or banks were taken at approximately 100-foot intervals. These stakes were then surveyed in and a map was prepared. The acreages were then calculated from the mapped areas.

U.S. Army Corps of Engineers "Waters of the United States", excluding wetlands

The limits of "waters of the United States", excluding wetland, are defined in 33 CFR 328.3(a) as those areas within the "ordinary high water mark" (OHWM). The OHWM is defined as:

> "...that line on the shore established by the fluctuations of the water and indicated by physical characteristics such as clear natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

In order to quantify the acreage of "Waters of the United States" the channel was walked and survey stakes of the discernable bed or banks were taken at approximately 100-foot intervals. These stakes were then surveyed in and a map was prepared. The acreages were then calculated from the mapped areas.

U.S. Army Corps of Engineers "Wetlands"

The conclusions in this determination and the subsequent delineation of the Jurisdictional Wetlands are based upon The U.S. Army Corps of Engineers' Wetland Delineation Manual, January 1987, Technical Report Y-87-1 (Manual). This Manual outlines a comprehensive approach based upon the presence of the following three parameters: wetland hydrology, hydrophytic vegetation, and hydric soils.

Wetland hydrology is present if the "sum total of wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation"(Manual). Hydrophytic vegetation is "the sum total of macrophytic plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content (Manual). A positive hydrophytic vegetation indicator is present if the prevalence, characterized by the dominant species of a plant community or communities, of the vegetation is classified as hydrophytic vegetation. Dominant plant species are those that contribute more to the character of a plant community than other species present, as estimated or measured in terms of some ecological parameter (i.e., %cover, %density, etc.) Hydric soil is a "soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.

Using this Manual, a wetland determination is made when under "normal circumstances" an area has all three parameters present. An area is not functioning under normal circumstances if a positive indicator for one of the three parameters could not be found due to effects of recent human activities. If a particular site has been recently disturbed by natural or human activities, it may not meet the criteria of "normal circumstances". If this occurs it would be classified as an "Atypical Situation" meaning one or more parameters are not reliable indicators.

To complete this Jurisdictional Wetland Delineation all three parameters were investigated, soils, hydrology and vegetation. The Manual describes inundation greater than one month to be a "very long duration", therefore areas that were ponded, or were saturated at the surface or within the root zone (usually 1-12 inches). The hydrophytic vegetation is characterized by plant species that have "demonstrated an ability to achieve maturity and reproduce in an environment where all or portions of the soil within the root zone become, periodically or continuously, saturated or inundated during the growing season." (Reed)

The National List of Plant Species That Occur in Wetlands was used to determine the indicator status of the dominant species of a community. The wetland area was delineated by looking for vegetation boundaries in the field between communities dominated by Facultative Wetland Species - Obligate Wetland Species and those dominated by Facultative Upland - Upland species, and comparing the hydrological and soils data along the vegetation transition.

RESULTS

Jurisdictional Determination for Waters of the United States

Anaverde Creek channel was investigated in this jurisdictional determination. This channel traverses west to east along the southerly edge of the property. This channel is characterized by deeply eroded channel. This channel is characterized by deeply incised sides with the western half characterized by wetland habitat and ponded areas, and the eastern half by a dry wash sparsely vegetated by upland species.

Anaverde Creek is an isolated water body, and light of the Supreme Court Decision regarding Solid Waste Association of Northern Cook Counties *vs.* United States Corps of Engineers (SWANCC) issued on January 9, 2001; the Supreme Court held that the Corps could not extend it jurisdiction to isolated waters or wetlands based solely upon the use of such waters by migratory water fowl. Because the channel originally deemed a "Water of the United States" by the Corps does not have any type of hydrological connection with another "Water of the United States" there by being isolated; it may no longer subject to Corps jurisdiction under Section 404. The ultimate decision regarding jurisdiction is the Corps' [personal communication with David Castanon, North Coast Section Chief, U.S. Army Corps of Engineers, Regulatory Branch (3-13-2001)]. They may exert jurisdiction on some segments of the Creek where endangered species are expected to occur.

Due to the deeply incised channel walls, often the limits of the Streambed were synonymous with the "ordinary high water mark" identified as potential Corps of Engineers jurisdiction. This was true primarily for the upper half of the channel, however in the lower portion, the CDFG streambed limits extended beyond the Corps limits.

CONCLUSION

Wetlands were observed on the upper half of the channel as it traversed the property. The lower half of the property is characterized by dry wash and is largely unvegetaed.

The result of this delineation is approximately 0.9 acre of the channel may be "Waters of the United States", and 1.9 acres are subject to California Department of Fish and Game under Section 1600 of the Fish and Game Code.

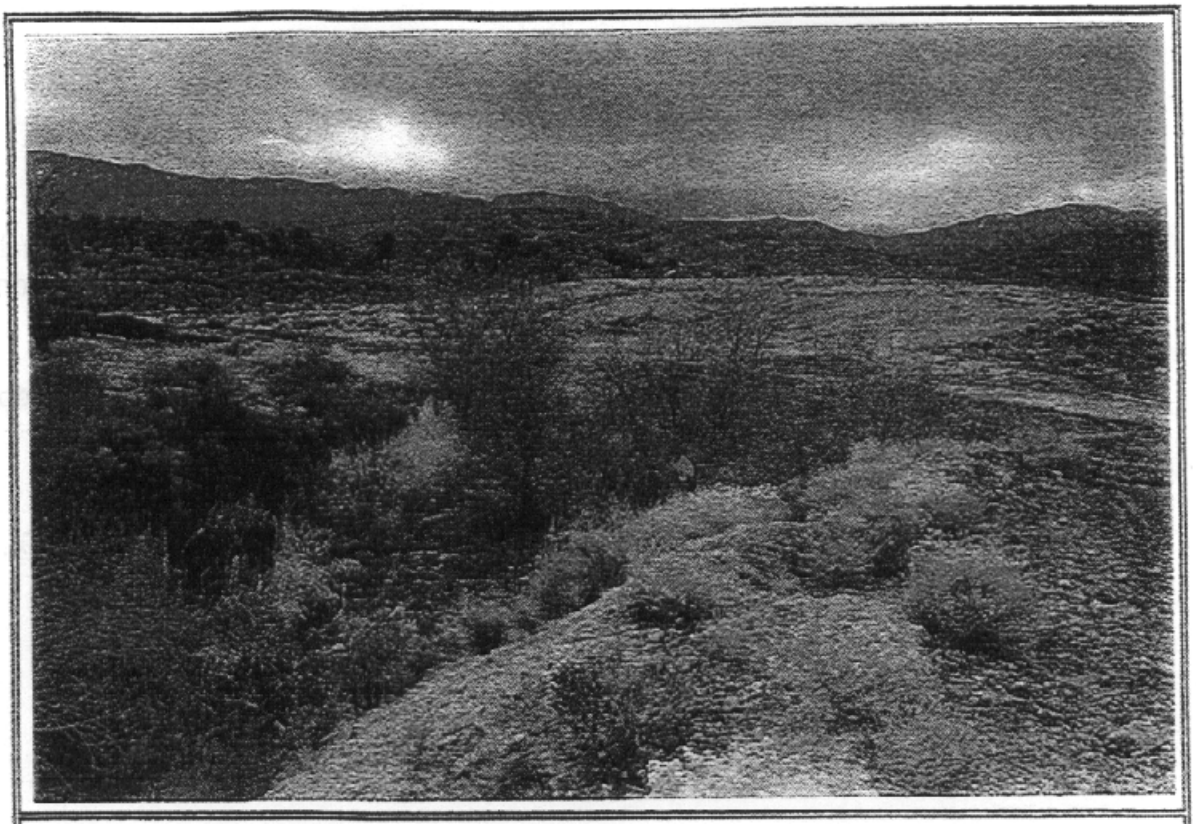


PHOTO 1: Ponded area on upper half

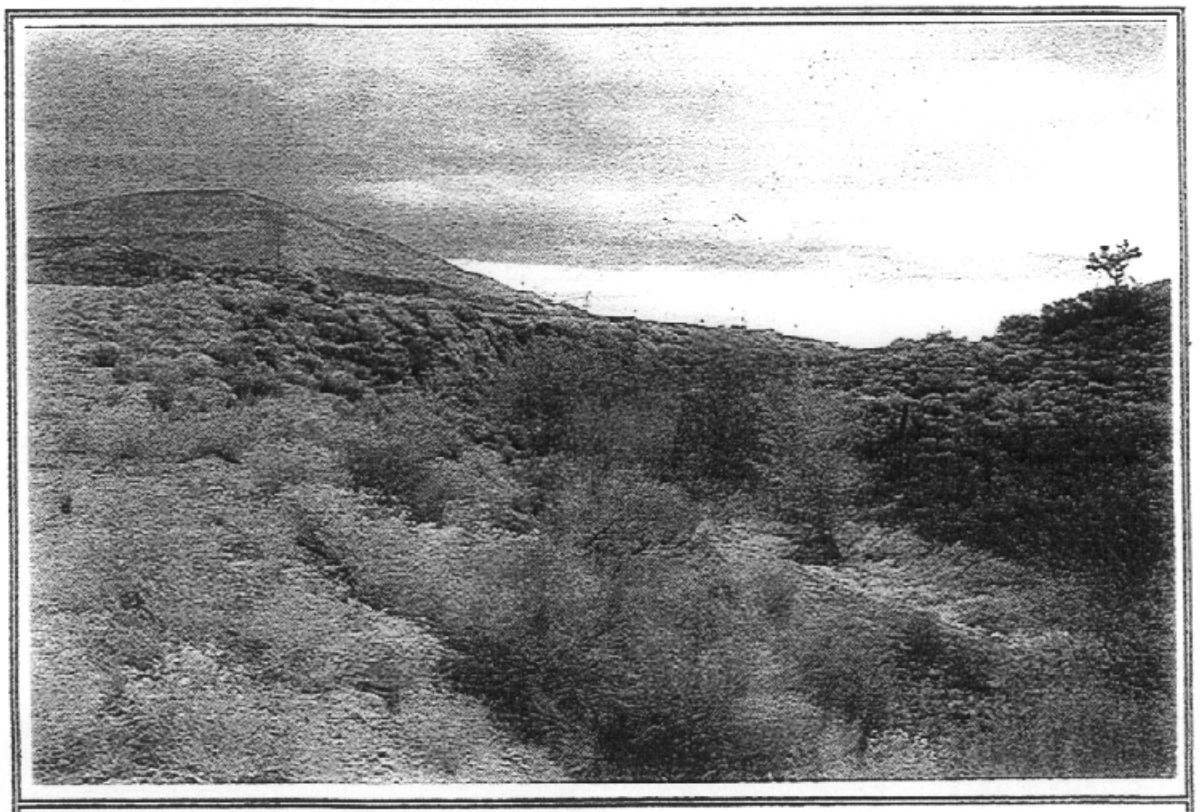


PHOTO 2: Riparian habitat on upper half

REFERENCES

Environmental Laboratory. 1987. "Corps of Engineers Wetland Delineation Manual," Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Hickman, J.C. Ed. 1993. The Jepson Manual. University of California Press. London, England. 150 pp.

Reed, P.B., Jr. 1988. National list of plant species that occur in wetlands: California (Region 0). U.S. Fish Wildlife Services Biological Rep. 88(26.10).

TABLE 1

PLANT INDICATOR STATUS CATEGORIES

INDICATOR CATEGORY	INDICATOR SYMBOL	DEFINITION
OBLIGATE WETLAND PLANTS	OBL	Plants that occur almost always (estimated probability >99%) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1%) in nonwetlands. Examples: *Spartina alterniflora, Taxodium distichum.*
FACULTATIVE WETLAND PLANTS	FACW	Plants that occur usually (estimated probability >67% to 99%) in wetlands, but also occur (estimated probability 1% to 33% in nonwetlands). Examples: *Fraxinus pennsylvanica, Cornus stolonifera.*
FACULTATIVE PLANTS	FAC	Plants with a similar likelihood (estimated probability 33% to 67%) of occurring both wetlands and nonwetlands. Examples: *Gleditsia triacanthos, Smilax rotundifolia.*
FACULTATIVE UPLAND PLANTS	FACU	Plants that occur sometimes (estimated probability 1% to <33%) in wetlands, but occur more often (estimated probability >67% to 99%) in nonwetlands. Examples: *Quercus rubra, Potentilla arguta.*
OBLIGATE UPLAND PLANTS	UPL	Plants that occur rarely (estimated probability <1%) in wetlands, but occur almost always (estimated probability >99%) in nonwetlands under natural conditions. Examples: *Pinus echinata, Bromus mollis.*

* Categories were originally developed and defined by the USFWS National Wetlands Inventory and subsequently modified by the National Plant List Panel. The three facultative categories are subdivided by (+) and (-) modifiers (see Appendix C, Section 1).

SPECIES LIST

Species	Indicator Status
ASTERACEAE	
Baccharis salicifolia	FACW-
Xanthium strumarium	FAC+
CYPERACEAE	
Caryx sp.	OBL
FABACEAE	
Lotus scoparius	---
JUNCACEAE	
Juncus sp	OBL
POACEAE	
Polypogon monspeliensis	FACW
SALICACEAE	
Salix sps.	FACW
SOLANACEAE	
Nicotiana glauca	---
TYPHACEAE	
Typha sp.	OBL

E. Archaeological Clearance Letter
Dated August 19, 2000

Re: Completion of Archaeological Data Recovery Excavation on the Antelope Valley Public Landfill Expansion Project as Stipulated by CUP No. 85512

BRIAN D. DILLON, PH.D.
CONSULTING ARCHAEOLOGIST
16007 LEMARSH STREET, NORTH HILLS, CA 91343
PHONE/FAX (818) 893-3468
E-MAIL: bddillon@earthlink.net

Mr. Hugh A. Walker
Waste Management Director
Antelope Valley Landfill
P.O. Box 4040
Palmdale, CA
93550

August 19, 2000

Mr. Don Culbertson
Los Angeles County Department of Regional Planning
320 West Temple Street, Room #1351
Los Angeles, CA
90012

Mr. Kerwin Chih
Los Angeles County Department of Regional Planning
320 West Temple Street, Room #1351
Los Angeles, CA
90012

RE: Archaeological Clearance Letter: Completion of Archaeological Data Recovery Excavations on the Antelope Valley Public Landfill Expansion Project as stipulated by CUP No. 85512.

Dear Sirs:

The present communication is a follow-up to my earlier letters of July 31, 2000, and of August 15, 2000 which noted the progress of our archaeological data recovery excavations at archaeological site CA-LAN-876 on the Antelope Valley Landfill property. On Friday, August 18th, 2000 (our 35th day of field research) we met and surpassed our initial goal of a 110 cubic meter sample scientifically excavated from the CA-LAN-876 archaeological site, resulting in a final total of 118.8 cubic meters (see enclosed tally sheets). To this may be added the much smaller amount removed for column sample analysis (.12 cubic meters from Unit 23 and .23 cubic meters from Unit 7) and the somewhat larger total removed during the scientific excavation of the ten surface features we removed at the site (.85 cubic meters) for a final, cumulative excavation sample of 120 cubic meters. As the archaeological site proved to be slightly larger than my minimal estimate suggested, extending farther to the west upslope under the fill layer that more or less camouflaged it, this slightly higher final total seems appropriate in light of our original goal of a 10% data recovery sample.

We excavated four 1 x 1 meter pits, twenty-nine 1 x 2 meter pits, and seven 2 x 2 meter pits, ranging in depth from 60 cm to 230 cm below present ground surface (see enclosed tally sheets). We discovered and excavated 17 features at the site, both in surface contexts and within the excavations themselves. In all but a single case, these proved to be fire pits used for cooking; one was associated with a probable deeply-buried house floor. The artifact and ecofact yield was quite varied, although typical of Antelope Valley archaeological sites, the yield per cubic meter excavated was generally low. No human remains of any kind were encountered during the course of our research, which suggests most strongly that the CA-LAN-876 site was used as a temporary camp, and that the prehistoric peoples who used it were buried somewhere else, off-site. We backfilled all 40 of our excavation units so as to eliminate any possibility of danger that open pits left unattended might present (see enclosed unit checklist sheet).

I will now proceed to the laboratory analysis of the archaeological collections recovered, which will result in the final report as required by the CUP. Following this analysis, I will deliver the artifact collections to the Antelope Valley College, as also stipulated by the CUP. Completion of these tasks will satisfy all Data Recovery requirements of the CUP and those of the project overall as regards archaeology, save that of the archaeological monitoring of the pre-construction grading of the archaeological site areas.

In my professional opinion, I believe that we have satisfied both the spirit and the letter of the archaeological requirements of the conditional use permit as regards the data recovery excavation program, and that there is no archaeological reason why the Antelope Valley Landfill Expansion Project may not now proceed on to its next phase.

Many thanks for your continued interest in our project,

Sincerely,

Encl: Volumetric Tally for 8/18/2000
Master Unit Checklist, Version 10
Cc: Ms. Jayna Morgan, EDAW
Mr. Harold Williams, Kawaiisu Tribal Elder

CA-LAN-876 *THE "I TA BUZZ" SITE*

RUNNING VOLUMETRIC TALLY

For 8/18/2000: Day 35, FINAL DAY

UNIT	LEVELS EXCAVATED																					CUBIC METERS DAILY/TOTAL	
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		.60
2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.00
3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		.80
4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		.80
5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.00
6	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.80
6S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	2.00	3.40
7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22/23	4.60
7N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22/23	4.60
8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.40
9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.00
11	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.60
12S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.60
13	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
14	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
15	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.60
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.20
17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.80
17S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.80
18	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.40
19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.60
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.20
21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.60
22	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.20
23	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.40
23S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	1.20	2.40
24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.00
25	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.60
26	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.60
27	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.80
28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.80
29	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		1.40
30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.60
Page 1 Total Cubic Meters Excavated																						5.60	

CA-LAN-876 *THE "I TA BUZZ" SITE*

RUNNING VOLUMETRIC TALLY

For 8/18/2000: Day 35, FINAL DAY

UNIT	LEVELS EXCAVATED																					CUBIC METERS DAILY/TOTAL	
31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.60
32	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.40
32S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	2.60	3.20
33	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.00
34	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.40
35	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.60
36	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.60
37	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
38	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
38N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	1.40	3.00
39	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		3.20
40	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		2.40
Page 2 Total Cubic Meters Excavated																						4.00	
Day's Total Cubic Meters Excavated																						9.60	
Project Total Cubic Meters Excavated																							118.8

CA-LAN-876: MASTER UNIT CHECKLIST

UNIT	PROFILES	PHOTOS	VIDEO	SITE MAP	BACKFILLED
1	8/24/1999	8/29/1999	8/29/1999	8/19/2000	8/16/2000
2	8/29/1999	8/29/1999	8/29/1999	8/19/2000	8/17/2000
3	8/29/1999	8/29/1999	8/29/1999	8/19/2000	8/15/2000
4	8/29/1999	8/29/1999	8/29/1999	8/19/2000	8/18/2000
5	8/13/2000	8/13/2000	8/13/2000	8/19/2000	8/17/2000
6	7/27/2000	8/13/2000	8/13/2000	8/19/2000	8/19/2000
7	8/12/2000	8/12/2000	8/12/2000	8/19/2000	8/19/2000
8	8/15/2000	8/14/2000	8/14/2000	8/19/2000	8/17/2000
9	8/16/2000	8/14/2000	8/14/2000	8/19/2000	8/19/2000
10	8/15/2000	8/14/2000	8/14/2000	8/19/2000	8/17/2000
11	8/16/2000	8/14/2000	8/14/2000	8/19/2000	8/19/2000
12	7/25/2000	8/12/2000	8/12/2000	8/19/2000	8/19/2000
13	7/25/2000	8/15/2000	8/15/2000	8/19/2000	8/18/2000
14	7/25/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
15	8/17/2000	8/15/2000	8/15/2000	8/19/2000	8/18/2000
16	8/17/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
17	8/11/2000	8/12/2000	8/12/2000	8/19/2000	8/19/2000
18	8/18/2000	8/15/2000	8/15/2000	8/19/2000	8/18/2000
19	8/13/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
20	8/12/2000	8/13/2000	8/13/2000	8/19/2000	8/16/2000
21	8/12/2000	8/14/2000	8/14/2000	8/19/2000	8/16/2000
22	8/17/2000	8/15/2000	8/15/2000	8/19/2000	8/18/2000
23	7/27/2000	8/14/2000	8/14/2000	8/19/2000	8/19/2000
24	8/15/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
25	8/15/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
26	8/15/2000	8/15/2000	8/15/2000	8/19/2000	8/17/2000
27	8/15/2000	8/15/2000	8/15/2000	8/19/2000	8/16/2000
28	8/13/2000	8/15/2000	8/15/2000	8/19/2000	8/16/2000
29	8/10/2000	8/13/2000	8/13/2000	8/19/2000	8/16/2000
30	8/13/2000	8/16/2000	8/16/2000	8/19/2000	8/17/2000
31	8/18/2000	8/16/2000	8/16/2000	8/19/2000	8/18/2000
32	8/11/2000	8/12/2000	8/12/2000	8/19/2000	8/19/2000
33	8/17/2000	8/16/2000	8/16/2000	8/19/2000	8/18/2000
34	8/17/2000	8/16/2000	8/16/2000	8/19/2000	8/18/2000
35	8/17/2000	8/16/2000	8/16/2000	8/19/2000	8/18/2000
36	8/11/2000	8/16/2000	8/16/2000	8/19/2000	8/17/2000
37	8/17/2000	8/17/2000	8/17/2000	8/19/2000	8/18/2000
38	8/11/2000	8/12/2000	8/12/2000	8/19/2000	8/19/2000
39	8/13/2000	8/13/2000	8/13/2000	8/19/2000	8/15/2000
40	8/18/2000	8/18/2000	8/18/2000	8/19/2000	8/18/2000
No. Wall	8/15/2000				

Version 10, 8/19/2000

F. Los Angeles County, Department of Regional Planning Correspondence Dated August 31, 2000

Re: CUP 85512 (Antelope Valley Landfill Expansion Project)

Los Angeles County
Department of Regional Planning
Director of Planning James E. Hartl, AICP

August 31, 2000

Brian D. Dillon, Ph.D
Consulting Archaeologist
16007 Lemarsh Street
North Hills, CA 91343

SUBJECT: CUP 85512 (Antelope Valley Landfill Expansion Project)

Dear Dr. Dillon:

Thank you for your letter dated August 19, 2000 in which you informed us your completion of data recovery excavation effort for CA-LAN-876 site. You also indicated that you are in the process of conducting laboratory analysis of the archaeological collections in order for you to prepare a final report for our record.

Upon receipt of the said report we will be happy to officially acknowledge the project compliance with conditions set forth in the Condition Use Permit regarding archaeological resources protection.

If you have any questions regarding this communication, please contact me at (213) 974-6461, between 7:00 a.m. to 6:00 p.m., Monday through Thursday. Our offices are closed on Fridays.

Very truly yours,

DEPARTMENT OF REGIONAL PLANNING

James E. Hartl, AICP
Director of Planning

Kerwin Chin, Section Head
Impact Analysis

KCC:hcc

c. Hugh Walker
Don Culbertson

Memo

320 West Temple Street • Los Angeles, CA 90012 • 213 974-6411 Fax: 213 626-0434 • TDD: 213 617-2292

G. Brian Dillon's Correspondence to the County of Los Angeles

Re: Submittal of the Executive Summary,
April 20, 2003

BRIAN D. DILLON, Ph.D.
CONSULTING ARCHAEOLOGIST
16007 LEMARSH STREET, NORTH HILLS, CA 91343
PHONE/FAX (818) 893-3468
E-MAIL: bddillon@earthlink.net

Mr. James E. Hartl, AICP
Director of Planning
Los Angeles County Department of Regional Planning
320 West Temple Street, Room #1351
Los Angeles, CA
90012

April 20, 2003

RE: Submittal of Executive Summary on Archaeological Compliance Work for CUP No. 85512, Antelope Valley Public Landfill Expansion Project

Dear Mr. Hartl:

In compliance with Conditional Use Permit 85512 (conditions 36 and 15), prepared by Mr. Richard Frazier of your office, in my capacity as project archaeologist for the Antelope Valley Public Landfill Expansion Project, and as a follow-up to previous correspondence with your office, I hereby submit an Executive Summary of the scientific research which was completed on this project so as to satisfy the archaeological provisions of the CUP. Full documentation of my work runs to several volumes and is too lengthy for inclusion in your files; the present document summarizes this fieldwork, its results, and the scientific and humanistic interpretation of such research in abbreviated form. It also denotes compliance with the archaeological requirements of the CUP.

My work was done at the invitation of Mr. Michael Williams, Waste Management Director for the Antelope Valley Public Landfill, of Waste Management Corporation, and in consultation with Ms. Jayna Morgan, of EDAW, Inc., who has been associated with this project since its inception. The research was also done in consultation with Mr. Harold Williams, Kawaiisu Indian elder, who served as Native American advisor to the project. Professor Roger Robinson, of Antelope Valley College, served as an independent archaeological advisor to the project. Compliance with the final requirement of the CUP, delivery of the collections generated by our research to a recognized institution specializing in the curation of archaeological collections, has been arranged through the kind efforts of Dr. Robert Yohe at the CSU Bakersfield Museum.

I also attached a copy of the letter from your office, dated 8/31/2000, noting that such compliance will be officially acknowledged by the Los Angeles County Department of Regional Planning regarding the archaeological resources protection requirements of the CUP. I would greatly appreciate it if such acknowledgement could be sent me at your convenience.

Many thanks for your consideration,

Sincerely,

cc: Mr. Michael Williams, Waste Management Corporation
Ms. Jayna Morgan, EDAW
Mr. Harold Williams, Kawaiisu Tribal Elder
Professor Roger Robinson, Antelope Valley College
Dr. Robert Yohe, California State University, Bakersfield

H. Los Angeles County, Department of Regional Planning Correspondence Dated November 18, 2003

Re: CUP 85512 (Project's Compliance with Mitigation Measures in the Adopted MMP)

Los Angeles County
Department of Regional Planning

Planning for the Challenges Ahead

James E. Hartl, AICP
Director of Planning

November 18, 2003

Brian Dillon, Ph.D.
Consulting Archaeologist
160007 Lemarsh Street
North Hills, CA 91343

SUBJECT: CONDITIONAL USE PERMIT NO. 85-512

Dear Dr. Dillon:

The Department of Regional Planning received the "Executive Summary: Archaeological Data Recovery, Antelope Valley Public Landfill Expansion Project" dated April 20, 2003 in which you summarize the cultural resources research undertaken for the above-mentioned project.

It is determined that the project is in substantial compliance with the mitigation measures stated in the adopted Mitigation Monitoring Program under "Archaeology" for Conditional Use Permit No. 85-512. All archaeological mitigation measures required to be implemented prior to issuance of the Solid Waste Facilities Permit by the Department of Regional Planning are verified.

If you have any questions, please contact me at (213) 974-6461, Monday to Thursday between 7:30 a.m. and 6 p.m. Our offices are closed on Fridays.

Very truly yours,

DEPARTMENT OF REGIONAL PLANNING
James E. Hartl, AICP
Director of Planning

Daryl Koutnik

Daryl Koutnik, Supervising Regional Planner
Impact Analysis Section

JEH:DLK:hcc

Cc: Jayna Morgan, EDAW

I. March 28, 2000 Correspondence

Re: Retention of Paleo Environmental Associates, Inc., by Waste Management, Inc., to Conduct Paleontological Monitoring Program at Antelope Valley Public Landfill Site No. 2

PALEO ENVIRONMENTAL ASSOCIATES

Paleontologic Resource Management

2248 Winrock Ave.
Altadena, CA 91001
(626) 797-9895 tel., fax

1731 New Hampshire Dr.
Costa Mesa, CA 92626
(714) 241-8880

TO: Mr. Kerwin Chih
County of Los Angeles
Department of Regional Planning
320 West Temple Street
Los Angeles, CA 90012-3225

FROM: E. Bruce Lander, Ph.D.
Paleo Environmental Associates, Inc.
2248 Winrock Avenue
Altadena, CA 91001

DATE: March 28, 2000

SUBJECT: Retention of Paleo Environmental Associates, Inc., by Waste Management, Inc., to conduct paleontologic monitoring program at Antelope Valley Public Landfill Site No. 2

This memorandum will acknowledge the retention by Waste Management, Inc., of Paleo Environmental Associates, Inc., to conduct a paleontologic monitoring program at the Antelope Valley Public Landfill Site No. 2 near Palmdale in Los Angeles County, California. The program will be conducted to ensure compliance by the landfill operation with Condition 36 of Conditional Use Permit 85512 - (5), and with Part V of the attachment to the CUP.

Cc: Hugh Walker, Waste Management, Inc.
Jayna Morgan, EDAW, Inc.
Brian Dillon, archaeologist

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palmdale landfill-plan.doc

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MAR 3 0 2000

EDAW, INC., IRVINE, CA

Appendix A-2

NOP Comment Letters

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

Main Office

818 West Seventh Street

12th Floor

Los Angeles, California

90017-3435

t (213) 236-1800

f (213) 236-1825

www.scag.ca.gov

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Riverside County: Marion Ashley, Riverside County • Thomas Buckley, Lake Elsinore • Bonnie Flickinger, Moreno Valley • Ron Loveridge, Riverside • Greg Pettis, Cathedral City • Ron Roberts, Temecula

San Bernardino County: Paul Biane, San Bernardino County • Bill Alexander, Rancho Cucamonga • Edward Burgnon, Town of Apple Valley • Lawrence Dale, Barstow • Lee Ann Garcia, Grand Terrace • Susan Longville, San Bernardino • Gary Ovitt, Ontario • Deborah Robertson, Rialto

Ventura County: Judy Mikels, Ventura County • Glen Becerra, Simi Valley • Carl Morehouse, San Buenaventura • Toni Young, Port Hueneme

Orange County Transportation Authority: Charles Smith, Orange County

Riverside County Transportation Commission: Robin Lowe, Hemet

Ventura County Transportation Commission: Bill Davis, Simi Valley

Printed on Recycled Paper 550-3/9/04

March 24, 2004

City of Palmdale Planning Department
Attention: Richard Kite, Associate Planner
38250 Sierra Highway
Palmdale, CA 93550

RE: SCAG Clearinghouse No. I 20040125 Proposed Expansion to the Antelope Valley Landfills I and II

Dear Mr. Kite:

Thank you for submitting the **Proposed Expansion to the Antelope Valley Landfills I and II** for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

We have reviewed the **Proposed Expansion to the Antelope Valley Landfills I and II**, and have determined that the proposed Project is not regionally significant per SCAG Intergovernmental Review (IGR) Criteria and California Environmental Quality Act (CEQA) Guidelines (Section 15206). Therefore, the proposed Project does not warrant comments at this time. Should there be a change in the scope of the proposed Project, we would appreciate the opportunity to review and comment at that time.

A description of the proposed Project was published in SCAG's **March 1-15, 2004** Intergovernmental Review Clearinghouse Report for public review and comment.

The project title and SCAG Clearinghouse number should be used in all correspondence with SCAG concerning this Project. Correspondence should be sent to the attention of the Clearinghouse Coordinator. If you have any questions, please contact me at (213) 236-1867. Thank you.

Sincerely,

Lauren Jones for

JEFFREY M. SMITH, AICP
Senior Regional Planner
Intergovernmental Review

RECEIVED
MAR 2 6 2004
PLANNING DEPT.

Notice of Scoping Meeting

The City of Palmdale is preparing a Supplemental Environmental Impact Report (SEIR) for the project identified below. We need to know the concerns of public agencies or other interested parties as to the scope and content of the environmental document to be prepared in connection with the proposed project.

Project Title: Antelope Valley Public Landfill Expansion

Project Applicant: Waste Management

Waste Management is proposing to expand the existing Antelope Valley Landfills I and II including modifications to the existing County-approved Conditional Use Permit (CUP). The project site is generally located south of the alignment of Avenue R on the north, east of the alignment of 20th Street West on the west, north of Anaverde Creek on the south and west of the alignment of Tierra Subida Avenue on the east. Proposed modifications include expanding the aggregate 114-acre refuse footprint by approximately 11 acres to combine the two landfills into one disposal area and adding 14 million cubic yards of capacity; increasing the facility boundary from 180 to 185 acres to accommodate additional ancillary facilities; and updating the legal boundary of the combined facility.

The City has initially determined that the SEIR should address the following topical areas: earth resources, air quality, hydrology and water quality, biological resources, aesthetics/light and glare, traffic and circulation, risk of upset, noise, and human health. Specific alternatives to be evaluated in this EIR have yet to be determined.

A scoping meeting will be held on March 29, 2004, at 1:30 pm in the City of Palmdale Development Services Conference Room, 38250 Sierra Highway, Palmdale, CA, to identify and discuss potential significant environmental issues associated with the project and discuss reasonable alternatives and mitigation measures for the project.

Copies of the application, maps, plans, Initial Study, and other pertinent materials related to this application are available for public review at the Planning Department (38250 Sierra Highway), and environmental documents at the Public Library (700 East Palmdale Boulevard, Palmdale, CA 93550).

Laurie Lile
DIRECTOR OF PLANNING
Legal Ad #04-20

Notice of Preparation Distribution List for Antelope Valley Public Landfill Expansion

Applicant

Waste Management
EDAW

City of Palmdale:

Case Planner
City Engineer
City Hall Counter Copy
Director of Parks and Recreation
Director of Public Works
Library
Planning Counter Copy
Traffic Engineer

State Agencies:

Air Resources Board
California Department of Fish and Game
Caltrans
Department of Health Services
Department of Water Resources
Native American Heritage Commission
Regional Water Quality Control Board, Lahontan Region
Waste Management Board

County of Los Angeles:

Los Angeles County Dept. of Public Works
Los Angeles County Fire Dept. (3 copies)
Los Angeles County Health Department
Los Angeles County Regional Planning
Los Angeles County Sanitation Districts
Los Angeles County Sheriff's Dept.
Los Angeles County Water Works Districts

School Districts:

Antelope Valley Union High School District
Palmdale School District
Westside Union School District

Federal Agencies:

Department of the Air Force (Plant 42)
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Forest Service

Utilities/Services:

Antelope Valley - East Kern (AVEK) Water Agency
Antelope Valley United Water Purveyors, Inc.
SBC
Palmdale Water District
Southern California Edison
Southern California Gas

Other:

Antelope Valley Air Pollution Control District
Antelope Valley Archaeological Society
City of Lancaster
City of Santa Clarita
South Central Coastal Information Center
Southern California Association of Governments
West Antelope Valley Historical Society

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a place to call home

JAMES C. LEDFORD, JR.
Mayor

JAMES A. "JIM" ROOT
Mayor Pro Tem

MIKE DISPENZA
Councilmember

STEVEN D. HOFBAUER
Councilmember

RICHARD J. LOA
Councilmember

38300 Sierra Highway

Palmdale, CA 93550-4798

Tel: 661/267-5100

Fax: 661/267-5122

TDD: 661/267-5167

February 26, 2004

Los Angeles County Clerk
Environmental Filings
12400 Imperial Hwy, Rm 2001
Norwalk, CA 90650

Re: Notice of Preparation of a Draft Environmental Impact Report for Antelope Valley Public Landfill Expansion

Dear Ms. Morla:

Please post the enclosed Notice of Preparation for 30 day review, and return verification to:

Lynn O'Brien
City of Palmdale/Planning Department
38250 Sierra Highway
Palmdale, CA 93550

Sincerely,

Lynn O'Brien
Administrative Secretary

Enclosures

Auxiliary aids provided for communication accessibility upon 72 hours' notice and request.

Notice of Preparation of a Draft Environmental Impact Report

The City of Palmdale will be the Lead Agency and will prepare a Supplemental Environmental Impact Report (SEIR) (SCH # 90010988) for the project identified below. We need to know the concerns of public agencies or other interested parties as to the scope and content of the environmental document to be prepared in connection with the proposed project.

Project Title: Antelope Valley Public Landfill Expansion

Project Applicant: Waste Management

The City of Palmdale will be the Lead Agency for the proposed project to expand the existing Antelope Valley Landfills I and II including modifications to the existing County-approved Conditional Use Permit (CUP). The project site is generally located south of the alignment of Avenue R on the north, east of the alignment of 20th Street West on the west, north of Anaverde Creek on the south and west of the alignment of 10th Street West on the east. Proposed modifications include expanding the aggregate 114-acre refuse footprint by approximately 11 acres to combine the two landfills into one disposal area and adding 14 million cubic yards of capacity; increasing the facility boundary from 180 to 185 acres to accommodate additional ancillary facilities; and updating the legal boundary of the combined facility.

The City has initially determined that the SEIR should address the following topical areas: earth resources, air quality, hydrology and water quality, biological resources, aesthetics/light and glare, traffic and circulation, risk of upset, noise, and human health. Specific alternatives to be evaluated in the EIR have yet to be determined.

Due to the time limits mandated by State law, your response to the Notice of Preparation must be sent at the earliest possible date but not later than March 31, 2004. Please send your response to Richard Kite, Associate Planner, 38250 Sierra Highway, Palmdale, CA 93550. We will need the name of a contact person and phone number of the agency or interested party. Copies of the application, maps, plans, Initial Study, and other pertinent materials related to these applications are available for public review at the Planning Department (38250 Sierra Highway), and environmental documents at the Public Library (700 East Palmdale Boulevard, Palmdale, CA 93550).

Laurie Lile
DIRECTOR OF PLANNING
Legal Ad #04-17

STATE OF CALIFORNIA

Governor's Office of Planning and Research

State Clearinghouse and Planning Unit

Arnold Schwarzenegger
Governor

Jan Boel
Acting Deputy Director

Notice of Preparation

March 2, 2004

To: Reviewing Agencies

Re: Antelope Valley Public Landfill Expansion
SCH# 1990010988

Attached for your review and comment is the Notice of Preparation (NOP) for the Antelope Valley Public Landfill Expansion draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

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Please direct your comments to:

Richard Kite
City of Palmdale
38250 Sierra Highway
Palmdale, CA 93550

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Terry Roberts
for Scott Morgan
Senior Planner, State Clearinghouse

Attachments
cc: Lead Agency

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
(916)445-0613 FAX(916)323-3018 www.opr.ca.gov

Document Details Report
State Clearinghouse Data Base

SCH# 1990010988
Project Title Antelope Valley Public Landfill Expansion
Lead Agency Palmdale, City of

Type NOP Notice of Preparation

Description The applicant is applying for certain modifications to the aformentioned CUP issued by Los Angeles County. The primary modifications sought are: 1) to enlarge the approved 114-acre refuse footprint by approximately 11 acres in order to reconfigure the two landfills into one contiguous disposal area and increase landfill capacity by approximately 14 million cubic yards; 2) udpate the overall area of the facility to 185 acres (adding 5 acres of ancillary facilities and other landfill property to the existing 180-acre area; 3) modify other certain physical and operational aspects of the landfill; and 4) obtain a single Conditional Use Permit entitlement by the City of Palmdale for the entire facility.

Lead Agency Contact

Name Richard Kite
Agency City of Palmdale
Phone 661 267-5200 **Fax**
email
Address 38250 Sierra Highway
City Palmdale **State** CA **Zip** 93550

Project Location

County Los Angeles
City Palmdale
Region
Cross Streets Tierra subida/City Ranch Road
Parcel No. 3004 013-009,010, 011
Township 6N **Range** 12W **Section** 33 **Base** SBBM

Proximity to:

Highways SR-14
Airports
Railways
Waterways Anaverde Creek/California Aqueduct
Schools Palmdale School District; Various
Land Use Solid Waste Facilities Permit (SWFP) No. 19-AA-0009.
PF-Landfill (Public Facility Landfill) and is zoned PF (Public Facility)

Project Issues Aesthetic/Visual; Air Quality; Archaeologic-Historic; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Noise; Public Services; Soil Erosion/Compaction/Grading; Solid Waste; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wildlife; Landuse; Cumulative Effects

Reviewing Agencies Resources Agency; Office of Historic Preservation; Department of Parks and Recreation; Department of Water Resources; Department of Fish and Game, Region 5; Department of Health Services; Native American Heritage Commission; California Highway Patrol; Caltrans, District 7; Integrated Waste Management Board; Regional Water Quality Control Bd., Region 6 (So Lake Tahoe)

Date Received 03/01/2004 **Start of Review** 03/01/2004 **End of Review** 03/30/2004

Note: Blanks in data fields result from insufficient information provided by lead agency.

NOP Distribution List

County: Los Angeles SCH# 1990010988

Resources Agency

- [x] **Resources Agency** Nadell Gayou
- [ ] **Dept. of Boating & Waterways** Suzi Betzler
- [ ] **California Coastal Commission** Elizabeth A. Fuchs
- [ ] **Colorado River Board** Gerald R. Zimmerman
- [ ] **Dept. of Conservation** Roseanne Taylor
- [ ] **California Energy Commission** Environmental Office
- [ ] **Dept. of Forestry & Fire Protection** Allen Robertson
- [x] **Office of Historic Preservation** Hans Kreutzberg
- [x] **Dept of Parks & Recreation** B. Noah Tilghman, Environmental Stewardship Section
- [ ] **Reclamation Board** Lori Buford
- [ ] **Santa Monica Mountains Conservancy** Paul Edelman
- [ ] **S.F. Bay Conservation & Dev't. Comm.** Steve McAdam
- [x] **Dept. of Water Resources** Resources Agency, Nadell Gayou

Fish and Game

- [ ] **Dept. of Fish & Game** Scott Flint, Environmental Services Division
- [ ] **Dept. of Fish & Game 1** Donald Koch, Region 1
- [ ] **Dept. of Fish & Game 2** Banky Curtis, Region 2
- [ ] **Dept. of Fish & Game 3** Robert Floerke, Region 3
- [ ] **Dept. of Fish & Game 4** William Laudermilk, Region 4
- [x] **Dept. of Fish & Game 5** Don Chadwick, Region 5, Habitat Conservation Program
- [ ] **Dept. of Fish & Game 6** Gabrina Gatchel, Region 6, Habitat Conservation Program
- [ ] **Dept. of Fish & Game 6 I/M** Tammy Allen, Region 6, Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Game M** George Isaac, Marine Region

Other Departments

- [ ] **Food & Agriculture** Steve Shaffer, Dept. of Food and Agriculture
- [ ] **Dept. of General Services** Robert Sleppy, Environmental Services Section
- [x] **Dept. of Health Services** Wayne Hubbard, Dept. of Health/Drinking Water

Independent Commissions,Boards

- [ ] **Delta Protection Commission** Debby Eddy
- [ ] **Office of Emergency Services** John Rowden, Manager
- [ ] **Governor's Office of Planning & Research** State Clearinghouse

_____

- [x] **Native American Heritage Comm.** Debbie Treadway
- [ ] **Public Utilities Commission** Ken Lewis
- [ ] **State Lands Commission** Jean Sarino
- [ ] **Tahoe Regional Planning Agency (TRPA)** Cherry Jacques

Business, Trans & Housing

- [ ] **Caltrans - Division of Aeronautics** Sandy Hesnard
- [ ] **Caltrans - Planning** Ron Helgeson
- [x] **California Highway Patrol** John Olejnik, Office of Special Projects
- [ ] **Housing & Community Development** Cathy Creswell, Housing Policy Division

Dept. of Transportation

- [ ] **Dept. of Transportation 1** Mike Eagan, District 1
- [ ] **Dept. of Transportation 2** Don Anderson, District 2
- [ ] **Dept. of Transportation 3** Jeff Pulverman, District 3
- [ ] **Dept. of Transportation 4** Tim Sable, District 4
- [ ] **Dept. of Transportation 5** David Murray, District 5
- [ ] **Dept. of Transportation 6** Marc Birnbaum, District 6
- [x] **Dept. of Transportation 7** Stephen J. Buswell, District 7
- [ ] **Dept. of Transportation 8** Linda Grimes, District 8
- [ ] **Dept. of Transportation 9** Gayle Rosander, District 9
- [ ] **Dept. of Transportation 10** Tom Dumas, District 10
- [ ] **Dept. of Transportation 11** Bill Figge, District 11
- [ ] **Dept. of Transportation 12** Bob Joseph, District 12

Cal EPA

Air Resources Board

- [ ] Airport Projects, Jim Lemer
- [ ] Transportation Projects, Kurt Karperos
- [ ] Industrial Projects, Mike Tollstrup

- [x] **California Integrated Waste Management Board** Sue O'Leary
- [ ] **State Water Resources Control Board** Jim Hockenberry, Division of Financial Assistance
- [ ] **State Water Resources Control Board** Student Intern, 401 Water Quality Certification Unit, Division of Water Quality
- [ ] **State Water Resouces Control Board** Steven Herrera, Division of Water Rights
- [ ] **Dept. of Toxic Substances Control** CEQA Tracking Center

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1** Cathleen Hudson, North Coast Region (1)
- [ ] **RWQCB 2** Environmental Document Coordinator, San Francisco Bay Region (2)
- [ ] **RWQCB 3** Central Coast Region (3)
- [ ] **RWQCB 4** Jonathan Bishop, Los Angeles Region (4)
- [ ] **RWQCB 5S** Central Valley Region (5)
  - [ ] **RWQCB 5F** Central Valley Region (5), Fresno Branch Office
  - [ ] **RWQCB 5R** Central Valley Region (5), Redding Branch Office
- [x] **RWQCB 6** Lahontan Region (6)
  - [ ] **RWQCB 6V** Lahontan Region (6), Victorville Branch Office
- [ ] **RWQCB 7** Colorado River Basin Region (7)
- [ ] **RWQCB 8** Santa Ana Region (8)
- [ ] **RWQCB 9** San Diego Region (9)

- [ ] **Other** _____

Last Updated on 01/12/04

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DECLARATION OF PUBLICATION

(2015.5 C.C.P.)

STATE OF CALIFORNIA } **s s**

County of Los Angeles

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **Antelope Valley Press**, a newspaper of general circulation, printed and published **daily** in the city of **Palmdale**, County of Los Angeles, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Los Angeles, State of California, under date of October 24, 1931, Case Number 328601; Modified Case Number 657770 April 11, 1956; also operating as the Ledger-Gazette, adjudicated a legal newspaper June 15, 1927, by Superior Court decree No. 224545; also operating as the Desert Mailer News, formerly known as the South Antelope Valley Foothill News, adjudicated a newspaper of general circulation by the Superior Court of the County of Los Angeles, State of California on June 15, 1967, Case Number NOC564 and adjudicated a newspaper of general circulation for the City of Lancaster, State of California on January 26, 1990; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

March 19, 2004

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Alison Adams

Signature

Dated: March 19, 2004
Executed at Palmdale, California

Notice of Scoping Meeting

The City of Palmdale is preparing a Supplemental Environmental Impact Report (SEIR) for the project identified below. We need to know the concerns of public agencies or other interested parties as to the scope and content of the environmental document to be prepared in connection with the proposed project.

Project Title:
Antelope Valley Public Landfill Expansion
Project Applicant:
Waste Management

Waste Management is proposing to expand the existing Antelope Valley Landfills I and II including modifications to the existing County-approved Conditional Use Permit (CUP). The project site is generally located south of the alignment of Avenue R on the north, east of the alignment of 20th Street West on the west, north of Anaverde Creek on the south and West of the alignment of Tierra Subida Avenue on the east. Proposed modifications include expanding the aggregate 114-acre refuse footprint by approximately 11 acres to combine the two landfills into one disposal area and adding 14 million cubic yards of capacity, increasing the facility boundary from 180 to 185 acres to accommodate additional ancillary facilities; and updating the legal boundary of the combined facility.

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Laurie Lile
DIRECTOR OF PLANNING
Legal Ad #04-20
Publish: 3/19/04

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CITY CLERK

DECLARATION OF PUBLICATION

(2015.5 C.C.P.)

STATE OF CALIFORNIA } **ss**

County of Los Angeles

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March 2, 2004

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Alison Adams

Signature

Dated: March 2, 2004

Notice of Preparation of a Draft Environmental Impact Report

The City of Palmdale will be the Lead Agency and will prepare a Supplemental Environmental Impact Report (SEIR) (SCH # 90010988) for the project identified below. We need to know the concerns of public agencies or other interested parties as to the scope and content of the environmental document to be prepared in connection with the proposed project.

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Laurie Lile
DIRECTOR OF PLANNING
Legal Ad #04-17
Publish: 3/2/04

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STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
120 S. SPRING STREET
LOS ANGELES, CA 90012
PHONE (213) 897-4429
FAX (213) 897-1337

Flex your power!
Be energy efficient!

March 24, 2004

IGR/CEQA cs/040309
NOP
City of Palmdale
Antelope Valley Public Landfill
Expansion: Tierra Subida
Avenue/City Ranch Rd.
Vic. LA-14-58.17
SCH# 1990010988

Mr. Richard Kite
City of Palmdale
38250 Sierra Highway
Palmdale, CA 93550

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Dear Mr. Kite:

Thank you for including the California Department of Transportation in the environmental review process for the above-mentioned project. Based on the information received, we have the following comments:

A traffic study will be needed to evaluate the project's overall impact on the State transportation system including the mainline SR14 (Antelope Valley Freeway) and all affected freeway on/off ramps. The traffic study should include, but not be limited to:

1) Assumptions used to develop trip generation/distribution percentages and assignments.

2) An analysis of ADT, AM and PM peak hour volumes for both the existing and future (year 2025) conditions. This should also include level-of-service calculations using the HCM 2000 methodology. The analysis should include the following:

- existing traffic volumes
- project and cumulative traffic volumes
- future traffic volumes projections for year 2025
- existing level-of-service (LOS) calculations
- project and cumulative level-of-service (LOS) calculations

3) Any mitigation measures proposed to alleviate traffic impact should include, but not be limited to the following:

- financing
- scheduling considerations
- implementation responsibilities
- monitoring plan

4) The Equitable Share responsibility for traffic mitigation measures will need to be calculated as determined by the percentage increase in projected peak period trips resulting in operational impacts to the SR-14 freeway mainline facility and on/off-ramps. The City should refer to Appendix "B" Methodology for Calculating Equitable Mitigation Measures found in our Caltrans Guide for the Preparation of Traffic Impact Studies. The Guide can be found on the internet at:

http://www.dot.ca.gov/hq/traffops/developserv/operationalsystems/reports/tisguide.pdf

We would appreciate advance copies of the DEIR and traffic study to facilitate internal Departmental review. Copies should be sent to the undersigned :

Cheryl J. Powell, IGR/CEQA Program Manager
California Department of Transportation
District 7, Office of Regional Planning
120 South Spring Street
Los Angeles, CA 90012

If you have any questions regarding our comments, refer to our internal IGR/CEQA Record # cs/040309, and please do not hesitate to contact me at (213) 897-3747.

Sincerely,

Cheryl J Powell

CHERYL J. POWELL
IGR/CEQA Branch Chief

cc: Mr. Scott Morgan, State Clearinghouse

Antelope Valley Archaeological Society
Environmental Review Committee
Po Box 2139
Rosamond, CA 93560

March 26, 2004

Richard Kite
Associate Planner
City of Palmdale Planning Department
38250 Sierra Highway
Palmdale, CA 93550

RECEIVED
MAR 2 6 2004
PLANNING DEPT.

Dear Mr. Kite:

Thank you for the opportunity to review the initial study questionnaire for Conditional Use Permit # 98-12. the proposed expansion of the Antelope Valley Recycling and Disposal Facility. The Antelope Valley Archaeological Society is always pleased to participate in the City's environmental review process.

I have the following questions and concerns:

1. What is the status of site CA-LAN-875? How will the proposed expansion impact the site? This site is located on the western portion of the landfill property but is not mentioned in the initial study or accompanying documentation.

2. What work was done at site CA-LAN-1917 and what are Dr. Dillon's findings? The archaeological clearance letter dated April 19, 2000 only addresses site CA-LAN-876.

3. The level of effort for site CA-LAN-876 seems adequate but I am concerned that Dr. Dillon's conclusions and determination regarding the site were made prior to analyzing the data recovered from his excavation.

4. In spite of Dr. Dillon's concern about the size of his report as expressed in his letter to Los Angeles County Department of Regional Planning dated April 20, 2003, the project file is incomplete without a copy of the report.

5. Curation of the collection from these sites at CSU Bakersfield makes them somewhat less available to interested researchers than they would be at a local facility. CSUB charges a modest access fee to researchers the local facilities do not charge. I am well aware of the lack of space in existing local facilities. Perhaps the City should explore options with other interested parties to develop a local curation facility, as this will be a reoccurring concern with future development projects.

6. We are pleased to see the involvement of Kawaiisu tribal elder, Harold Williams and local archaeologist Roger Robinson in this project. There needs to be more Native American involvement in future excavation projects within the City's sphere of influence. We would also like to see greater cooperation between the outside contractors doing archaeology here and the local archaeologists who best know the resources.

7. I have heard mention of data recovery from a site at the landfill that was accidentally discovered during grading. Which site was this and how has that data been incorporated into the initial study?

8. The potential for other buried sites within the landfill property warrants continued monitoring as mentioned in mitigation measure # 46 of the previous EIR.

Given the concerns I have expressed here we feel that concern for archaeological resources should not be focused out of the present supplemental EIR but should remain a concern to be addressed.

Thank you for including the Antelope Valley archaeological Society in the City's environmental review process. If you have any questions regarding my comments or if I can be of any further assistance feel free to contact me at (661) 400-4397.

Mark Campbell
Environmental Review Committee Chair
Antelope Valley Archaeological Society

California Integrated Waste Management Board

Linda Moulton-Patterson, Chair
1001 I Street • Sacramento, California 95814 • (916) 341-6000
Mailing Address: P. O. Box 4025, Sacramento, CA 95812-4025
www.ciwmb.ca.gov

Terry Tamminen
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

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March 30, 2004

Mr. Richard Kite, Associate Planner
City of Palmdale Planning Department
38250 Sierra Highway
Palmdale, CA 93550

Subject: **SCH No. 1990010988** – Notice of Preparation of a Draft Supplemental Environmental Impact Report for the proposed expansion to the Antelope Valley Landfills I and II, Solid Waste Facilities Permits Nos. 19-AA-0009 and 19-AA-5624, City of Palmdale, Los Angeles County

Dear Mr. Kite:

Board staff of the California Integrated Waste Management Board (Board) has reviewed the document cited above. Following is a description of the proposed project based on Board staff's understanding of the project as described in the Notice of Preparation. If the proposed Project Description below varies substantially from the project as understood by the Lead Agency; Board staff requests that any significant differences be clarified and included in the Draft Supplemental Environmental Impact Report.

PROPOSED PROJECT DESCRIPTION

The proposed project by the City of Palmdale is to expand the existing Antelope Valley Landfill I and the permitted but not operational Antelope Valley Landfill II including modifications to the existing County Conditional Use Permit. The project site is located generally south of the alignment of Avenue R on the North, East of the alignment of 20th Street West on the West, North of Anaverde Creek on the South and West of the alignment of 10th Street West on the East. Proposed modifications include expanding the aggregate 114-acre refuse footprint by approximately 11-acres to combine the two landfills into one disposal area and adding 14 Million (MM) yd^3 of capacity; increasing the facility boundary from 180 acres to 185 acres to accommodate additional ancillary facilities; and updating the legal boundary of the combined facility. The project applicant is Waste Management, Inc.

The proposed project is located at 1200 West City Ranch Road in the City of Palmdale. The existing General Plan Land Use Designation is PF (Public Facility) and existing zoning is PF-PZ

(Public Facility - Pre-Zone) and PF-Landfill (Public Facility Landfill). Previous to a recent annexation by the City of Palmdale, Antelope Valley Landfill II was located in the county. Antelope Valley Landfill I is currently active and near capacity. Antelope Valley Landfill II is not presently operational and has never received any waste; it has been permitted to receive waste since 1997.

The landfills (I & II) are located near residential areas with a modest buffer between the landfills and the encroaching residential areas.

Current and Proposed Changes
Antelope Valley Landfill I & II

	Landfill I	Landfill II	Proposed Combined Landfill
Permitted Area	65 Acres	75 Acres	185 Acres
Permitted Disposal Area	57 Acres	54 Acres	125 Acres
Remaining Capacity	4.6 MM yd^3	8.2 MM yd^3	14 MM yd^3
Maximum Elevation	3205 ft MSL	3140 ft MSL	3200 ft MSL
Maximum Depth Below Ground Surface	None Specified	None Specified	None Specified
Estimated Closure Date	July 1999	2008	None Specified
Peak Daily Tonnage	1400	1800	3600
Peak Daily Vehicle	434	None Specified	None Specified
Landfill & Ancillary Operations	5:00 AM to 10:00 PM	5:00 AM to 10:00 PM	None Specified
Days of Operation	Monday thru Sunday	Monday thru Sunday	None Specified
Receipt of Waste	6:00 AM to 5:00 PM	6:00 AM to 5:00 PM	None Specified
Open to Public	8:00 AM to 4:45 PM	None Specified	None Specified

BOARD STAFF'S COMMENTS

To assist Board staff's analysis and evaluation of this project, and aid in the determination of the adequacy of the Supplemental Environmental Impact Report and related CEQA document(s), we request that the following comments and questions be addressed in the Draft Supplemental Environmental Impact Report under preparation by the Lead Agency prior to circulation of the document. Much of the information needed for a clear and detailed project description is normally included in a facility's Report of Facility Information (RFI) for a Solid Waste Facility. If an RFI has been developed that incorporates Antelope Valley's project description, that RFI may be incorporated or referenced in the Draft Supplemental Environmental Impact Report.

As required by 14 CCR §§ 15126.2, 15126.4 and 15126.6, Board staff requests that the Draft Supplemental Environmental Impact Report contain detailed considerations and discussions of the significant effects, mitigation measures and alternatives for the proposed project including the alternative of "no project." Analysis should be presented for cumulative impacts from known or anticipated future growth.

The Draft Supplemental Environmental Impact Report must detail all provisions in order to indicate the ability of the facility to meet State Minimum Standards for environmental protection (see 27 CCR §§ 20005, et. seq. and 14 CCR §§ 17000 et. seq.). The following Internet link accesses checklists developed by Board staff as a guide to Lead Agencies in the preparation of Environmental Impact Reports for disposal facilities: http://www.ciwmb.ca.gov/LEACentral/CEQA/disposal.htm

Final Elevations

Final elevation as described in the 1997 permit indicates that filled area shall not exceed 3140 feet above mean sea level. At final closure, the filled area will not exceed 3140 feet, including final cover. In the draft environmental document please make this clear that the peak elevation is not to exceed 3140 feet mean sea level, including final cover, if it is to be some other elevation please clarify. Board staff's understanding, as a result of an onsite visit on March 24, 2004, that the elevation issue for Antelope Valley Landfill I has not been resolved between the operator and the City of Palmdale as to visibility of the landfill contours from the City of Palmdale above the ridge line. If this issue is not resolved to the satisfaction of all parties prior to the circulation of the draft environmental document Board staff would like to see an analysis of both positions on the ridge/final elevation argument.

The Board staff maybe reluctant to recommend concurrence to the Board and the Board may be reluctant to concur on a Solid Waste Facilities Permit for this site until there is resolution to this issue.

Acceptable Waste

Indicate in the draft environmental document the types of waste to be accepted as well as those types of waste to be excluded. Discuss load checking/screening procedures. Describe procedures for handling Household Hazardous Waste that may come in self-haul and commercial loads that is not detected through load checking. Describe policies and procedures for handling Universal Waste and e-waste. Describe any "free dump" days when the peak permitted tonnage or vehicle count might be exceeded when the public might bring in items otherwise not normally acceptable, such as Household Hazardous Waste, tires or batteries, as an example.

Please describe in detail any other types of operations that may be expected to operate at the landfill site such as chipping and grinding, green waste, wood waste, construction and demolition material processing, MRF, etcetera.

Hours of Operation

Indicate any changes in hours of operation for receipt of waste, landfill operations and any other ancillary activities to take place within the landfill boundaries.

Alternative Daily Cover

Discuss and analyze for any alternative daily cover that is intended to be used. By the fact that there are multiple types of alternative daily cover approved for landfill use, does not give blanket approval for their use at all landfills. Some alternative daily covers may not be appropriate for use at Antelope Valley Landfill I & II.

Tonnage

The Board prefers that Solid Waste Facilities Permits have daily peaks or maximums. The Notice of Preparation has indicated that the daily tonnage for the combined landfill is to be 3600 tons per day. If this is intended to be an average daily tonnage Board staff recommends that this be re-analyzed and changed to a peak or maximum daily tonnage. If tonnage is to be more than 3600 tons per daily please present appropriate analysis and be advised that there should also be an adequate peak daily vehicle allowance to transport said tonnage.

Facilities

Describe buildings, scale areas, sorting area, areas for ancillary activities, soil stockpiling, traffic flow, ingress and egress routing, etcetera in detail. Include drawings to scale of the facility indicating where buildings are located and activities take place.

Describe provisions made in the design or operations of the facility to prevent project related impacts from litter, odor, dust, noise, glare, vectors, vehicle queuing, drainage, and health and safety.

Traffic/Transportation

In traffic and transportation analysis, please analyze for peak traffic count entering and leaving the landfill. Take into account commercial, self-hauls, employee, etcetera.

Map/Drawing

All maps and drawings should be to scale and current with sufficient detail that Board staff can identify and analyze the aspects of the proposed project

Permitted Area and Permitted Disposal Area

Present adequate explanation in the draft environmental document so the lay reader can understand the increasing of the facility boundary from 180 acres to 185 acres is undertaken when the combined permitted area is only 140 acres and the proposed project is to add an 11 acre

area sometimes referred to as the void between the two landfills plus an additional 5 acres for ancillary uses. Board staff finds the total acreage to be only 156 acres, based on the two existing permits of 65 acres and 75 acres plus the 11 acres for the void area and 5 acres for the ancillary activity area. Please reconcile the acreages from the existing Solid Waste Facilities Permits plus the 11 acre and 5 acre additions to the draft environmental document acreage of a proposed 185 acres.

ROLE OF THE BOARD

The Board must ensure that solid waste facilities meet required state standards for the protection of public health, safety and the environment. The Board implements this goal through programs such as: permit oversight for solid waste facilities, certification and evaluation of Local Enforcement Agencies (LEA), which administer specific provisions of the Integrated Waste Management Act of 1989. Review of environmental documents for proposed, new or expanded solid waste facilities for compliance with CEQA, enforcement of state standards for Solid Waste Facilities, corrective action programs for facilities out of compliance with state standards and research and development for special waste management issues.

California Environmental Quality Act Review

CEQA compliance is required for the establishment, expansion, or change in operation(s) of a Solid Waste Facility requiring the issuance or revision of a Solid Waste Facility Permit. Board staff's review of the Draft Supplemental Environmental Impact Report is to help decision-makers (1) identify potential impacts from proposed projects, (2) determine whether any such impacts are significant, and (3) ascertain whether significant impacts can be mitigated to a level of insignificance in compliance with the CEQA statute and guidelines. In order for Board staff to ascertain that the Draft Supplemental Environmental Impact Report is complete and adequate for our use in the Solid Waste Facility Permit permitting process, the proposed project should be described in sufficient detail and the potential environmental impacts must be identified clearly in the environmental assessment/Initial Study Section of the Draft Supplemental Environmental Impact Report. Mitigating measures to reduce potentially significant environmental impacts should be incorporated into the project, when feasible, in order to avoid potentially significant effects upon project implementation. When a potential significant environmental effect is identified and an argument is made as to why no mitigation is necessary, the discussion/analysis should be in sufficient detail that the reviewer/decision-maker can understand the Lead Agency's reasoning for their determination. In order to expedite document preparation and minimize redundancy - supporting documentation and/or studies would be helpful and should be incorporated by referenced in the Draft Supplemental Environmental Impact Report.

CONCLUSION

Board staff requests copies of any subsequent or revised environmental documents in addition to the Draft and Final Supplemental Environmental Impact Reports. Any subsequent or revised environmental documents should be circulated through the State

Clearinghouse as required in 14 CCR §15205(a) of the CEQA Guidelines. The Board requests being noticed of the date, time and location of any public hearings regarding the project proposal at least ten days in advance.

Board staff has no further comments on the project as proposed at this time. Thank you for the opportunity to comment on this project in the early planning stages. Permitting and Inspection staff are available for any planned scoping meetings, workshops or other public meetings. If you have any questions regarding these comments, please contact me at 916.341.6728 or e-mail me at rseamans@ciwmb.ca.gov.

Sincerely,

Raymond M. Seamans
Permitting and Inspection Branch
Environmental Review, Region 4
Permitting and Enforcement Division
California Integrated Waste Management Board

cc: William Marciniak
Willy Jenkins
Permitting and Inspection Branch, Region 4
Permitting and Enforcement Division
California Integrated Waste Management Board

Suzanne Hambleton, Supervisor
Permitting and Inspection Branch, Region 4
Permitting and Enforcement Division
California Integrated Waste Management Board

Pete Ota
County of Los Angeles
Department of Health Services
5050 Commerce Circle
Baldwin Park, CA 90716

State of California – The Resources Agency
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
4949 Viewridge Avenue
San Diego, CA 92123
(858) 467-4201

ARNOLD SCHWARZENEGGER, *Governor*

March 30, 2004

Mr. Richard Kite
City of Palmdale
38250 Sierra Highway
Palmdale, CA 93550

Notice of Preparation for an Environmental Impact Report for Antelope Valley Public Landfill Expansion SCH# 1990010988, Los Angeles County

Dear Mr. Kite:

The Department of Fish and Game (Department) appreciates this opportunity to comment on the above-referenced project, relative to impacts to biological resources. The proposed project involves a proposal to enlarge an approved 114 refuse footprint by approximately 11 acres, update the overall facility area to 185 acres (an increase of 5 acres) and obtain a CUP from the City of Palmdale for the entire facility which was is originally under a CUP issued by Los Angeles County. The proposed project is located in the City of Palmdale near Tierra subida and City Ranch Road. The proposed landfill area supports wetland and riparian habitats.

To enable Department staff to adequately review and comment on the proposed project we recommend the following information, where applicable, be included in the Draft Environmental Impact Report:

1. A complete, recent assessment of flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, and locally unique species and sensitive habitats.

   a. A thorough recent assessment of rare plants and rare natural communities, following the Department's Guidelines for Assessing Impacts to Rare Plants and Rare Natural Communities (Attachment 1).

   b. A complete, recent assessment of sensitive fish, wildlife, reptile, and amphibian species. Seasonal variations in use of the project area should also be addressed. Recent, focused, species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with the Department and U.S. Fish and Wildlife Service.

   c. Rare, threatened, and endangered species to be addressed should include all those which meet the California Environmental Quality Act (CEQA) definition (see CEQA Guidelines, Section 15380).

   d. The Department's California Natural Diversity Data Base in Sacramento should be

contacted at (916) 327-5960 to obtain current information on any previously reported sensitive species and habitats, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code. Also, any Significant Ecological Areas (SEAs) or Environmentally Sensitive Habitats (ESHs) or any areas that are considered sensitive by the local jurisdiction that are located in or adjacent to the project area must be addressed.

2. A thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts. This discussion should focus on maximizing avoidance, and minimizing impacts.

   a. CEQA Guidelines, Section 15125(a), direct that knowledge of the regional setting is critical to an assessment of environmental impacts and that special emphasis should be placed on resources that are rare or unique to the region.

   b. Project impacts should also be analyzed relative to their effects on off-site habitats and populations. Specifically, this should include nearby public lands, open space, adjacent natural habitats, and riparian ecosystems. Impacts to and maintenance of wildlife corridor/movement areas, including access to undisturbed habitat in adjacent areas, should be fully evaluated and provided. The analysis should also include a discussion of the potential for impacts resulting from such effects as increased vehicle traffic and outdoor artificial lighting.

   c. A cumulative effects analysis should be developed as described under CEQA Guidelines, Section 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

   d. Impacts to migratory wildlife affected by the project should be fully evaluated. This can include such elements as migratory butterfly roost sites and neo-tropical bird and waterfowl stop-over and staging sites. All migratory nongame native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) of 1918 (50 C.F.R. Section 10.13). Sections 3503, 3503.5 and 3513 of the California Fish and Game Code prohibit take of birds and their active nests, including raptors and other migratory nongame birds as listed under the MBTA.

   e. Impacts to all habitats from City or County required Fuel Modification Zones (FMZ). Areas slated as mitigation for loss of habitat shall not occur within the FMZ.

   f. Proposed project activities (including disturbances to vegetation) should take place outside of the breeding bird season (February 1- September 15) to avoid take (including disturbances which would cause abandonment of active nests containing eggs and/or young). If project activities cannot avoid the breeding bird season, nest surveys should be conducted and active nests should be avoided and provided with a minimum buffer as determined by a biological monitor (the Department recommends a minimum 500-foot buffer for all active raptor nests).

3. A range of alternatives should be analyzed to ensure that alternatives to the proposed project are fully considered and evaluated. A range of alternatives which avoid or otherwise minimize impacts to sensitive biological resources including wetlands/riparian habitats, alluvial scrub, coastal sage scrub, native woodlands, etc. should be included. Specific alternative locations should also be evaluated in areas with lower resource sensitivity where appropriate.

   a. Mitigation measures for project impacts to sensitive plants, animals, and habitats

should emphasize evaluation and selection of alternatives which avoid or otherwise minimize project impacts. Compensation for unavoidable impacts through acquisition and protection of high quality habitat elsewhere should be addressed.

b. The Department considers Rare Natural Communities as threatened habitats having both regional and local significance. Thus, these communities should be fully avoided and otherwise protected from project-related impacts (Attachment 2).

c. The Department generally does not support the use of relocation, salvage, and/or transplantation as mitigation for impacts to rare, threatened, or endangered species. Department studies have shown that these efforts are experimental in nature and largely unsuccessful.

4. A California Endangered Species Act (CESA) Permit must be obtained, if the project has the potential to result in "take" of species of plants or animals listed under CESA, either during construction or over the life of the project. CESA Permits are issued to conserve, protect, enhance, and restore State-listed threatened or endangered species and their habitats. Early consultation is encouraged, as significant modification to the proposed project and mitigation measures may be required in order to obtain a CESA Permit. Revisions to the Fish and Game Code, effective January 1998, require that the Department issue a separate CEQA document for the issuance of a CESA permit unless the project CEQA document addresses all project impacts to listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of a CESA permit. For these reasons, the following information is requested:

a. Biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA Permit.

b. A Department-approved Mitigation Agreement and Mitigation Plan are required for plants listed as rare under the Native Plant Protection Act.

5. The Department opposes the elimination of watercourses and/or their channelization or conversion to subsurface drains. All wetlands and watercourses, whether intermittent, ephemeral, or perennial, must be retained and provided with substantial setbacks which preserve the riparian and aquatic habitat values and maintain their value to on-site and off-site wildlife populations.

a. The Department requires a Streambed Alteration Agreement (SAA), pursuant to Section 1600 et seq. of the Fish and Game Code, with the applicant prior to any direct or indirect impact to a lake or stream bed, bank or channel or associated riparian resources. The Department's issuance of a SAA may be a project that is subject to CEQA. To facilitate our issuance of the Agreement when CEQA applies, the Department as a responsible agency under CEQA may consider the local jurisdiction's (lead agency) document for the project. To minimize additional requirements by the Department under CEQA the document should fully identify the potential impacts to the lake, stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for issuance of the Agreement. Early consultation is recommended, since modification of the proposed project may be required to avoid or reduce impacts to fish and wildlife resources.

The Department suggests a pre-project or early consultation planning meeting for all projects. To make an appointment, please call Scott Harris, Wildlife Biologist, at (626) 797-3170.

Thank you for this opportunity to provide comment.

Sincerely,

Scott Harris for

Morgan Wehtje
Environmental Scientist IV

Attachments

cc: Ms. Morgan Wehtje
Mr. Scott Harris
Ms. Betty Courtney
HCP-Chron
Department of Fish and Game

State Clearinghouse
Sacramento

SPH:sph

ATTACHMENT 1

State of California
THE RESOURCES AGENCY
Department of Fish and Game
May 4, 1984

GUIDELINES FOR ASSESSING THE EFFECTS OF PROPOSED DEVELOPMENTS ON RARE AND ENDANGERED PLANTS AND PLANT COMMUNITIES

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how field surveys should be conducted and what information should be contained in the survey report.

Botanical surveys that are conducted to determine the environmental effects of a proposed development should be directed to all rare and endangered plants and plant communities. Rare and endangered plants are not necessarily limited to those species which have been "listed" by state and federal agencies but should include any species that, based on all available data, can be shown to be rare and/or endangered under the following definitions.

A species, subspecies or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy form one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition or disease. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.

Rare plant communities are those communities that are of highly limited distribution. These communities may or may not contain rare or endangered species. The most current version of the California Natural Diversity Data Base's Outline of Terrestrial Communities in California may be used as a guide to the names of communities.

It is appropriate to conduct a botanical field survey to determine if, or the extent that, rare plants will be affected by a proposed project when:

a. Based on an initial biological assessment, it appears that the project may damage potential rare plant habitat;

b. Rare plants have historically been identified on the project site, but adequate information of impact assessment is lacking; or

c. No initial biological assessment has been conducted and it is unknown whether or not rare plants or their habitat exist on the site.

Botanical consultants should be selected on the basis of possession of the following qualifications (in order of importance):

a. Experience as a botanical field investigator with experience in field sampling design and field methods;

b. Taxonomic experience and a knowledge of plant ecology;

c. Familiarity with the plants of the area, including rare species; and

d. Familiarity with the appropriate state and federal statutes related to rare plants and plant collecting.

Field surveys should be conducted in a manner that will locate any rare or endangered species that may be present. Specifically, rare or endangered plant surveys should be:

a. Conducted at the proper time of year when rare or endangered species are both "evident" and identifiable. Field surveys should be scheduled (1) to coincide with known flowering periods, and/or (2) during periods of

phenological development that are necessary to identify the plant species of concern.

b. Floristic in nature. "Predictive surveys" (which predict the occurrence of rare species based on the occurrence of habitat or other physical features rather than actual field inspection) should be reserved for ecological studies, not for impact assessment. Every species noted in the field should be identified to the extent necessary to determine whether it is rare or endangered.

c. Conducted in a manner that is consistent with conservation ethics. Collection of rare or suspected rare species (voucher specimens) should be made only when such actions would not jeopardize the continued existence of the population and in accordance with applicable state and federal permit regulations. Voucher specimens should be deposited at recognized public herbaria for future reference. Photography should be used to document plant identification and habitat whenever possible, but especially when the population cannot withstand collection of voucher specimens.

d. Conducted using systematic field techniques in all habitats of the site to ensure a reasonably thorough coverage of potential impact areas.

e. Well documented. When a rare or endangered plant (or rare plant community) is located, a California Native Species (or Community) Field Survey Form or equivalent written form should be completed and submitted to the Natural Diversity Data Base.

5. Reports of botanical field surveys should be included in or with environmental assessments, negative declarations, EIR's and EIS's, should contain the following information:

a. Project description, including a detailed map of the project location and study area.

b. A written description of biological setting referencing the community nomenclature used and a vegetation map.

c. Detailed description of survey methodology.

d. Dates of field surveys.

e. Results of survey (including detailed maps).

f. An assessment of potential impacts.

g. Discussion of the importance of rare plant populations with consideration of nearby populations and total species distribution.

h. Recommended mitigation measures to reduce or avoid impacts.

i. List of all species identified.

j. Copies of all California Native Species Field Survey Forms or Natural Community Field Survey Forms.

k. Name of field investigator(s).

l. References cited, persons contacted, herbaria visited, and disposition of voucher specimens.

ATTACHMENT 2

Sensitivity of Top Priority Rare Natural Communities in Southern California*

*Sensitivity rankings are determined by the Department of Fish and Game, California Natural Diversity Data Base and based on either number of known occurrences (locations) and/or amount of habitat remaining (acreage). The three rankings used for these top priority rare natural communities are as follows:

S1.- Less than 6 known locations and/or on less than 2,000 acres of habitat remaining

S2.- Occurs in 6-20 known locations and/or 2,000-10,000 acres of habitat remaining

S3.- Occurs in 21-100 known locations and/or 10,000-50,000 acres of habitat remaining

The number to the right of the decimal point after the ranking refers to the degree of threat posed to that natural community regardless of the ranking. For example:

S1.1 = very threatened
S2.2 = threatened
S3.3 = no current threats known

Sensitivity Rankings (February 1992)

Rank	Community Name	
S1.1	Mojave Riparian Forest	Southern Dune Scrub
	Sonoran Cottonwood Willow Riparian	Southern Coastal Bluff Scrub
	Mesquite Bosque	Maritime Succulent Scrub
	Elephant Tree Woodland	Riversidean Alluvial Fan Sage Scrub
	Crucifixion Thorn Woodland	Southern Maritime Chaparral
	Allthorn Woodland	Valley Needlegrass Grassland
	Arizonan Woodland	Great Basin Grassland
	Southern California Walnut Forest	Mojave Desert Grassland
	Mainland Cherry Forest	Pebble Plains
	Southern Bishop Pine Forest	Southern Sedge Bog
	Torrey Pine Forest	Cismontane Alkali Marsh
	Desert Mountain White Fir Forest	

Sensitivity Rankings (Cont.)

Community Name

S1.2
Southern Foredunes
Mono Pumice Flat
Southern Interior Basalt Fl. Vernal Pool

S2.1
Venturan Coastal Sage Scrub
Diegan Coastal Sage Scrub
Riversidean Upland Coastal Sage Scrub
Riversidean Desert Sage Scrub
Sagebrush Steppe
Desert Sink Scrub
Mafic Southern Mixed Chaparrel
San Diego Mesa Hardpan Vernal P.
San Diego Mesa Claypan Vernal P.
Alkali Meadow
Southern Coastal Salt Marsh
Coastal Brackish Marsh
Transmontane Alkali Marsh
Coastal and Valley Freshwater Marsh
S. Arroya Willow Riparian Forest
Southern Willow Scrub
Modoc-G.Bas. Cottonwood Willow Rip.
Modoc-Great Basin Riparian Scrub
Mojave Desert Wash Scrub
Engelmann Oak Woodland
Open Engelmann Oak Woodland
Closed Engelmann Oak Woodland
Island Oak Woodland
California Walnut Woodland
Island Ironwood Forest
Island Cherry Forest
S. Interior Cypress Forest
Bigcone Spruce-Canyon Oak Forest

S2.2
Active Coastal Dunes
Active Desert Dunes
Stab. and Part. Stab. Desert Dunes
Stab. and Part. Stab. Desert Sandfield
Mojave Mixed Steppe
Transmontane Freshwater Marsh
Coulter Pine Forest
S. California Fellfield
White Mountains Fellfield

S2.3
Bristlecone Pine Forest
Limber Pine Forest

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

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JAMES A. NOYES, Director

900 SOUTH FREMONT AVENUE
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Telephone: (626) 458-5100
www.ladpw.org

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

April 12, 2004

IN REPLY PLEASE REFER TO FILE: WM-4

Mr. Richard Kite
Associate Planner
Planning Department
City of Palmdale
38250 Sierra Highway
Palmdale, CA 93550

RECEIVED
APR 1 6 2004
PLANNING DEPT

Dear Mr. Kite:

RESPONSE TO NOTICE OF PREPARATION
SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT
CONDITIONAL USE PERMIT NO. 98-12
CITY OF PALMDALE

Thank you for the opportunity to provide comments on the subject document which we received on March 9, 2004. The proposed project consists of modifications to the existing County-approved Conditional Use Permit. These modifications include expanding the aggregate 114-acre refuse footprint by approximately 11 acres to combine the 2 landfills into one disposal area, increase the facility boundary from 180 to 185 acres to accommodate additional ancillary facility, and update the legal boundary of the combined facility. A daily tonnage increase is also requested. These modifications will provide an enhancement of 14 million cubic yard of capacity. The project site is located at 1200 West City Ranch Road in the City of Palmdale. We have reviewed the submittal and offer the following comments:

Environmental Programs

State law (Public Resources Code, Section 40000 et seq.), commonly known as AB 939, requires each County to prepare and administer a Countywide Siting Element. The Siting Element is a planning document addressing the solid waste disposal needs of all the cities in the County and the unincorporated County communities for a 15-year planning period for the residual waste remaining after waste diversion recycling, composting, etc. activities have taken place. The Los Angeles County Countywide Siting Element, dated June 1997, was prepared by Public Works under the auspices of the County of Los Angeles Integrated Waste Management Task Force.

The Siting Element was approved by a majority of the cities in the County of Los Angeles (83 out of 88 cities) containing a majority of the cities' population (97 percent) in late 1997, by the County Board of Supervisors on January 27, 1998, and by the California Integrated Waste Management Board on June 24, 1998.

The Siting Element establishes goals, policies, and guidelines for proper planning and siting of solid waste disposal (landfills and transformation) facilities on a Countywide basis. Goal 2.4.1 of the Siting Element establishes policies to enhance in County landfill disposal capacity by assisting project proponents to expedite, where appropriate, the development/expansion of the disposal sites identified in the Siting Element that are found to be environmentally sound and technically feasible, including the expansion of the Antelope Valley Recycling and Disposal Facility. Therefore, the proposed expansion and continued operation of the Antelope Valley Recycling and Disposal Facility and the project's objectives identified in the Initial Study are consistent with said Goal 2.4.1 of the Siting Element.

Should any operation within the proposed project include the construction/installation, modification, or removal of underground storage tanks and/or industrial waste control system/facility, our Environmental Programs Division must be contacted for required approvals and operating permits.

The proposed project may be subject to a Standard Urban Storm Water Mitigation Plan as established by the State of California Water Resources Control Board. The applicant should verify the applicability of this requirement to the proposed project and, if required, the project proponent must obtain the approval of our Environmental Programs Division.

The proposed expansion of the Antelope Valley Recycling and Disposal Facility will require a Finding of Conformance from the Task Force. This is in accordance with the requirement of the Siting Element, and approved by the majority of the cities containing the majority of the populations in the County, the County of Los Angeles Board of Supervisors, and the California Integrated Waste Management Board.

The proposed Supplemental Environmental Impact Report for the expansion project should include a discussion on how the proposed expansion project will meet each of the Disposal Facility Siting criteria listed in Chapter 6, Volume 1, and Appendix 6-A, Volume 3, of the Siting Element.

The proposed material recovery facility may require an amendment to the City of Palmdale's Non-disposal Facility Element pursuant to Section 50001(a)(2) of the California Public Resources Code.

If you have any questions, please contact Ms. Anna Gabriel at (626) 458-2193.

Flood Maintenance

The subject document is outside the Flood Control District boundary, therefore, we have no comments.

If you have any questions, please contact Mr. Jerry Burke at (626) 458-4114.

Geotechnical and Materials Engineering

The proposed project will not have significant environmental effects from a geology and soils standpoint, provided the appropriate ordinances and codes are followed. Portions of the project are located within mapped potentially liquefiable areas, per the State of California Seismic Hazard Zone Map, Ritter Ridge Quadrangle. However, a liquefaction analysis is not warranted at this time. Detailed liquefaction analyses, conforming to the requirements of the State of California Division of Mines and Geology Special Publication 117, must be conducted at the tentative map and/or grading/building plan stages.

If you have any questions, please contact Mr. Amir Alam at (626) 458-4921.

Land Development

Hydrology and Standard Urban Storm Water Mitigation Plan (SUSMP) Review

This environmental document has been reviewed only for drainage and SUSMP impacts to the County of Los Angeles areas and facilities. As stated in the initial study, the project will comply the City's drainage master plan, the postdevelopment flows will not exceed 85 percent of the predevelopment flows.

If you have any questions, please contact Mr. Timothy Chen at (626) 458-4921.

Transportation Planning

We reviewed the subject document and determined that the proposed project will not have any significant impacts on County of Los Angeles Highways.

If you have any questions, please contact Mr. Hubert Seto at (626) 458-4349.

Traffic and Lighting

The proposed project has the potential to significantly impact the County and County/city roadways and intersections in the area. We would like the opportunity to review the related environmental documents and traffic study upon its completion. The County's methodology shall be used when evaluating the County and/or County/city intersections. The study shall also address the cumulative impacts generated by this and nearby developments and include the level of service analysis for the affected intersections. If traffic signals or other mitigation measures are warranted at the affected intersections, the developer shall determine its proportionate share of traffic signal or other mitigation costs and submit this information to Public Works for review and approval. A copy of our Traffic Impact Analysis Report Guidelines is enclosed.

If you have any questions, please contact Ms. Marian Guirguis of our Traffic Studies Section at (626) 300-4848.

Watershed Management

The proposed project should include investigation of watershed Management opportunities to maximize capture of local rainfall on the project site, eliminate incremental increase in flows to the storm drain system, and provide filtering of flows to capture contaminants originating from the project site.

San Gabriel River Watershed

Coordination will be necessary with the proper agencies related to potential requirements on any impacted riparian and wetland areas and landfill operation including runoff and leachate controls. We have no other watershed-related comments on this permit application.

If you have any questions, please contact Mr. Glenn Howe at (626) 458-5963.

Water Quality

The proposed project should fully assess and incorporate all appropriate Best Management Practices to enhance quality of urban runoff and stormwater. The project shall comply with all the requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Storm Water Permit issued by the Los Angeles Regional Water Quality Control Board to the County of Los Angeles and local Agencies, including, but not limited to, Parts IV.D. and IV.E, Development Planning and Development Construction.

The following should be reviewed to assure your project is in compliance with the NPDES Permit.

1. The NPDES Municipal Storm Water Permit can be viewed on the web at http://www.swrcb.ca.gov/rwqcb4/html/programs/stormwater/la_ms4_final/FinalPermit.pdf

2. The Standard Urban Storm Water Mitigation Plan Manual can be viewed or downloaded from the web at http://www.ladpw.org/wmd/npdes/table_contents.cfm

3. The 2002 list of Impaired Water Bodies can be found on the web at http://www.swrcb.ca.gov/tmdl/docs/2002reg4303dlist.pdf. Coastal Los Angeles County and the Upper Santa Clara River Watershed are in Region 4. The Antelope Valley area of Los Angeles County is in Region 6B.

4. More information on Total Maximum Daily Loads can be found on the web at http://www.swrcb.ca.gov/tmdl/tmdl.html and http://www.swrcb.ca.gov/rwqcb4/html/meetings/tmdl/tmdl.html.

5. Handbooks that can offer a better understanding of Best Management Practices can be viewed or downloaded from the web at http://www.cabmphandbooks.net/

If you have any questions, please contact Mr. Frank Kuo at (626) 458-4350.

If you have any questions regarding the above comments or the environmental review process of Public Works, please contact Mr. Massie Munroe at (626) 458-4359.

Very truly yours,

JAMES A. NOYES
Director of Public Works

ROD H. KUBOMOTO
Assistant Deputy Director
Watershed Management Division

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Enc.

Traffic Impact Analysis Report Guidelines

January 1, 1997

Prepared by the County of Los Angeles
Department of Public Works

James A. Noyes
Director of Public Works

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(01/22/99)

III. TIA Report Contents

A. Project Description

The following information is required:

1. A description of the project, including those factors which quantify traffic generators, e.g., dwelling units, square feet of office space, persons to be employed, restaurant seats, acres of raw land, etc. For residential developments, the description should indicate the type of residence, (e.g., one level or townhouse condominiums, and if its use is for families, adults or retirees).

2. A plot plan showing proposed driveways, streets, internal circulation, and any new parking facilities on the project site.

3. A vicinity map showing the site location and the study area relative to other transportation systems.

4. A brief history of the projects that are part of the phased Master Plan or a parent tract/parcel map.

B. Transportation Circulation Setting

The following information is required:

1. <u>Existing and Proposed Site Uses</u>

   A description of the permitted and/or proposed uses of the project site in terms of the various zoning and land use categories of the County, and the status and the usage of any facilities currently existing on the site.

2. <u>Existing and Proposed Roadways and Intersections</u>

   A description of existing streets and roadways, both within the project site (if any) and in the surrounding area. Include information on the roadway classifications (per the Highway Plan), the number of lanes and roadway widths, signalized intersections, separate turn lanes, and the signal phases for turning movements.

Existing daily directional and peak-hour through and turning traffic volumes on the roadways surrounding and/or logically associated with the project site, including Secondary and Major highways and freeways. Local streets affected by the project should also be shown. Each report shall include appendices providing count data used in the preparation of the report. The source and date of the traffic volume information shall be indicated. Count data should not be over one year old. Since peak volumes vary considerably, a ten percent daily variation is not uncommon, especially on recreational routes or roadways near shopping centers; therefore, representative peak-hour volumes are to be chosen carefully.

All assumed roadways and intersections or any other transportation circulation improvements must be identified and discussed. The discussion should include the scope and the status of the assumed improvements including the construction schedule and financing plan. It should be noted that all assumed roadways and intersections or any other transportation circulation improvements will be made a condition of approval for the project to be in place prior to the issuance of building permits. If assumed improvements do not get built on time due to an unforeseeable condition, traffic conditions for a different assumed highway network or other mitigation measures will be considered if a traffic study is submitted with a different assumed network or other measures are recommended to mitigate the traffic impact in question.

C. Analysis and Impact

The following information is required:

1. Trip Generation Analysis

Tabulate the estimated number of daily trips and a.m. and p.m. peak-hour trips generated by the proposed project entering and exiting the site. Trip generation factors and source are to be included. The trip generation rates contained in the latest edition of the Institute of Transportation Engineers Trip Generation manual should generally be used, except in the case of condominiums/townhomes when the following rates should be used per unit:

The County of Los Angeles Department of Regional Planning (DRP) and other public agencies (if necessary) should be contacted to obtain the latest listings. A table and a map showing the status, project/zone change/conditional use permit/parcel map/tract number, and the location of each project must be provided. For a computer printout of the listing of all filed projects within the County, Land Development Management Section of the DRP, at (213) 974-6481 can be contacted.

4. LOS Analysis

If it appears that the project's generated traffic alone or together with other projects in the area could worsen the LOS of an intersection or roadway, a "before" and "after" LOS analysis is necessary. The Intersection Capacity Utilization (ICU) or Critical Movement Analysis are two methods often used to assess existing and future LOS at intersections.

If the ICU planning method is used, a maximum of 1,600 vehicles per hour per lane should be used (2,880 vehicles per hour should be used for dual left-turn lanes) and a ten percent yellow clearance cycle should be included. Intersection LOS analysis and calculation work sheets, as well as diagrams showing turning volumes shall be included in the report for the following traffic conditions.

(a) Existing traffic;
(b) Existing traffic plus ambient growth to the year the project will be completed (preproject);
(c) Traffic in (b) plus project traffic;
(d) Traffic in (c) with the proposed mitigation measures (if necessary);
(e) Traffic in (c) plus the cumulative traffic of other known developments; and
(f) Traffic in (e) with the proposed mitigation measures (if necessary).

The project's impact on two-lane roadways should also be analyzed for all of the above traffic conditions if those two-lane roadways are used for access. LOS service analysis contained in the Highway Capacity Analysis, Chapter 8, Two-Lane Highways, should be used to evaluate the project's impact. For simplified analysis, use the established significant impact thresholds for two-lane roadways as shown on page 7.

6. **Analysis Discussion**

Discuss conclusions regarding the adverse impacts caused by the proposed project on the roadway system. If the cumulative traffic impact of this and other projects require mitigation measures, such as traffic signals, then estimate the percent share using the project percent share formula given in the Section III D of the TIA Guidelines. When the proposed project and other nearby developments are expected to significantly impact adjacent roadways, the developer may be required to enter into a secured agreement to contribute to a benefit district to fund major roadway and bridge improvements in the region. Also, for all recommendations to increase the number of travel lanes on a street or at an intersection as a mitigation measure, the report must clearly identify the impacts associated with such a change such as whether or not additional right of way will be required and whether it is feasible to acquire the right of way based on the level of development of the adjacent land and buildings (if any).

Discuss other possible adverse impacts on traffic. Examples of these are: (1) the limited visibility of access points on curved roadways; (2) the need for pavement widening to provide left-turn and right-turn lanes at access points into the proposed project; (3) the impact of increased traffic volumes on local residential streets; and (4) the need for road realignment to improve sight distance.

Projects which propose to amend the County's General Plan Land Use and substantially increase potential traffic generation must provide an analysis of the project at current planned land use versus proposed land use in the build out condition for the project area. The purpose of such analysis is to provide decision makers with the understanding of the planned circulation network's ability to accommodate additional traffic generation caused by the proposed General Plan Land Use amendments.

D. Traffic Models and Model Generated TIA's

Computerized traffic models are planning tools used to develop future traffic projections based on development growth patterns. The Department currently operates two traffic models, one for the Santa Clarita Valley and another for the Ventura Corridor area. The Department can test proposed development project traffic impacts for the public in these areas for a fee. For assistance in the traffic modeling, the Planning Division, Transportation Planning/Assessments Section, can be contacted at (626) 458-4351.

The project percent share should be based on the peak-hour volumes that warrant signals. If both peak hours satisfy the installation of signals, the average of the two peak-hour volumes should be used in the percent share analysis.

F. Mitigation Measures

The following information is required.

Identify feasible mitigation measures which would mitigate the project and/or other related projects' significant impacts to a level of insignificance. Also, identify those mitigation measures which will be implemented by others. Those mitigation measures that are assumed to be implemented by others will be made a condition of approval for the project to be in place prior to issuance of building permits. Mitigation measures may include, but are not limited to, the following:

1. <u>Traffic Engineering Techniques.</u>

   a. Locate access points to optimize visibility and reduce potential conflict.
   b. Design parking facilities to avoid queuing into public streets during peak arrival periods.
   c. Provide additional off-street parking.
   d. Dedicate visibility easements to assure adequate sight distance at intersections and driveways.
   e. Signalize or modify traffic signals at intersections.
   f. Install left-turn phasing and/or multiple turning lanes to accommodate particularly heavy turning movements.
   g. Widen the pavement to provide left- or right-turn lanes to lessen the interference with the traffic flow.[1]
   h. Widen intersection approaches to provide additional capacity.
   i. Prohibit left turns to and from the proposed development.
   j. Restrict on-street parking during peak hours to increase street capacity.[1]

2. <u>Contribute to a benefit district to fund major capital improvements</u>

---

1 Physical roadway improvements to improve capacity should be considered before considering parking restrictions.

The geographic area examined in the TIA must include the following, at a minimum.

- All CMP arterial monitoring intersections (see Exhibit B of the Guidelines), including freeway on- or off-ramp intersections, where the proposed project will add 50 or more trips during either the a.m. or p.m. peak hours.

- Main line freeway monitoring locations (see Exhibit C of the Guidelines) where the project will add 150 or more trips, in either direction, during the a.m. or p.m. weekday peak hours.

- Caltrans must also be consulted to identify other specific locations to be analyzed on the State highway system.

If, based on these criteria, the TIA identifies no facilities for study, no further traffic analysis is required.

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(01/07/99)

Attach.

COUNTY OF LOS ANGELES

FIRE DEPARTMENT

1320 NORTH EASTERN AVENUE
LOS ANGELES, CALIFORNIA 90063-3294
(323) 890-4330

P. MICHAEL FREEMAN
FIRE CHIEF
FORESTER & FIRE WARDEN

April 29, 2004

RECEIVED
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PLANNING DEPT.

Mr. Richard Kite
Palmdale Planning Department
38250 Sierra Hwy
Palmdale, CA 93550-4609

Dear Mr. Kite:

NOTICE OF PREPARATION FOR SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT FOR THE PROPOSED EXPANSION TO THE ANTELOPE VALLEY LANDFILLS I AND II, STATE CLEARING HOUSE #90010988, "CITY OF PALMDALE" – (EIR #1926/2004)

The Notice of Preparation for a Supplemental Environmental Impact Report for the proposed Expansion to the Antelope Valley Landfills I and II Project has been reviewed by the Planning Division, Land Development Unit, and Forestry Division of the County of Los Angeles Fire Department. The following are their comments:

PLANNING DIVISION:
The Initial Study, Section N.1.a states: "The proposed project would not create any additional needs for... fire protection services in the area." The project proposes new ancillary facilities, as shown in Figure 2A, Attachment A. To the extent that these include roofed structures, such as the proposed public convenience center and the household hazardous waste service center, the developer should be required to pay the City's Fire Facilities Impact Fee.

LAND DEVELOPMENT:
The County of Los Angeles Fire Department, Land Development Unit appreciates the opportunity to comment on this project. However, this project does not propose structures or any other improvements that appear to have a significant impact that requires a comment from the Land Development Unit.

Specific fire and life safety requirements for the construction phase will be addressed at the building and fire safety plan check. There may be additional fire and life safety requirements during this time. Should any questions arise regarding subdivision, water systems, or access please contact Inspector Marvin Dorsey at (323) 890-4243.

FORESTRY DIVISION:
The statutory responsibilities of the County of Los Angeles Fire Department, Forestry Division include erosion control, watershed management, rare and endangered species, vegetation, fuel modification for Very High Fire

Hazard Severity Zones or Fire Zone 4, archeological and cultural resources, and the County Oak Tree Ordinance. These areas should be addressed in the Supplemental Environmental Impact Report.

If you have any additional questions, please contact this office at (323) 890-4330.

Very truly yours,

DAVID R. LEININGER, CHIEF, FORESTRY DIVISION
PREVENTION BUREAU

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Appendix A-3

NOP Response

May 3, 2004

Mr. Mark Campbell, Chair
Environmental Review Committee
Antelope Valley Archaeological Society
P.O. Box 2139
Rosamond, CA 93560

Re: Responses to the March 26, 2004 Comment Letter

Dear Mr. Campbell:

Thank you for your interest in the proposed expansion of the Antelope Valley Public Landfill. The following are responses to your comments regarding archaeological resources on the site. Also, attached please find a copy of the executive summary dated March 10, 2003, prepared by Mr. Brian Dillon that summarizes the results of his data recovery efforts. This report was prepared in response to the County of Los Angeles condition which required data recovery excavation and recordation for the sites CA-LAN-876 and AVL-1 and subsequent preparation of a report of the findings. Upon completion of data recovery and preparation of the final report (attached), the County of Los Angeles officially acknowledged the project's compliance with conditions set forth in the Conditional Use Permit (CUP) 85512 regarding archaeological resources protection. The County of Los Angeles correspondence is included in the Initial Study document as attachments.

1. What is the status of site CA-LAN-875? How will the proposed expansion impact the site? This site is located on the western portion of the landfill property but is not mentioned in the initial study or accompanying documentation.

   Based on the March 10 2003 report on Archaeological Data Recovery performed by Mr. Brian Dillon, the CA-LAN-875 site consists of two loci, a larger northern portion and much smaller southern portion, both exhibiting plentiful surface artifacts of both chipped and ground stone. The northern portion furthermore exhibits surface trace of midden and may contain midden deposits of some depth. In the context of site preservation and protection, the CA-LAN-875 archaeological site fortunately stands little risk of adverse impact from the proposed expansion. The larger northern locus exists completely off the study property, on the adjacent parcel to the north and east of the study parcel's boundary, whereas the smaller southern locus lies to the west of the maximum area proposed both for grading and/or other earth-moving activities as presently understood for the landfill expansion project. Consequently, neither locus of this potentially significant site would be adversely impacted by the proposed project.

2. What work was done at site CA-LAN-1917 and what are Dr. Dillon's findings? The archaeological clearance letter dated April 19, 2000 only addresses site CA-LAN-876.

   Based on the report mentioned above, prepared by Mr. Dillon, the CA-LAN-1917 is one of the archaeological sites of comparatively low significance. It is a very small surface site which takes the form of a light lithic scatter with no significant depth or artifact component represented. This archaeological site probably represents a single season of use by a very small party, perhaps a half-dozen persons, and incorporates no midden, no features, and only a very few diagnostic artifacts. At least one of these, however, a small quartz projectile point, comfortably fits within the Late Prehistoric Period point typology accepted for the region, or may be transitional to it from the preceding period. A 100% surface collection was made at this site, and test excavations revealed no subsurface deposit. According to Mr. Dillon, such research completed at such a site of minimal size, content, and surface depth should constitute adequate mitigation of potentially adverse impacts which may result from continuation of the landfill expansion project.

3. The level of effort for site CA-LAN-876 seems adequate but I am concerned that Dr. Dillon's conclusions and determination regarding the site were made prior to analyzing the data recovered from his excavation.

   Based on the latest report by Mr. Dillon, the most substantial archaeological site on the property, CA-LAN-876, was named the It a Buzz site by the Native American advisor to the project, meaning "place of the ancient ones." It is a badly-disturbed midden site of respectable size and depth now recognized as the most extensively-studied of any prehistoric site within the Anaverde corridor in terms both of its volume of deposit, the size of its deposit scientifically excavated, and the rigor with which the excavated collections were analyzed. According to Mr. Dillon, the requirements of the conditional use permit regarding data recovery excavation have been satisfactorily met.

4. In sprite of Dr. Dillon's concern about the size of his report as expressed in his letter to Los Angeles County Department of Regional Planning dated April 20, 2003, the project file is incomplete without a copy of the report.

   The attached executive summary dated March 10, 2003, prepared by Mr. Dillon is a sufficient re-count of the data recovery efforts and was deemed complete and adequate by the County of Los Angeles, Department of Regional Planning. The final document will consist of several three-ring binders.

5. Curation of the collection from these at sites at CSU Bakersfield makes them somewhat less available to interested researchers than they would be at a local facility. CSUB charges a modest access fee to researchers the local facilities do not charge. I am well aware of the lack of space in existing local facilities. Perhaps the City should explore options with other interested parties to develop a local curation facility, as this will be a reoccurring concern with future development projects.

Dr. Dillon agrees that housing the archaeological collections at California State University, Bakersfield introduces the inconvenience of time and distance to anyone who might wish to study these materials in the future. He also agrees with the general archaeological precept that archaeological collections should be housed by responsible research institutions as close to the archaeological site of origin as possible.

Storing the collection locally was the original plan, for at the initiation of the project, Dr. Dillon had made arrangements through his colleague and prior advisor Professor Roger Robinson, a well-known and well-respected expert on the archaeology of the Antelope Valley, to deposit the archaeological collections at Robinson's home institution, the Antelope Valley College. Professor Robinson has taught archaeology at this college for more than 30 years, and the tangible results of his own local archaeological research as well as that of others, has been housed at the small museum associated with the college.

However, owing to a decision by the Antelope Valley College (AVC) administration beyond the control either Dr. Dillon or Professor Robinson, the AVC had decided that no only would no new collections from any source be accepted, but that all pre-existing collections at the AVC museum itself would have to find a new home. Professor Robinson, after careful consideration of the problem, concluded that California State University, Bakersfield (CSUB) would be the most suitable institution to which he could transfer the AVC museum's archaeological collections, and suggested that our original agreement could still be adhered to by delivery of the Antelope Valley Public Landfill (AVPL) project archaeological collections to CSUB along with his own extensive archaeological collections, also from the Antelope Valley. The CSUB museum already holds extensive archaeological collections from the Antelope Valley, in particular from the Edwards Air Force Base area, so the collections moving there from both the AVC and the AVPL project would not exist there in isolation.

The only other museum that came into consideration as a potential receiver of the collections was the Maturango Museum in Ridgecrest, California, approximately as far distant from the study location as is Bakersfield. This second museum would be every bit as good a place for the collections to reside in; however, since the AVC collections were already destined to go to Bakersfield, it seemed best that the AVPL collections not be separated from the larger block of materials developed by Professor Robinson and that AVC already committed to CSUB.

6. We are pleased to see the involvement of Kawaiisu tribal elder, Harold Williams and local archaeologist Roger Robinson in this project. There needs to be more Native American involvement in future excavation projects within the City's sphere of influence. We would also like to see greater cooperation between the outside contractors doing archaeology here and the local archaeologist who best know the resources.

The comment is noted and is being considered by the City.

7. I have heard mention of data recovery from a site at the landfill that was accidentally discovered during grading. Which site was this and how has that data been incorporated into the initial study?

A single feature (an agave roasting pit) had been cut through by earth movers excavating a borrow pit from which to quarry soft fill prior to the arrival of the archaeological team on the project site. This badly-disturbed feature was far enough distant from the previously-recorded sites on the property to be considered as isolated from them, and owing to the fact that it was completely covered by Aeolian (windblown) sand, would have been "invisible" to pedestrian inspectors walking over this portion of the property prior to its accidental exposure by the earth moving equipment.

This agave roasting pit consistent of a probably prehistoric intrusive pit dug down into the ancient subsoil, which was then filled with fire-cracked rocks, ash, cinders, and burnt sand as it was used and, presumably, re-used, for roasting agave roots. No intentionally-formed artifacts were discovered associated with this feature, nor did any naturally-produced lithics exhibit any usewear. Eventually, it was abandoned, and came to be covered over by a 10 to 15 cm. cap of Aeolian sand, effectively obscuring it from view. Agave whipplei today is quite common on and adjacent to the study property, and through ethnographic analogy we know that local Indian peoples at contact were accustomed to using this valuable plant in many ways, including roasting the bolus or "root ball" in earth ovens such as the one fortuitously discovered in the sidewall of the borrow pit.

However, when found, an estimated 60 to 70% of this feature had already been destroyed by the heavy equipment, and the remaining internal constituents (fire cracked rock, ashy sand, etc.) were continually eroding out of the borrow pit sidewall and falling some ten feet downwards into the pit. Dr. Dillon was able to clean a vertical exposure through this feature, allowing for photography, and during the process of cleaning attempted to recover carbon fragments large enough to be useful for 14C radiometric dating, but failed to discover any of suitable size. This notwithstanding, a sample of the ashy soil containing minute fragments of carbon was recovered prior to the final collapse of the remaining portions of the feature into the pit. This sample has been retained against the future possibility that advances in analytical techniques may yet allow for its analysis.

8. The potential for other buried sites within the landfill property warrants continued monitoring as mentioned in mitigation measure #46 of the previous EIR.

Monitoring will be performed, as necessary and as required by the mitigation measures in the previous certified EIR.

Additionally, the response to comment #7 above, underlines the necessity of continued archaeological monitoring of previously undisturbed areas within the project area during the course of future land-moving activities, for previously unrecorded sites, features, or significant cultural resources may yet exist upon the property. Given the local history of Aeolian deposition, of slopewash, and of constant erosion and downwards transport of

the lighter fraction of the predominantly sandy soil throughout the area, the possibility that previously-exposed archaeological sites may now be covered by sterile deposits and therefore now be "archaeologically invisible" cannot be discounted. Conscientious archaeological monitoring of the initial stages of earthmoving should help mitigate the adverse impacts, such as accidental site damage or destruction that might otherwise occur.

In Dr. Dillon's opinion, such monitoring should be done, by a qualified archaeologist, wherever fresh ground is broken through mechanical means during the course of the excavation project. Such monitoring need not be continued in specific areas once the archaeological monitor has determined that mechanical excavation has proceeded to a depth in excess of any possibility of encountering sub-surface cultural resources, and no such cultural resources have been found within such reasonable depth. Similarly, once the archaeological monitor has determined that a specific mechanical excavation within a specific portion of the property is progressing through artificially-deposited fill, dumped there as a result of some earlier earth-moving activity, and that the pre-existing ground surface originally obscured by such artificially imported fill has been encountered without any traces of cultural resources present, and once the above caveat has likewise been observed, no additional archaeological monitoring in that specific area should be required. Should the archaeological monitor; however, observe previously unknown archaeological sites or resources outside the areas where these have already been studied, then this monitor should be empowered to either halt or re-direct earthmoving activities away from the discovery location until such finds have been studied and a determination made as to their most appropriate mitigation, be it salvage, stabilization, or some other option.

We hope the above responses and the attached executive summary sufficiently address your concerns. If you have any additional questions/comments, please do not hesitate to contact us.

Sincerely,

Richard Kite
Associate Planner

Appendix A-4

Original County-Approved MMP for 1992 Certified EIR

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
GEOTECHNICAL				
Seismic Hazards/Faulting				
1	Prior to the issuance of a *Solid Waste Facilities Permit*, all slopes and pertinent attendant facilities shall be designed to withstand strong ground shaking in accordance with accepted engineering practices.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review
2	Concurrent with ongoing landfill operations, geologic mapping of exposures in future excavations shall be completed to provide further lithologic data and structural relationships.	Concurrent with ongoing landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
3	During *ongoing landfill operations, earth moving operations* shall be observed and placement of fill shall be tested by a qualified geotechnical engineer.	During *landfilling* operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
Slope Stability				
4	Prior to issuance of a *Solid Waste Facilities Permit*, design plans shall be checked to ensure that the toe of any landfill slope shall be located a minimum of one hundred (100) feet from the closest segment of the local San Andreas fault.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
5	Prior to the isssuance of a *Solid Waste Facilities Permit*, design plans shall be checked to ensure that permanent landfill slopes shall be constructed at a maximum 2:1 (horizontal to vertical) slope. Engineered fill should be compacted to a minimum of 90% relative compaction per ASTM D 1557. To aid in the compaction process, fill soils shall be placed in eight inch uncompacted lifts and mechanically compacted.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review
6	Prior to the issuance of a *Solid Waste Facilities Permit*, design plans shall be checked to ensure that fill material shall be derived from the Anaverde clay shale bedrock source for permanent landfill slope construction.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review
7	Prior to the issuance of a *Solid Waste Facilities Permit*, design plans shall be checked to ensure that terraces at least six feet (6') in width shall be established at not more than thirty foot (30') vertical intervals on all permanent fill slopes. In addition, for slopes greater than sixty feet (60') high, one terrace located approximately midheight should be at least twelve feet (12') wide. Where only one terrace is required, it shall be midheight.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
8	Prior to the issuance of a *Solid Waste Facilities Permit*, design plans shall be checked to ensure that according to the nature of the cut slope material, permanent cut slopes shall be constructed in the following manner: **Material Type** / **Maximum Slope Angle** / **Maximum Height** Gray or Pink Arkose (Tag, Tar) — 1.5:1 — --- Granitic (gd) — 1.5:1 — ---	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review
9	During *landfill operations*, permanent cut slopes shall be visually observed by the geologist or their representative to check for adverse bedding, joint patterns or other geologic feature exposed within the slope face. Where necessary, due to geologic consideration, the permanent cut slope shall be constructed at a flatter angle than recommended above.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
10	During *landfill operations*, lined interceptor drains shall be constructed at the top of all cut slopes to divert runoff away from the slope face and to help minimize moisture infiltration into the landfill mass. Interceptor drain dimensions shall be as specified in the Uniform Building Code. Interceptor drains constructed in alluvial soils shall be lined with gunite, concrete or other suitable material.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review

Source: STA Planning, Inc.

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
11	Prior to the issuance of a *Solid Waste Facilities Permit* and according to the nature of the cut slope material, temporary cut slopes shall be constructed in the following manner (Dependant upon local bedding attitude):	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review

Material Type	Maximum Slope Angle	Maximum Height
Alluvium (Qal), (Qoa and Qoa_2)	1.5:1	50'
Clay Shale (Tac)	0.75:1	60'
Clay Shale (Tac)	1:1	85'
Gray or Pink Arkose (Tag, Tar)	1:1	---
Granitic (gd)	0.75:1	---

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
FLOOD				
1	Prior to the issuance of a *Solid Waste Facilities Permit*, a final design plan based upon the conceptual design plan shown in Exhibit 16 shall be prepared depicting how surface runoff shall be intercepted and diverted around the operation to insure that leachate resulting from the contact of surface waters (principally storm water infiltration) with the refuse contained within the landfill shall be minimized. The method of diversion that shall be used in the proposed landfill plan includes the use of interceptor ditches placed along the sides of the canyon at the edge of the fill area with a lower gradient retention pond. These perimeter ditches shall divert overland runoff from flowing onto the fill areas in addition to collecting runoff from precipitation that falls directly onto the covered fill surface. The ditches shall be lined except in bedrock or on slopes of less than 1 percent. *Grading plans may require the review and approval of the County Department of Public Works.*	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services/ County Department of Public Works* 3. Department of Health Services/ County Department of Public Works	Plan Review/Periodic Field Checks
2	Prior to the issuance of a *Solid Waste Facilities Permit*, a final design plan based upon the conceptual design plan shown in Exhibit 16 shall be prepared depicting how runoff shall be returned to the natural stream channel below the operational portion of the site with use of a retention pond to control storm water discharge flow and reduce final sediment load. *Grading plans may require the review and approval of the County Department of Public Works.*	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services/ County Department of Public Works.* 3. Department of Health Services/ County Department of Public Works.	Plan Review

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
3	Prior to the issuance of a *Solid Waste Facilities Permit*, a final design plan based upon the conceptual design plan shown in Exhibit 16 shall be prepared depicting how daily, intermediate, and final covers shall be implemented to minimize infiltration through the refuse and the resulting generation of leachate. *Grading plans may require the review and approval of the County Department of Public Works.*	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services/ County Department of Public Works.* 3. Department of Health Services/ County Department of Public Works.	Plan Review
4	Prior to the issuance of a *Solid Waste Facilities Permit*, the final surface water collection system shall be designed based upon the conceptual design plan shown in Exhibit 16 to contain excess runoff and suspended sediments. Water leaving the sedimentation pond shall be monitored so as to achieve proper runoff rates and acceptable suspended sediment loads. Energy dissipators shall decrease the peak flow rate. County Department of Public Works storm/surface water standards and infrastructure capacity shall be met. *Grading plans may require the review and approval of the County Department of Public Works.*	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services/ County Department of Public Works.* 3. Department of Health Services/ County Department of Public Works.	Plan Review/Periodic Field Checks
5	During *landfill operations*, the application of daily, intermediate, and final covers shall limit the percolation of water into the landfill. The final cover shall be compacted and graded with a minimum 3% gradient to preclude percolation of rain water and to direct runoff away from the refuse into drains that ultimately discharge into the sedimentation basin. An onsite sedimentation basin shall be designed to limit peak runoff levels at or below existing levels. *Grading plans may require the review and approval of the County Department of Public Works.*	During *landfill operations*	1. Applicant *2. Department of Health Services/ County Department of Public Works.* 3. Department of Health Services/ County Department of Public Works.	Plan Review/Periodic Field Checks

Source: STA Planning, Inc.

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
6	During *landfill operations*, surface drains shall be installed and maintained so that surface runoff is diverted from working slopes and isolated from contact with the refuse waste. Onsite drainage channels shall meet 100-year storm conditions and 24-hour rainfall conditions. *All drainage outlets shall be periodically inspected and silt, debris or other material obstructing the outlets shall be removed. Grading plans may require the review and approval of the County Department of Public Works.*	During *landfill operations*	1. Applicant *2. Department of Health Services/ County Department of Public Works.* 3. Department of Health Services/ County Department of Public Works.	Plan Review/Periodic Field Checks
NOISE				
1	All power equipment shall be sound-attenuated so as not to exceed 65 dBA at the southern and western property lines.	During *landfill operations*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Check
WATER QUALITY				
Groundwater Quality				
1	The operation and final closure of the landfill project shall be monitored by the *County of Los Angeles*, designated as the local enforcement agency by the California *Integrated* Waste Management Board (CIWMB) as well as by the RWQCB. These *enforcement agencies* have broad latitude in their authority to require measures of abatement regarding water quality problems that may arise during the operation of the landfill.	During operation and Final Closure procedures	1. Applicant 2. Department of Health Services 3. Department of Health Services	Plan Review/Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
2	During *landfill operations* to supplement the *natural* containment features of the site, a compacted clay of 1 x 10^{-6} cm/sec hydraulic conductivity shall be placed along the base the landfill extension area. The liner will provide an additional measure of groundwater quality protection to the geologic substructure which underlies the site.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review/Periodic Field Checks
3	Prior to depositing waste material, an internal leachate collection and removal system (L.C.R.S.) shall be installed at the base of the landfill. This system shall control any generated leachate with proper disposal thereof consistent with Regional Water Quality Control Board requirements. The collection system shall consist of a filter rock blanket embedded with a system of collection pipes that transport the collected fluid to a leachate sump. The filter rock blanket shall be comprised of angular, well graded, crushed rock. The blanket will be placed over the basal surface of the landfill. The leachate collection tank shall be sampled and monitored on a regular basis for leachate characterization.	Prior to depositing waste	1. Applicant *2. Department of Health Services and RWQCB* 3. Department of Health Services and RWQCB	Plan Review
4	Prior to depositing waste material, the leachate collection and removal system (L.C.R.S.) shall be designed and installed in accordance with Article 2543(a) of Subchapter 15, Title 23, Chapter 23 of the California Code of Regulations which requires that the L.C.R.S. be "...designed, constructed, maintained, and operated to collect and remove twice the maximum anticipated daily volume of leachate from the waste management unit."	Prior to depositing waste	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
5	During *landfill operations*, the application of daily, intermediate, and final covers in accordance with applicable regulatory requirements shall be performed to restrict leachate formation by limiting the infiltration of liquids to the landfill mass.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review/Periodic Field Checks
6	An independent inspector shall be onsite during preparation of the soil liner and for verification of required conditions or operation, to the satisfaction of the local enforcement agency(s).	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
7	During *landfill operations*, groundwater quality monitoring in the surrounding groundwater basins shall continue in accordance with Regional Water Quality Control Board (RWQCB) requirements to assure that the landfill extension operation will not adversely effect adjacent groundwater basins. Should a change in water quality be detected, notice shall be given to the RWQCB, and the Board will implement corrective action.	During *landfill operations*	1. Applicant 2. Department of Health Services and RWQCB 3. Department of Health Services and RWQCB	Periodic Field Checks
Surface Water Quality				
8	During *landfill operations*, on-site excavating and compacting of the semi-permeable surface cover shall direct excessive amounts of surface water away from the fill. Surface water drainage shall be handled with an artificial drainage system, including ditches, berms, energy dissipators, and other stormwater management measures, all designed for high-flow capacity. This will prevent ponding (inundation), and the infiltration and percolation of the runoff through the refuse fill.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review/Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
9	Upon initiation of *landfill operations*, surface water quality shall be monitored by collecting grab samples on a regular basis for water quality analysis to ensure that water-quality protection standards as determined for the site by both Regional Water Quality control Board and the Los Angeles County Department of Public Works are not exceeded. Samples shall be taken both below the sedimentation basin and at each major discharge site into the sedimentation basin. This monitoring program shall continue for the entire active life of the site, which shall include post-closure monitoring.	During *initial* grading	1. Applicant 2. Public Works and RWQCB 3. Public Works and RWQCB	Periodic Field Checks
Permeability				
10	Prior to the issuance of a *Solid Waste Facilities Permit*, the portion of expansion area underlain by alluvial units and arkosic sandstone shall contain the required lining necessary to meet state criteria for landfill construction.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Review/Periodic Field Checks
11	During *landfill operations*, the onsite material represented by the clay shale member of the Anaverde Formation shall be periodically evaluated as excavation proceeds to ascertain that permeability standards will be maintained during placement of the liner.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
AIR QUALITY				
Fugitive Dust Emissions				
1	Various dust suppression systems are currently employed for controlling dust emissions from access roads, cut areas, working faces and unpaved roads. These dust suppression methods, as well as other measures that become available, will be used to control dust emissions from the proposed project. Normal dust suppression methods include the use of watering trucks to reduce the potential fugitive dust emissions from roadways, waste disposal operations and excavating and grading activities, and the application of 6 inches of daily cover over the active working face.	During *landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
2	*During landfill operations, paved parking shall be provided and traffic on unpaved roads shall be reduced to less than 15 mph.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
3	During landfill operations, early paving of construction roads shall occur and chemical stabilization of blows and areas adjacent to paved areas shall be provided.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
4	During landfill operations, all excavation, grading, and soil removal operations shall comply with District Rule 403.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
Landfill Activity Emissions				
5	*During landfill operations, trucks shall be covered during on-road hauling and shall maintain a 2-foot freeboard height.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
6	*During landfill operations, soil binders shall be provided onsite on unpaved roads and parking areas.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
7	*During landfill operations, all equipment shall be properly tuned and maintained.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
8	*During landfill operations, low-sulfur fuel for all equipment shall be used wherever possible; power from existing sources shall be used; temporary power sources shall be avoided.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
Landfill Gas Emissions				
9	The landfill will be operated in accordance with South Coast Air Quality Management District Rule 1150.1 and other applicable SCAQMD regulations and will also comply with applicable Department of Public Works requirements.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Plan Check/Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
10	During the life of landfill, monitoring of landfill emissions shall continue. The surface shall be periodically monitored to ensure that the average concentration of total organic compounds [Reactive Organics (ROG) measured as methane] over the landfill surface does not exceed the SCAQMD's standard of 50 ppm.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
11	During the life of the landfill, monthly spot checks on the landfill surface will be made to determine that the maximum concentration of ROGs measured as methane measured at any one point on the landfill's surface does not exceed the SCAQMD's standard of 500 ppm.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
12	The landfill surface will be monitored on a monthly basis to ensure that the average concentration of total organic compounds [Reactive Organics (ROG) measured as methane] over the landfill surface does not exceed the SCAQMD's standard of 50 ppm.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
13	Periodically, 24-hour integrated gas samples and required meteorological data will be taken to assess any impact the landfill is having on the air at the landfill perimeter.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
Methane Gas Migration				
14	Prior to the issuance of a Solid Waste Facilities Permit, one probe per 500 feet of landfill perimeter will be installed. These probes will be monitored to ensure that quantities of gas are not venting offsite through the subsurface soils.	Prior to issuance of a Solid Waste Facilities Permit	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
15	If during monthly spot checks levels of landfill gas *migration* exceed the County of Los Angeles and/or SCAQMD standards, a Landfill Gas Control System shall be installed in compliance with the 1150.1 plan.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
16	*During the life of the landfill, monitoring, probing and other equipment used shall meet the EPA and SCAQMD standards.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*
Odor				
17	If an odor nuisance problem or hazard condition should develop, appropriate control measures shall be employed such as applying additional cover material or more frequent application of the cover material to seal the surface, or adjustments to the wells, or equipment.	During landfill operations	1. Applicant *2. Department of Health Services* 3. Department of Health Services	Periodic Field Checks
18	*During the life of the landfill, waste stored prior to landfilling shall not be exposed to rain and the potential for odor shall be avoided.*	*During landfill operations*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Periodic Field Checks*

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
BIOTA				
Vegetation				
1	Consistent with the City of Palmdale's Desert Vegetation Ordinance, joshua trees otherwise to be lost onsite, shall be transplanted offsite prior to the initiation of initial earth excavation to ensure their preservation. If necessary, a qualified expert shall be consulted to advise and oversee the transplanting program. It is most desirable that the trees be relocated as close to their original location as possible. The opinion and advise of the expert to be consulted shall represent the ultimate decision in this regard.	Prior to issuance of *Solid Waste Facilities Permit*. Submit detailed report to Department of Regional Planning.	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Plan Review
Tributary to Anaverde Creek				
2	Pursuant to Section 1601-1603 of the California State Fishing and Game Code, the California Department of Fish and Game should be notified prior to any alteration of the blue line drainage traversing the property. The purpose of this notification is to allow the state to regulate alterations to streamed habitats, including, but not necessarily limited to, those drainages which are shown by a "blue line" in U.S.G.S. 7.5 minute quad sheets.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant 2. California Department of Fish and Game 3. Department of Health Services	Plan Review
3	Prior to issuance of a *Solid Waste Facilities Permit*, the project engineer shall develop and implement erosion and siltation control plans, as necessary to prevent graded and cleared areas from being eroded, resulting in the transport of sediment into the drainages on site an downstream to Anaverde Creek where it may adversely impact habitat areas.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant 2. Department of Public Works 3. Department of Public Works	Plan Review

Source: STA Planning, Inc.

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
CULTURAL RESOURCES				
Archaeology				
1	In accordance with Appendix K in the California Environmental Quality Act, if engineering or other project parameters will not allow preservation, the applicant shall subject the onsite deposits of shell and lithic material detected during the reconnaissance of site Ca-LAn-876 *and site AVL-1* to a data recovery excavation and recordation. The applicant shall be responsible for all costs incurred for archaeological excavation and reporting. The data recovery excavation and recordation shall be performed prior to the issuance of a *Solid Waste Facilities Permit* and include the development of a mitigation plan.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Documented Proof of Activity
2	All material collected during the above recommended work shall be donated to an institution which has adequate facilities for curation, display and use by interested scholars and the general public.	Prior to issuance of *Solid Waste Facilities Permit*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Documented Proof of Activity
3	A qualified archaeologist shall be present during clearing and initial grading of the property to monitor any additional deposits obscured by brush or buried by alluvial material. The monitoring archaeologist shall be prepared to document and recover any significant material that appears as quickly as possible using standard archaeological field practice.	During *initial* grading	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Period Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
Paleontology				
4	During *landfill excavation*, a qualified paleontologist shall be retained to perform periodic inspections of excavations and, if necessary, salvage exposed fossils. The frequency of inspections will depend on the rate of excavation, the materials being excavated, and the abundance of fossils. During grading, the paleontologist shall be allowed to divert or direct grading in the area of an exposed fossil to facilitate evaluation and, if necessary, salvage. Because of the small nature of some of the fossils possibly present in the study area, samples of the sediments shall be collected for processing through fine mesh screens.	During *landfill excavation*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Checks
5	All fossils collected during *landfill excavation* shall be donated to a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County. Provisions for preparation and curation shall be made before the fossils are donated to their final repository.	During *landfill excavation*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Documented Proof of Activity
VISUAL QUALITIES				
Litter				
1	During *landfill operations*, airborne litter shall be controlled by litter fences.	During *landfill operations*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Checks
2	During conditions of severe wind, operating hours shall be limited, size of the working face shall be reduced, and completed cells shall be promptly covered.	*During landfill operations*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Checks

Source: STA Planning, Inc.

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
3	During *landfill operations* and after construction, personnel members shall be assigned the task of daily patrolling for purposes of litter cleanup.	During *landfill operations*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Checks
TRAFFIC				
Existing Conditions				
1	Operating signals at the intersections of Palmdale Boulevard and SR-14 northbound and southbound ramps shall be installed prior to the acceptance of any refuse into the proposed expansion area. Installation of the signals shall be funded by the City of Palmdale and/or the applicant. If the applicant funds installation of the signals, he shall be entitled to receive reimbursement for implementing this mitigation measures from the project's "fair-share" fees collected by the City of Palmdale.	Prior to acceptance of any refuse	1. Applicant 2. Public Works - Traffic 3. Public Works - Traffic	Plan Review
Cumulative Impacts				
2	The project along with other future cumulative projects, shall on a "fair-share" basis, contribute sufficient funds to offset the costs of implementing the recommended mitigation measures contained within the Palmdale Southwest Area Study.	Prior to acceptance of any refuse	1. Applicant 2. Public Works - Traffic 3. Public Works - Traffic	Plan Review/Receipt of Payment
3	It is anticipated that the assumed circulation system (refer to Exhibit 49) will be implemented by the year 2010. As a result, City Ranch Road will be a four-lane divided facility along the project access. At the time of City Ranch Road improvement, a 250-foot long left-turn lane shall be installed at the project access in order to provide queuing space for left turning trucks onto the site access road.	Prior to City Ranch Road improvement	1. Applicant 2. Public Works - Traffic 3. Public Works - Traffic	Plan Review

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
4	During landfill operations, composting or resource recovery activities shall be encouraged by the applicant to reduce the volume of waste materials, thus assists in reducing future traffic flows at the landfill.	During landfill operations	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	Periodic Field Checks
5	*During landfill operations, worker rideshare and transit plans shall be encouraged by the landfill operator consistent with the goals of the Air Quality Management Plan.*	*During landfill operations*	1. Applicant 2. Department of Health Services 3. Department of Regional Planning	*Periodic Field Checks*
ENVIRONMENTAL SAFTEY				
1	During landfill operations, the existing refuse inspection program which involves a staff inspection of incoming loads and includes an inspector who is assigned to monitor materials as they are dumped on the operating face shall be continued for expansion operations.	During landfill operations	1. Applicant 2. Department of Health Services 3. Department of Health Services	Periodic Field Checks
2	During landfill operations, in the event that hazardous waste is discovered by the landfill operator at the working face the operator shall: 1) detain the vehicle driver and obtain his driver's license and vehicle license number; 2) notify the Hazardous Materials Units of the Los Angeles City Police Department; and 3) notify the County of Los Angeles Department of Health Services, Hazardous Waste Control Program so that these agencies can impose criminal penalties on the hauler(s).	During landfill operations	1. Applicant 2. Department of Health Services 3. Department of Health Services	Periodic Field Checks
3	During landfill operations, procedures for disposal of hazardous material/waste shall be provided to waste haulers on a routine basis. Notices shall also be posted at convenient locations on the site to inform waste material haulers of the rules and regulations governing the disposal of hazardous waste.	During landfill operations	1. Applicant 2. Department of Health Services 3. Department of Health Services	Periodic Field Checks

Source: STA Planning, Inc.

MITIGATION MONITORING PLAN (CONT'D.)

Mitigation Measure Number	Mitigation Measure	Monitoring Milestone (Frequency)	1. Responsible Party 2. Enforcement Party 3. Monitoring Party	TIMING
4	*Prior to depositing waste material, a radioactive detector shall be established at the gate house in order to detect the presence of radioactive materials.*	*Prior to depositing waste*	1. Applicant *2. Department of Health Services* 3. Department of Health Services	*Documented Proof of Activity*

Source: STA Planning, Inc.

Appendix A-5

Remaining Refuse Disposal Capacity of Active in County Landfills 2003

Remaining Refuse Disposal Capacity of Active In County Landfills 2003

WASTE DIVERSION

AB 939 required that all jurisdictions in California divert 50% of their waste by the year 2000 and thereafter. Jurisdictions in California committed a tremendous amount of resources to achieve the required 50% diversion rate by the 2000 deadline and have continued to pursue that rate. Most jurisdictions have had residential recycling programs, waste reduction and recycling education programs, green waste and other diversion programs tailored specifically for their particular needs. However, by the year 2000, in Los Angeles County, 74% of the jurisdictions had diversion rates of less than 50% and 53% of the jurisdictions had diversion rates of less than 40% based on the CIWMB data base preliminary numbers. Additionally, it will be difficult for jurisdictions to achieve the last increment of required diversion since, in many cases, the most effective and economical programs have already been implemented. Complicating this matter further are the expected changes in population and economic activity that will increase the volume of waste generated.

It is expected that generation of waste for disposal will increase in Los Angeles County due to projected population and positive economic growth factors. In addition to Los Angeles County, the Antelope Valley growth is expected to continue through at least the next two decades. The high desert climate coupled with the growth of the industrial areas and the future Palmdale International Airport have caused the Antelope Valley to rank as one of the fastest growing areas of Los Angeles County. Based upon population projections of the Los Angeles County Department of Regional Planning (LACDRP), the Antelope Valley was expected to grow in population by as much as 111,000 people from 1980 to the year 2000.

The projected growth rate over the next 10 years will result in the generation of approximately 8,000 tpd in Los Angeles County of additional waste over the current generation rate that must be managed. Assuming the resource recovery programs currently in-place in Los Angeles County had reached their maximum effectiveness, a minimum of 4,000 tpd of additional daily permitted landfill capacity would be needed to accommodate the population and economic growth.

Additional daily refuse capacity will also be needed due to the closures of the other regional landfills over the next 10 years (e.g., Bradley and Puente Hills). It is therefore not feasible to expect that diversion alone will be adequate to accommodate anticipated growth, landfill closures, and associated reductions in system wide daily permitted refuse capacity.

In the following discussion about Waste Generation, specific information should be provided about waste generation by Palmdale, Lancaster and surrounding Antelope Valley communities. Subsequent discussion about County Waste Generation should be moved to a separate Chapter.

WASTE GENERATION

As previously discussed, most jurisdictions in Los Angeles County have maximized the available avenues to increase waste diversion. This fact, coupled with the economic and population growth, has created increased waste generation in Los Angeles County for the last five years. Currently, waste disposal is handled in one of two ways: disposal in a landfill and/or incineration to produce electricity in a refuse-to-energy facility. Waste destined for landfilling is accepted at either an in-County disposal facility or exported to an out-of-County landfill.

The total waste generated for disposal in Los Angeles County presented does not include inert or construction/demolition wastes destined for landfills. Total solid waste generation after diversion within Los Angeles County was 11,523,142 tons in 2002. Using 307 work days/year, this annual volume of waste translates into an average of 37,534 tpd.

The total volume of waste disposed in Los Angeles County landfills in 2002 was 8,973,755 tons or 29,230 tpd. Approximately 2,009,845 tons of waste was exported from Los Angeles County in 2002, which results in an average of 6,546 tpd of waste exported out-of-Los Angeles County in 2002. Another 539,542 tons were burned at the two waste-to-energy plants (Coastal Resource Enhancement Fund (CREF) and Southeast Resource Recovery Facility (SERRF)) in 2002.

IN-COUNTY SOLID WASTE DISPOSAL SYSTEM (MOVE TO SEPARATE CHAPTER)

Currently, solid waste disposed in Los Angeles County can be received at one of 15 facilities, including 13 landfills and two waste-to-energy plants as shown on **Table 1**.

TABLE 1
IN-COUNTY LANDFILL AND REFUSE-TO-ENERGY FACILITIES
MAXIMUM DAILY PERMITTED CAPACITY

	Facility Name[2]	Operator Type	Facility Type	Permitted TPD	Effective TPD[1]
1	**Antelope Valley[3]**	**Private**	**Landfill**	**1,400**	**1,400**
2	Bradley	Private	Landfill	10,000	600
3	Burbank	Public	Landfill	240	154
4	Calabasas	Public	Landfill	3,400	1,738
5	Chiquita Canyon	Private	Landfill	6,000	6,000
6	Commerce Refuse-to-Energy Facility (CREF)	Public	Waste-to-Energy	1,000	565
7	Lancaster[3]	Private	Landfill	1,700	1,700
8	Puente Hills	Public	Landfill	13,200	13,200
9	Savage Canyon	Public	Landfill	350	268
10	Scholl Canyon	Public	Landfill	3,500	1,482
11	South East Resource Recovery Facility (SERRF)	Public	Waste-to-Energy	2,240	1,900
12	Sunshine Canyon	Private	Landfill	6,600	6,600
	Total Permitted TPD			**49,630**	35,607

Source: CEWMP SWIS Information Data Base

[1]Effective TPD is based on the current tonnage data obtained through April 2004.
[2]Does not include Pebbly Beach, San Clemente and Brand Park Landfills.
[3]Applied for expansion and/or increase to 3, 000 tpd of landfilled material.

It is important to note that, for purposes of this analysis, the Brand Park, Pebbly Beach, and San Clemente Landfills were not considered in the discussion of existing in-County landfill capacity. Pebbly Beach Landfill is located on the Island of Catalina and handles a limited portion of the island's waste. The San Clemente Landfill is owned and operated by the United States Navy and is available for use only by the Navy. In addition, both of these facilities have extremely limited remaining disposal capacity. Based on

information presented on the CIWMB website, Brand Park Landfill has no remaining landfill capacity. Therefore, the list of 10 in-County landfills and two waste-to-energy facilities presented in **Table 1** does not reflect these three sites.

As shown on **Table 1**, Los Angeles County's landfills and waste-to-energy facilities have a combined permitted daily refuse capacity of 49,630 tpd. Although the 49,630 tons of permitted daily capacity for the current in-County waste disposal system exceeds the average of 37,534 tpd of waste generated for disposal in-County in 2002, the permitted daily capacity does not reflect actual site specific limitations. Only five landfills in Los Angeles County are private and have no restrictions on waste acceptance. The Puente Hills Landfill, operated by Los Angeles County Sanitation Districts (LACSD), can accept waste from all areas in the County with the exception of the City of Los Angeles. The remainder of the sites have some sort of restriction (i.e., waste shed limits) effectively reducing their permitted daily inflow rate. The effective reduction of permitted daily capacity is discussed below.

DAILY REFUSE CAPACITY EVALUATION (MOVE)

Traditionally, refuse capacity analyses have focused on total refuse disposal capacity or airspace volume and not on daily permitted capacity. As discussed above, approximately 11,523,142 tons of refuse was generated for disposal in Los Angeles County in 2002, or 37,534 tpd. After removal of the waste that was exported and that processed through the County's two transformation facilities approximately 8,973,755 tons of waste, were disposed of in Los Angeles County landfills or 29,230 tpd. The current permitted daily inflow rate is 49,630 tpd, therefore, based on tons disposed in 2002, it would appear that the Los Angeles County solid waste system has sufficient permitted daily capacity. In fact, it appears that the County has sufficient permitted daily capacity to handle the total waste generated for disposal. However, currently permitted and long-term daily refuse capacity in Los Angeles County is "effectively" reduced by several factors including:

- Wasteshed Restrictions
- Facility Design Limitations
- Limited Remaining Capacity
- Waste Stream Restrictions
- Geographic Location

To better define the distribution of waste generated in Los Angeles County, the following definition of "effective" daily inflow rate is used. The "effective" daily inflow rate is defined as the actual amount of solid waste disposed at the landfills in Los Angeles County, versus the permitted daily amount (the limit the landfill can receive per day). The "effective" inflow rate for Los Angeles County landfills is 35,607 tpd. Based on the reported tonnage disposed for 2002 in Los Angeles County landfills of 37,534 the County currently has a daily refuse capacity deficit of approximately 2,000 tpd. Furthermore, since 1999 waste generation in Los Angeles County has increased about one percent per year, further widening this deficit for 2003-04. This shortfall is currently made up by exporting waste of out-of-County. Fortunately, Los Angeles County has the ability to export waste to Orange, Riverside, and Ventura Counties. In 2002, approximately 2,009,845 tons of waste were exported from Los Angeles. Reliance on waste export gives Los Angeles County some relief by providing additional daily capacity. The current "effective" waste export limits to Los Angeles County are discussed below.

The current status of daily capacity within Los Angeles County is overstated if the permitted daily maximum inflow rates for all the active landfills with or without export are compared against what is actually generated within the County.

In addition, it should be noted that, landfills typically receive higher volumes of waste on Monday through Friday. Lower volumes are received on Saturday, with even lower volumes received if a site is open on Sunday. When analyzing daily inflow rates it is important to segregate the "effective" and average daily waste disposal (ADWD) for Monday through Friday, from Saturday. The permitted inflow rates for most Los Angeles County landfills are the same for each day the facility is open, except for the Puente Hills and Sunshine Canyon landfills. These sites have a daily and weekly maximum tonnage levels which lowers the amount of waste that can be received on Saturday, on weeks where waste volumes have been at or near the permitted maximum during the preceding week (Monday through Friday). For example, the Puente Hills Landfill is permitted to receive a maximum of 13,200 tpd or a maximum of 72,000 tons a week. Because Puente Hills receives waste at or very near its daily maximum Monday through Friday, the site "effectively" can only receive 6,000 tons on most Saturdays. The Sunshine Canyon Landfill is currently permitted by the County to receive a maximum of 6,600 tpd or a maximum of 36,000 tons a week. Because Sunshine Canyon receives waste at or very near its daily maximum Monday through Friday, the site "effectively" can only receive 3,000 tons on most Saturdays.

In addition to Puente Hills and Sunshine Canyon, the Chiquita Canyon Landfill has also been reaching its maximum daily inflow rate. The fact that these sites all have been or are currently receiving waste at or near their maximum permitted daily inflow rate is not surprising. All of these landfills have no restrictions on the origin of wastes accepted, except for Puente Hills. Waste is actually being turned away on a frequent basis at these landfills, increasing the potential for public health nuisances. To date, the remaining two private landfills (Antelope Valley and Lancaster) have some ability to accept additional waste.

WASTE EXPORT – DISPOSAL OPTIONS (THIS SHOULD BE LOCATED UNDER PROJECT ALTERNATIVES AND NOT HERE)

Out-of-County Options

Los Angeles County allows individual jurisdictions to dispose their waste at any facility, including exporting waste out-of-County, at their discretion. The following section will show that all out-of-County landfills in Southern California that are within truck haul distance (less than 150 miles) are currently limited in their ability to accept waste from Los Angeles County. This is due to one or more of the following factors:

- Existing permit conditions
- Existing or proposed ordinances
- Existing contractual agreements
- Local use of existing capacity
- Litigation

Based on a review of the current state of solid waste management in the region, both public and private agencies have had extreme difficulty permitting additional or new disposal capacity in Los Angeles County. This has forced the County to rely on out-of-County landfills to meet its short- and long-term waste disposal needs. **Table 1** shows that available landfill capacity in the Southern California market is divided between landfills owned by public entities (e.g., local cities such as Whittier and Burbank, Orange County and the LACSD); and landfills owned or operated by private solid waste companies (e.g., Allied Waste, Republic and Waste Management). Many publicly-owned landfills do not accept waste from outside their jurisdictions.

Conversely, privately-owned landfills generally accept waste from outside the jurisdiction where they are located. In some cases the local jurisdiction controls or influences, by permit or agreement, the private

landfills' ability to import waste from outside the jurisdiction, and may impose conditions or fees upon such importation.

Currently, solid waste generated for disposal in Los Angeles County is exported to Orange, Riverside, and Ventura Counties. The following discussion presents information on the status of these export sources and describes other, less preferable sources available to Los Angeles County.

Orange County: Until about five years ago, an Orange County ordinance expressly banned the import of waste into any Orange County landfill. However, as a result of the severe financial crisis caused by Orange County's bankruptcy, the County made a decision to import waste into its landfill system and transfer the profits from such importation into the County general fund. Imported waste is accepted at the Olinda Alpha, Frank R. Bowerman, and Prima Deshecha landfills. Orange County can import up to 1.2 million tons of waste per year from out-of-County and to date has approximately that amount. Approximately 60 percent (2,500 tpd) of this waste import comes from Los Angeles County.

By ordinance, Orange County is barred from entering into any new or expanded agreements for additional waste import. Orange County may import waste through the year 2015. Waste load shifting could increase the volume of export available to Los Angeles County if another entity exporting waste to Orange reduces or eliminates the volume of their exports. Conversely, the level of export available to Los Angeles could also decrease if population growth in Orange County creates the demand for additional in-County disposal capacity.

Riverside County: A Riverside County ordinance prohibits disposal of any waste generated outside of its boundaries at any landfill in Riverside County, except at the Blythe, Eagle Mountain, and El Sobrante landfills. The only waste allowed at the Blythe Landfill is waste generated in and delivered from Arizona. The Eagle Mountain Landfill was permitted to receive waste from outside Riverside County, although the site is currently not ready to accept waste. The site is being purchased by the LACSD for use by Los Angeles County. The necessary infrastructure has not yet been built in Los Angeles County to transport the waste to Eagle Mountain. In addition, litigation is also pending regarding the Bureau of Land Management (BLM) land exchanges, the adequacy of the EIR/EIS and under valuation of the land. The Eagle Mountain site is a waste-by-rail facility, which is discussed further in this section. The El Sobrante Landfill is, therefore, the only landfill in Riverside County that may accept waste exported from Los Angeles County. The maximum daily inflow rate for out-of-County (import) waste is 7,500 tpd of the maximum 10,000 tpd.

Ventura County: Ventura County has two active landfills: the Toland Road Landfill and the Simi Valley Landfill. The Toland Road Landfill is operated by the Ventura County Sanitation Districts, and the Simi Valley Landfill is owned and operated by WMI. The Toland Road Landfill's CUP prohibits the disposal of any waste originating from outside of Ventura County, with the exception of a limited amount of waste from Santa Barbara County. The Simi Valley Landfill (private) receives approximately 500 tpd from Los Angeles County. This waste primarily originates from the waste shed in or around the Calabasas Landfill. However, the Simi Valley Landfill's CUP and Operating Agreement with Ventura County mandate that the vast majority of its daily capacity be reserved for Ventura County waste. It is, therefore, limited in its potential to become a regional waste import site.

San Bernardino County: A San Bernardino County ordinance prohibits the disposal of any waste generated outside of its boundaries at any San Bernardino County landfill, except for the Colton Landfill. The Colton Landfill is located in unincorporated San Bernardino County near the City of Colton, a considerable distance from Los Angeles County. The site is owned and operated by the County of San Bernardino and is permitted to accept up to 3,100 tons of refuse per day. In the first six months of 2002, the site received an average of 1,000 tpd, with minimal amounts coming from Los Angeles County. The

site had approximately 0.85 million tons of remaining permitted capacity at the end of 2000, and is therefore not a viable future source of daily capacity for Los Angeles County.

Kern County: The County of Kern owns all of the solid waste landfills within Kern County. The tipping fees charged at County landfills pay for only a portion of overall site operating costs. The remaining operating costs are collected through property tax assessments. To collect all revenue required to operate its landfills, Kern County does not accept out-of-county waste for disposal at its landfills.

Waste by Rail

Waste-by-Rail requires local and remote infrastructure. The local infrastructure includes material recovery facilities and/or transfer stations, and rail loading facilities. The remote infrastructure includes waste unloading and transport facilities and the disposal site. In August 2000, the LACSD entered into purchase agreements to acquire the Mesquite Regional Landfill project in Imperial County and the Eagle Mountain Landfill project in Riverside County, both of which are permitted to import out-of-county waste by rail. The Mesquite Regional Landfill and Eagle Mountain Landfill are the only two permitted waste-by-rail landfills in California, and are the two sites the LACSD plans to use in its waste-by-rail system.

The Mesquite Landfill and the Eagle Mountain Landfill will only become viable waste disposal alternatives after the appropriate waste handling, transport, and landfilling infrastructure are completed. The Puente Hills MRF was designed to handle 4,000 tpd and should be fully operational in 2004. However, an additional 8,000 tpd of materials recovery and rail loading capacity would still be necessary just to accommodate the waste currently being accepted at the Puente Hills Landfill.

Other permitted waste-by-rail landfills in the Western United States are located in Arizona, New Mexico, Oregon, Utah, and Washington. Currently, there has been no movement to use these more remote out-of-state sites, especially with the purchase of the Mesquite Regional and Eagle Mountain waste-by-rail landfills by the LACSD.

Summary

Waste export is currently only being sent to three neighboring counties, Orange, Riverside, and Ventura counties. Based on Los Angeles County's ability to utilize only a select number of facilities within these counties combined with the in-County landfill capacity, it appears that adequate daily and total refuse capacity is available. However, the current site and/or County-specific conditions and/or limitations effectively reduce the ability to dispose of Los Angeles County waste outside the County. Without additional landfill capacity, future demands created by continued growth and development within the region may not be met. Further, it is important to understand that the utilization of out-of-county facilities, which maybe located at greater distances than in-county landfills, may have potentially serious fiscal and environmental consequences, including 1) increased transportation and disposal costs; 2) loss of revenue to the County; and 3) increased traffic, noise, air quality, and related impacts associated with the increase in vehicle miles traveled.

Appendix B-1

Earth Resources and Earthquake Hazards, Golder Associates
October 2005

Golder Associates Inc.

230 Commerce, Suite 200
Irvine, CA USA 92602
Telephone (714) 508-4400
Fax (714) 508-4401
www.golder.com

EARTH RESOURCES AND EARTHQUAKE HAZARDS
PROPOSED EXPANSION
ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA

Prepared for:

Waste Management Inc.
25772 Springbrook Road
Saugus, California 91350

Prepared by:

Golder Associates Inc.
230 Commerce, Suite 200
Irvine, California 92602

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APPENDICES

Appendix A	Slope Stability Analysis

1.0 INTRODUCTION

A supplemental Environmental Impact Report (EIR) is currently under preparation for a proposed expansion of the Antelope Valley Public Landfill (AVPL). The EIR process requires review and analysis of earth resources at the proposed expansion site, including any proposed mitigation measures. A major earth resource issue at the proposed expansion site is the potential impact of earthquake-related hazards. Earthquake hazards are significant because the known trace of the San Andreas fault is less than one-half mile from the site.

Earth resources and earthquake-related hazards at the AVPL have been studied in detail over about the last 20 years (e.g. Buena Engineers, 1985; Kleinfelder, 1989a, b, c; Virogroup, 1993; Southland Geotechnical, 1993; GCE, 1999). This report:

- Summarizes past site-specific earth resources and earthquake hazard information; and
- Updates regional and site-specific earthquake hazard information.

Section 2 describes the general geological setting of the AVPL, including the earth materials known from surface and subsurface investigations of the site. Section 3 describes the seismic and tectonic setting of the AVPL, and provides up-to-date information on significant earthquakes and faults. Section 4 describes the geological hazards and their potential impacts at the AVPL. References are provided in Section 5.

2.0 GEOLOGICAL SETTING

The AVPL is located at the southern margin of the western Mojave Desert, which is part of the Transverse Ranges geomorphic province of California (California Geological Survey, 2002). The Transverse Ranges are characterized by east-west trending mountain ranges and deeply incised valleys. Rapid tectonic uplift, active faulting and folding of young geological units characterize the geological history of this province. Regional geology consists of pre-Tertiary (more than 65 million years old) granite and metamorphic basement rocks and mid- to late-Cenozoic Era (less than about 30 million years) volcanic and sedimentary rocks that underlie Quaternary (less than 1.6 million years old) alluvial and terrace deposits (Norris and Webb, 1990). The Transverse Ranges Province and adjoining Coast Range Province are the most seismically active parts of California.

The AVPL site is located on a narrow topographic ridge that is a southeastward continuation of Ritter Ridge. The topographic ridge sits within the zone of faulting and folding associated with displacement along the San Andreas fault (SAF). The SAF separates distinct geological terranes. Strongly metamorphosed Pelona schist and other basement rocks occur southwest of the SAF. Granitic rocks and Tertiary sedimentary and volcanic rocks of the Mojave region occur to the northeast.

Rocks on both sides of the SAF and within the fault zone have been subjected to intense faulting and folding. Major secondary faults, such as the Little Rock and Nadeau faults are considered by California Geological Survey (2003) to bound the major deformation zone of the SAF. The Little Rock fault and other smaller faults were mapped within the AVPL site by. Kleinfelder (1989a). The activity and earthquake hazard significance of these faults are discussed in Section 3.

2.1 Earth Materials

The geology of the AVPL site has been investigated in detail by Buena Engineers (1985), Kleinfelder (1989a, b) and GCE (1999). Figure 1 presents a summary the geology of the AVPL site based on these

earlier studies. Figure 2 provides a generalized cross section through the AVPL site. In general, the pre-Tertiary Period basement rocks present in the AVPL are quartz monzonite (qm) and granodiorite (gd). These rocks formed from magma that cooled within the crust about 100 million years ago. Uplift and erosion have exposed these rocks at the ground surface. The quartz monzonite is highly fractured and moderately weathered. The granodiorite is strongly weathered within the AVPL, and becomes increasingly fractured close to local faults.

Three members of the Pliocene-age (5.3 to 1.6 million years) Anaverde Formation are exposed within the limits of the AVPL:

- Lower red arkose-(Tar) is a red to pinkish tan, fine- to coarse-grained arkosic sandstone. The sandstone is weakly to moderately indurated, and contains some silty and pebbly beds. Unweathered portions are very hard; weathered portions are more friable.

- Middle gray arkose (Tag) is a gray to tan, fine- to coarse-grained arkosic sandstone with thin interbeds of shaly sand, pebble conglomerate, and cobble conglomerate. This unit is well indurated and resistant to weathering. The unit forms cliffs and ridges north of the SAF.

- Upper gypsiferous claystone (Tac) is a brown to black thinly-bedded claystone with abundant interbeds of gypsum, anhydrite, halite, and other evaporitic deposits. The rock unit contains occasional thin to thick beds of gray, pebbly, fine- to coarse-grained arkose. The claystone is intensely folded and sheared in the vicinity of the SAF.

Four Quaternary-age (less than 1.6 million years old) alluvial units have been identified and mapped within the AVPL. In order of decreasing age these alluvial units are: terrace deposits of the Harold formation; terrace deposits (Qt); older alluvium (Qo); and younger alluvium (Qal). The alluvial units comprise interbedded layers of gravel, sand and silt up to 50 feet (15 meters) thick.

3.0 SEISMIC HAZARDS AND FAULTING

The high level of historic earthquake activity in the Transverse Ranges geomorphic province indicates that seismic hazards could be important for the ongoing development of the AVPL. This section reviews current information available on the historic earthquake record, active faulting and related geological hazards relevant to the proposed AVPL development.

3.1 Historic Earthquakes

Large earthquakes and associated ground shaking have occurred regularly in the history of the greater Los Angeles area that includes the AVPL. The 1857 magnitude (M) 8 Fort Tejon, 1992 M 7.4 Landers and 1994 M 6.8 Northridge earthquakes are well known examples from southern California. Only the Landers earthquake epicenter was within 62 miles (100 km) of the AVPL. Figure 3 shows the location of earthquake epicenters greater than M 4 since 1973 and greater than about M 4.5 since the early 18th Century within about 62 miles (100 km) of AVPL. Table 1 provides details of the earthquakes with magnitudes of about 6 or greater within 62 miles (100 km) of the landfill site.

3.2 Major Faults

There are 21 known active fault earthquake sources within about 62 miles (100 km) of the AVPL site (Figure 3, Table 2) including a segment of the SAF adjacent to the AVPL. Table 2 indicates the distance from each earthquake source to the AVPL. Also shown is the estimated median peak horizontal ground acceleration (PGA) values site for each maximum magnitude or maximum credible

earthquake (MCE). These deterministic PGA values are calculated using the PGA attenuation relationship of Sadigh et al. (1997), which is based on strong motion records from California earthquakes.

3.2.1 The San Andreas Fault

The SAF and associated faults are a major component of the wide boundary zone between the Pacific and North American tectonic plates. The SAF is a continuous right-lateral strike-slip fault that strikes northwest throughout onshore southern and central California. High rates of historical seismicity and geomorphic and geologic evidence for coseismic rupture are known from many places along the SAF.

Petersen et al. (1996) divided the SAF into a number of discrete segments. Each segment is inferred to represent an independent earthquake source for the calculation of seismic hazard. The SAF near the AVPL is part of the Mojave segment that is about 64 ± 6 miles (103 ± 10 km) long. The Mojave segment has an estimated average slip rate of 30 ± 7 mm/year based on longer paleoseismic investigations summarized by WGCEP (1995).

Recent studies by Fumal et al. (2002) indicate that 14 large earthquakes have ruptured the Mojave segment of the SAF in the last 1500 years. The last surface rupture was during the Fort Tejon earthquake in 1857. Sieh (1978) estimated the earthquake epicenter near Cholame in Central California because the maximum horizontal slip of about 30 feet (9 m) occurred there. Several segments of the fault, including the Mojave segment ruptured in association with the 1857 earthquake.

The 1857 Fort Tejon earthquake resulted in more 225 miles (360 km) of surface rupture along the San Andreas Fault in Central and Southern California, including the part of the fault close to the AVPL. Sieh (1978) estimates that about 13 feet (4 m) of right-lateral, horizontal movement occurred near Lake Palmdale during this large earthquake. While surface rupture occurred adjacent to the AVPL site, the earthquake epicenter is considered by Sieh (1978) to be located about 150 miles (240 km) northwest of the AVPL site, near Cholame in central California. This epicenter is not included in Figure 1 because it is more than 62 miles (100 km) from the AVPL site, although strong earthquake shaking almost certainly occurred at the AVPL site during this earthquake.

The SAF was identified and mapped within the AVPL site by Kleinfelder (1989a, b) and GCE (1999). GCE (1999) mapped surface traces of the SAF in detail within the AVPL site. They identified the surface rupture trace associated with the 1857 and earlier earthquakes. Their mapping included accurate location of the surface fault trace and a recommendation that refuse be set back from the known fault trace.

4.0 GEOLOGICAL HAZARD IMPACTS

4.1 Potential for Active Fault Surface Fault Rupture at the Site

The SAF ruptured to the ground surface during the 1857 Fort Tejon Earthquake. Part of this surface trace is visible at the present ground surface and on pre-development aerial photographs of the AVPL (GCE, 1999). California Code of Regulations, Title 27, Division 2 require that Class III Landfill Units shall not be located on a known Holocene fault (Section 20260(d) Ground Rupture). A Holocene fault is a fault that is or has been active in the last 11,000 years.

Mapping by the State of California (Bryant et al., 2002; California Geological Survey, 2003) indicates that the Alquist-Priolo Earthquake Fault Zone (AP Zone) is within the southwestern part and adjacent to the northeastern boundary of the AVPL site (Figure 1). An AP Zone is a regulatory zone delineated by

the State Geologist (Chief of the California Geological Survey) where active faults may pose a surface rupture hazard for structures for human occupancy built within the zone.

Kleinfelder, (1989a, b & GCE, 1999) evaluated the potential for rupture of the ground surface along the fault traces at the AVPL. Their studies used geological mapping, aerial photograph interpretation and trenching studies to identify and evaluate the Little Rock, Fault A, and Fault B for surface rupture potential. GCE (1999) showed that Fault B had been incorrectly identified as a fault, and a geological contact was the more probable interpretation of the observed geologic contacts. Based on the lack of offsets in overlying Quaternary soils, the Little Rock and Fault A were considered to show no evidence of surface displacement in the last 11,000 years. The Little Rock and Fault A are not active as defined in California.

Kleinfelder (1989a, b) considered that there may be some potential for sympathetic displacement on mapped and unmapped faults during a major earthquake on the SAF. However, data supporting this conclusion have not been observed in previous studies of excavations or trenches at the AVPL site.

Figure 1 shows the location of SAF traces mapped by GCE (1999) with respect to the existing and proposed AVPL boundaries. SAF traces occur within the AVPL property along part of the south and southwestern property boundary. However, no known traces of the SAF cross or occur within the existing or proposed landfill footprint. No refuse will be placed across the known active trace of the SAF.

4.2 Earthquake Ground Shaking

Strong earthquake ground motions can be expected at the site from earthquakes caused by rupture of faults and other earthquake sources (Tables 1 & 2). Table 2 indicates that only three known active faults are estimated to produce median PGA values of more than 0.1g—the San Andreas, Sierra Madre and San Gabriel faults. However, other lower slip faults and background earthquake sources may generate PGA more than 0.1 g at the AVPL site.

Pyke (1994) and Pyke (2000) completed a site-specific deterministic analysis to develop design earthquake motions at AVPL. Their results provided estimates of PGA and spectral acceleration values, and recommended acceleration time histories. The design earthquake is a MCE on the SAF with a moment magnitude (M_w) of 8.0. Attenuation relations developed by Abrahamson and Silva (1997) were used to model the dependency of the maximum horizontal rock acceleration (MHA) and spectral acceleration on earthquake magnitude and distance for the M_w 8 earthquake at a very close distance (i.e., <1 km) to the site. These analyses indicate that design earthquake ground motions should be 0.89g parallel to the fault and 0.74g perpendicular to the fault.

4.3 Liquefaction

Liquefaction is the loss of soil strength due to increases in pore pressure and loss of effective stress from strong ground shaking during an earthquake. Soils most susceptible to liquefaction are loose, saturated silty fine sands. The Seismic Hazard Zones map for Ritter Ridge Quadrangle, (California Geological Survey, 2003) indicates that, based on regional geological and groundwater considerations, there is a potential for earthquake-related liquefaction of the unconsolidated Quaternary (Qal) soil deposits within the proposed project site. These soils occur predominately adjacent to Anaverde Creek. (Figure 1). The Seismic Hazard Zones map provides a guideline for identifying potential liquefaction areas which should be further evaluated. The map is not a substitute for site-specific liquefaction analysis.

Two studies have been conducted at AVPL to evaluate liquefaction potential in the ancillary facilities area of the site. Ganico (2001; 2002) completed geotechnical investigations for the maintenance facility and an LNG fuel station at AVPL, respectively. These investigations and measurements of the depth of ground water in monitoring wells (e.g. SCE, 2004) indicate that ground water is at present about 70 feet (21 m) beneath the service building area. Liquefaction is only considered a potential hazard if ground water is less than 50 feet (15 m) below ground surface. Ganico (2001; 2002) considered the liquefaction potential for the ancillary facilities area of the AVPL to be low due to the lack of free groundwater.

Most of the unconsolidated soils beneath the proposed landfill will be removed in the area of the landfill. Previous evaluations of soils beneath the disposal area by GCE (2000) identified only limited thicknesses of unconsolidated soils (less than 6 feet). High recorded blow counts in the alluvial soils, and substantial confining loads under the refuse fill, suggest the potential for liquefaction under the landfill lining system is low.

4.4 Slope Stability

The stability of the natural slopes within the AVPL was judged as satisfactory by Buena Engineers (1985). They observed no evidence of gross or deep-seated landslides. There was some evidence of surficial instability (less than 10 feet) of residual soils overlying the steeper Anaverde clay shale outcrops. They recommended that all residual soils be removed during landfill and slope grading. Table 3 shows permanent slopes and heights recommended by Buena Engineers (1985) for the earth materials at the AVPL.

Potential slope instability of the natural slopes is possible during severe seismic activity. Slope instability effects can be minimized by appropriate site grading and design. Kleinfelder (1991) reviewed slope stability of the existing natural slopes for the proposed landfill expansion. They found no evidence for gross or deep-seated landslides in natural or over-steepened cut slopes. California Geological Survey (2003) mapped three small areas within the AVPL site that may be susceptible to earthquake-induced landsliding. Their mapping was based on a regional assessment of rock type and slope angle, rather than site-specific investigations.

ViroGroup (1993) completed a slope stability analysis of the proposed landfill slopes during earthquake shaking. They found that seismically-induced displacements range from 0.2-1.5 feet during the design earthquake. They considered these displacements to be acceptable, and that the landfill slopes were stable under static and dynamic conditions.

A more detailed analysis of seismic stability of the landfill slopes was completed by Golder (2001), using the earthquake ground motions recommended by Pyke (2000). This analysis is provided in Appendix A. Golder (2001) determined that seismically-induced permanent deformations are expected in the upper slopes of the landfill. These deformations are acceptable provided provisions were made for the repair of the monolithic cover system after the earthquake.

4.5 Expansive Soils

Expansive soils were identified by Kleinfelder (1989 a, b) in the central portion of the expansion (Landfill II) site within the AVPL, particularly within the Upper gypsiferous claystone of the Anaverde Formation (Tac-Figure 1)). Claystone and silty claystone members of this unit are highly expansive.

Potentially expansive members of the Anaverde Formation crop out in the southern part of the proposed area for Landfill expansion. They also probably underlie the Quaternary age deposits immediately north of the known outcrops.

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TABLES

Table 1: Summary of M ≥ 6.0 Earthquake Epicenters within 62 Miles (100 km) of Antelope Valley Public Landfill (AVPL)

Date (mm-dd-yyyy)	Latitude (°N)[1]	Longitude (°W)	Magnitude	Distance from the AVPL (miles [km])[2]
12-08-1812	33.70	117.90	6.9	61 [98]
07-22-1899	34.30	117.50	6.5	41 [66]
10-23-1916	34.90	118.90	6.0	48 [78]
07-21-1952	35.00	119.02	7.7	58 [93]
07-21-1952	35.00	119.00	6.4	56 [91]
07-23-1952	35.37	118.58	6.1	60 [97]
02-09-1971	34.41	118.40	6.4	17 [28]
10-01-1987	34.06	118.08	6.1	34 [55]
02-28-1990	34.14	117.70	6.2	38 [62]
01-17-1994	34.21	118.54	6.8	32 [52]

Notes:
1. Locations and magnitudes were obtained from the USGS/NEIC PDE (1973-present) and California (1735-1974) earthquake catalogs. http://neic.usgs.gov/neis/.
2. Distance from the Landfill site based on location at 34.561°N, 118.150°W.

Table 2: Potential Large Earthquake Sources within about 62 miles (100 km) of Antelope Valley Public Landfill (AVPL)

Fault or Fault Segment[1]	Approx. Closest Distance from AVPL (miles [km])	Maximum Magnitude (M_w)[2]	Estimated Median PGA at AVPL (g)[3]	Average Return Period (years)
San Andreas (1857 Rupture Segment)	0 [0]	7.8	0.77	206
Sierra Madre (San Fernando)	23 [37]	6.7	0.11	1000
San Gabriel	24 [38]	7.0	0.13	1264
Verdugo	27 [44]	6.9	0.08	1608
Raymond Fault	29 [47]	6.5	0.05	1541
Hollywood Fault	33 [53]	6.4	0.04	626
San Cayetano	38 [61]	7.0	0.05	150
Garlock Fault Zone (West)	38 [61]	7.3	0.07	1000
Cucamonga	39 [62]	6.9	0.06	650
Newport-Inglewood	40 [65]	7.1	0.05	1006
San Jacinto (San Bernardino)	42 [67]	6.7	0.04	100
Elsinore (Whittier)	44 [71]	6.8	0.04	641
Garlock (East)	46 [74]	7.5	0.06	1000
Lenwood-Lockhart	47 [76]	7.5	0.06	5000
Malibu Coast Fault	50 [80]	6.7	0.03	2908
Pleito	50 [80]	7.0	0.04	706
Helendale	50 [81]	7.3	0.05	5000
North Frontal Zone (western)	54 [87]	7.2	0.04	1314
Palos Verdes	55 [88]	7.3	0.04	650
Elsinore (Glen Ivy)	55 [89]	6.8	0.03	340
Gravel Hills	58 [93]	7.1	0.03	5000

Notes:
1. Segment names, maximum magnitude and average return period after Petersen et al. (1996) and Cao et al. (2003).
2. Moment Magnitude (M_w) relates the size of earthquake to the area and average displacement on the causative fault.
3. PGA is median value calculated from Sadigh et al. (1997)

Table 3: Slopes and Heights for Earth Materials Recommended by Buena Engineers (1985) at Antelope Valley Public Landfill (AVPL)

Earth Material	Maximum Slope (horizontal:vertical)	Maximum Height (feet)
Alluvium (Qal)	1.5:1	50
Upper gypsiferous claystone (Tac)	0.75:1	60-80
Lower red and gray arkose-(Tar + Tag)	1:1	
quartz monzonite (qm) & granodiorite (gd)	1.5:1	

FIGURES

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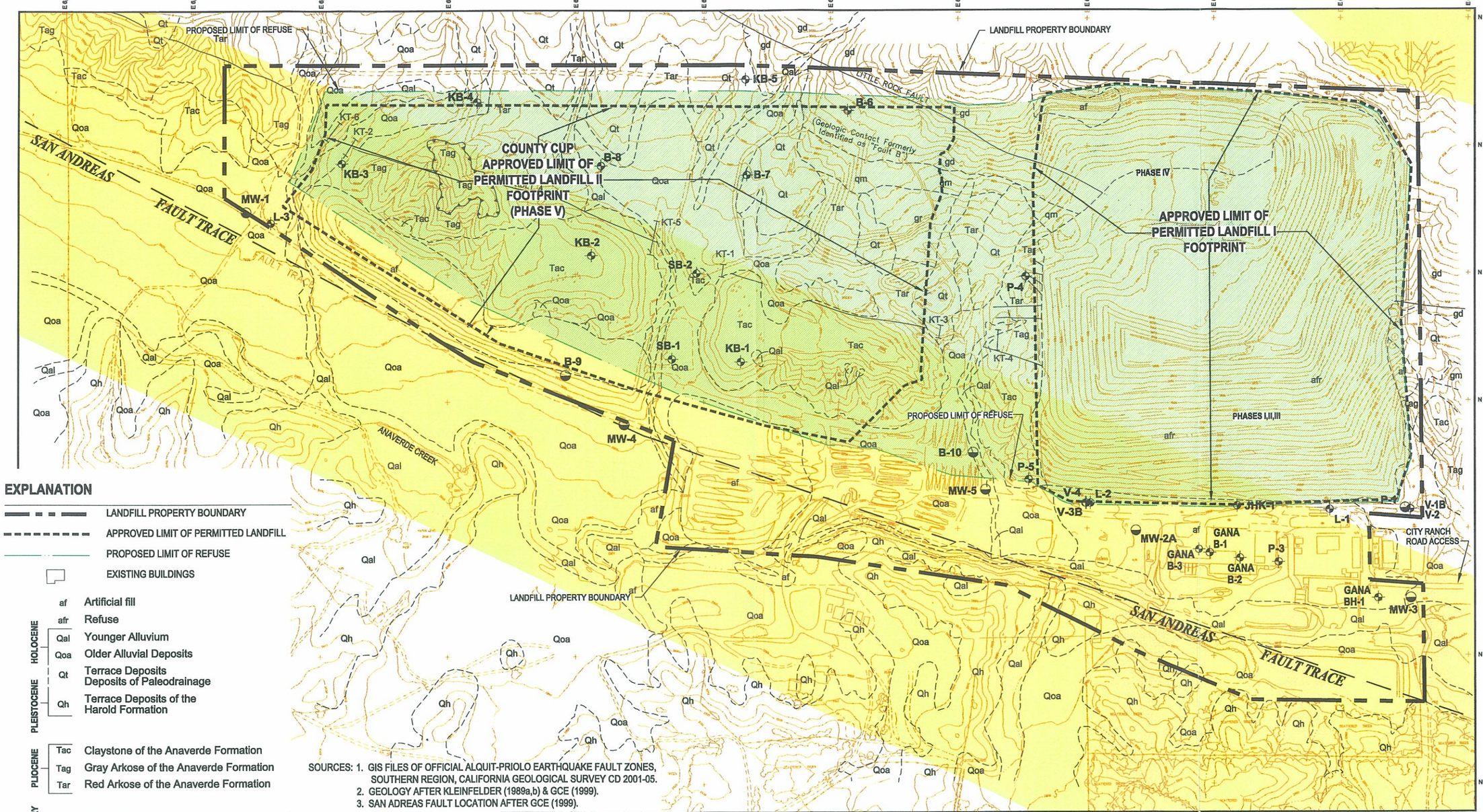

EXPLANATION

- LANDFILL PROPERTY BOUNDARY
- APPROVED LIMIT OF PERMITTED LANDFILL
- PROPOSED LIMIT OF REFUSE
- EXISTING BUILDINGS

	af	Artificial fill
	afr	Refuse
HOLOCENE	Qal	Younger Alluvium
HOLOCENE	Qoa	Older Alluvial Deposits
PLEISTOCENE	Qt	Terrace Deposits Deposits of Paleodrainage
PLEISTOCENE	Qh	Terrace Deposits of the Harold Formation
PLIOCENE	Tac	Claystone of the Anaverde Formation
PLIOCENE	Tag	Gray Arkose of the Anaverde Formation
PLIOCENE	Tar	Red Arkose of the Anaverde Formation
PRE-TERTIARY	qm	Quartz Monzonite
PRE-TERTIARY	gd	Granodiorite

SOURCES: 1. GIS FILES OF OFFICIAL ALQUIT-PRIOLO EARTHQUAKE FAULT ZONES, SOUTHERN REGION, CALIFORNIA GEOLOGICAL SURVEY CD 2001-05.
2. GEOLOGY AFTER KLEINFELDER (1989a,b) & GCE (1999).
3. SAN ADREAS FAULT LOCATION AFTER GCE (1999).

- GEOLOGIC CONTACT
- THRUST FAULT
- FAULT, Solid where mapped, dashed where inferred, dotted where concealed
- BORING LOCATION
- GROUND WATER MONITORING WELL LOCATION
- KT-3 EXPLORATION TRENCH
- ALQUIST - PRIOLO EARTHQUAKE FAULT ZONE

NOTE

TOPOGRAPHIC BASE MAP COMPOSITE FROM ANALYTICAL PHOTOGRAMMETRIC SURVEYS, INC., SURVEY FLIGHTS DATED JUNE 11, 1992 (FOR WESTERN AREAS) AND JANUARY 7, 2000 (FOR OPERATING LANDFILL AREA). CONTOUR INTERVAL IS 10 FEET.

200 0 200 400
scale feet

Golder Associates

1" = 400'

Figure 1
Geology, Fault Zones and Major Permit Boundaries

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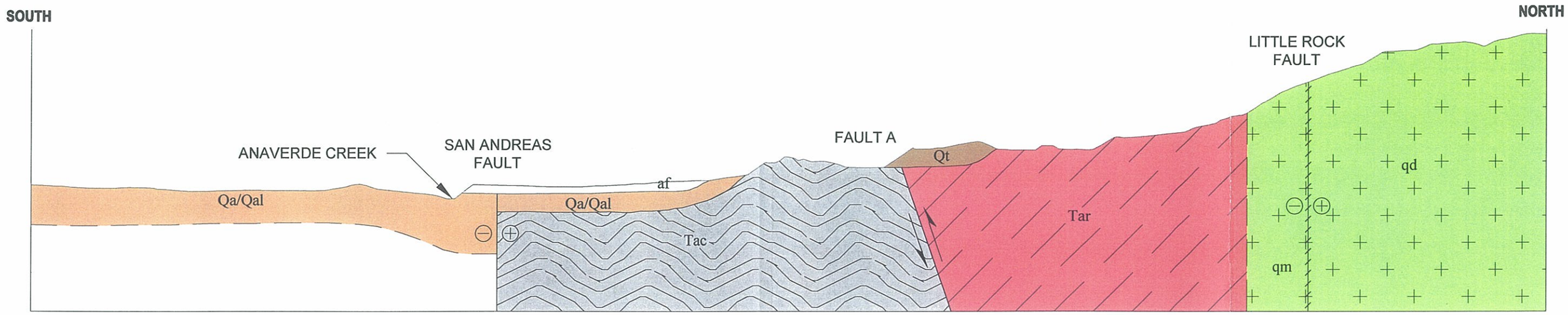

EXPLANATION

	af	Artificial fill
HOLOCENE	afr	Refuse
HOLOCENE	Qal	Younger Alluvium
HOLOCENE	Qoa	Older Alluvial Deposits
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PRE-TERTIARY	qm	Quartz Monzonite
PRE-TERTIARY	gd	Granodiorite

⊖⊕ Relative Horizontal Fault Movement
+ Movement Toward Observer
− Movement Away from Observer

Relative Vertical Fault Movement

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N.T.S.

Figure 2
Schematic Geologic Cross-sections of AVPL Site

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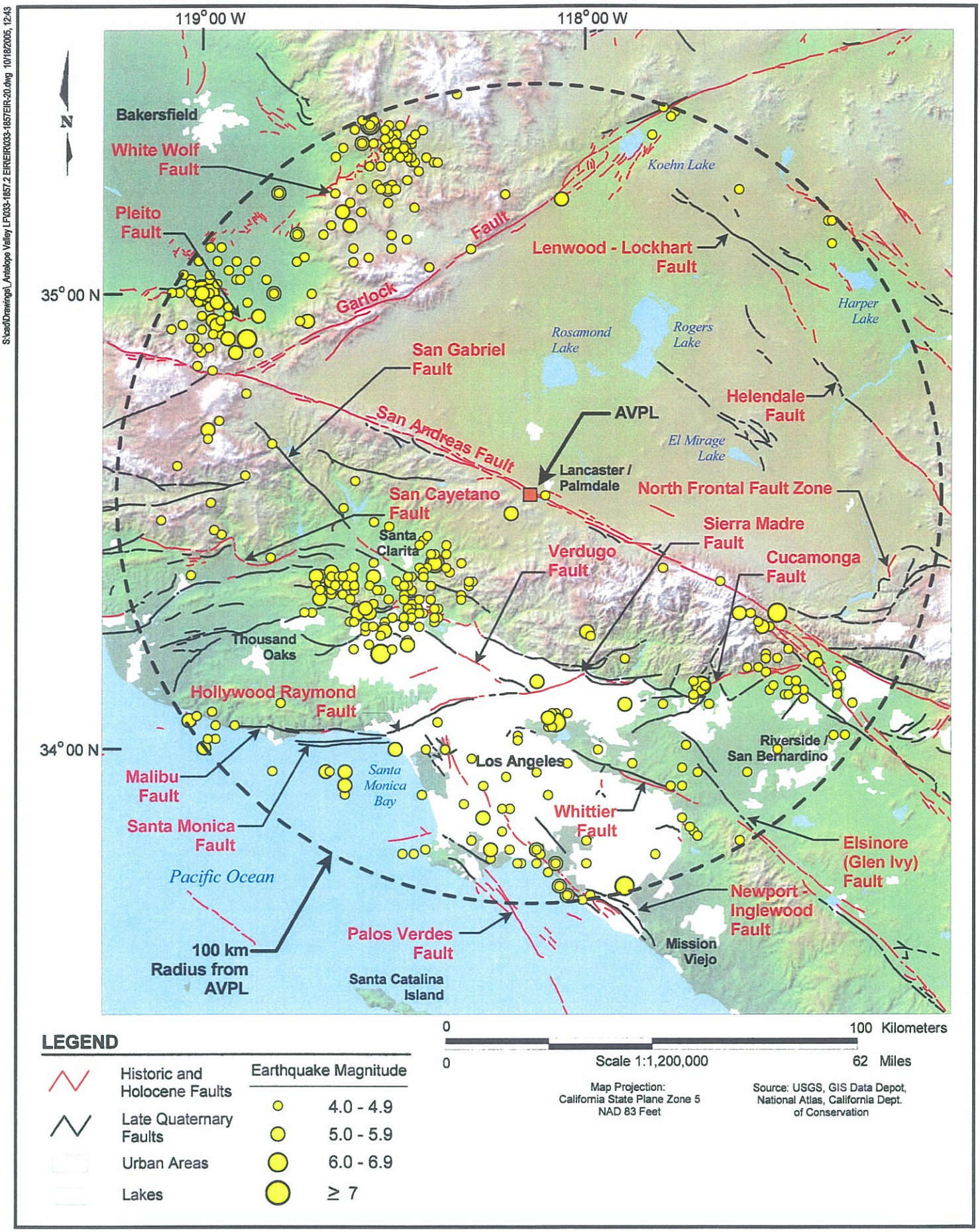

Golder Associates

scale as noted

Figure 3
Earthquakes and Active Faults within 62 Miles (100 km) of the Landfill

APPENDIX A
SLOPE STABILITY

Golder Associates Inc.

230 Commerce, Suite 200
Irvine, CA USA 92602
Telephone (714) 508-4400
Fax (714) 508-4401
www.golder.com

LANDFILL SLOPE STABILITY AND SEISMIC EXPOSURE REPORT
ANTELOPE VALLY PUBLIC LANDFILL
LOS ANGELES COUNTY, CALIFORNIA

Prepared for:

Waste Management Inc.
1200 West City Ranch Road
Palmdale, California 93551

Prepared by:

Golder Associates Inc.
10 Chrysler, Suite B
Irvine, California 92618

January 2001

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FIGURES

Figure 1-1: Site Location Map

Figure 2-1: Site Geologic Map

Figure 2-2: Fault Location Map

Figure 3-1: Refuse Fill Plan

Figure 3-2: Slope Stability Cross Sections

APPENDICES

Appendix A: Letter Reports by Bob Pyke

Appendix B: Laboratory Test Data

Appendix C: Slope Stability Output

LIST OF SYMBOLS

B	Bulk modulus
c	Cohesion intercept
E	Young's Modulus
E_i	Initial tangent modulus
f_{max}	Frequency cut off for dynamic site response analysis
G	Shear modulus
K_e	Primary loading modulus number, relates the confining pressure, σ_3, to the initial tangent modulus
K_b	Bulk modulus number, relates the confining pressure, σ_3, to the bulk modulus
K_g	Shear modulus constant, relates the mean effective stress, σ_m, to the shear modulus
K_{ur}	Unload/reload loading modulus number, relates the confining pressure, σ_3, to the unload/reload modulus
m	Bulk modulus exponent
n	Modulus exponent
n_g	Shear modulus exponent
P_a	Atmospheric pressure
R_f	Failure ratio, relates the asymptotic value of stress difference to the stress difference at failure
V_s	Shear wave velocity
V_p	Shear wave velocity
λ	Wavelength of seismic wave
ϕ	Friction angle
$\Delta\phi$	Reduction in friction angle for a ten-fold increase in confining pressure, σ_3
ρ	Mass density
σ_1	Major principal stress
σ_3	Minor principal stress
σ_m	Mean effective stress
$(\sigma_1-\sigma_3)_f$	Stress difference at failure or compressive strength
$(\sigma_1-\sigma_3)_{ult}$	Asymptotic value of stress difference, related closely to the strength of the soil
ν	Poisson's ratio

1 INTRODUCTION

1.1 Proposed Development

The Antelope Valley Public Landfill (AVPL) is a Class III municipal solid waste landfill located approximately 60 miles northeast of downtown Los Angeles, in Palmdale, California. The AVPL currently consists of two permitted landfills owned and operated by Antelope Valley Recycling and Disposal Facility, Inc. Landfill I is located in the eastern portion of the property and consists of Phases I, II, III, and IV. Phase IV is currently accepting waste. Landfill II, which is located to the west of Landfill I, is a proposed expansion that has not been constructed at this time. The proposed landfill expansion involves the combining Landfills I and II, raising the top deck elevation. This report presents the results of slope stability analyses performed for the combined expansion of Landfills I and II. The location of the site is shown on Figure 1-1. This work was conducted in accordance with Golder's proposal dated January 28, 2000 and subsequent revisions.

1.2 Elevation Datum and Horizontal Control

Elevations in this report are given in feet above mean sea level (MSL). Horizontal control is based on the existing project coordinate scheme.

1.3 Objective and Scope of Investigation

The objective of this study for the Landfill expansion is to evaluate the seismic exposure, and the stability of proposed final refuse slopes and monolithic soil cover to support the design of the landfill grading. Development of the landfill requires that stability analyses be performed in accordance with California Code of Regulations (CCR) Title 27. A description of the scope of work performed to achieve these objectives is presented below.

Based upon a review of the previous reports, Golder developed geotechnical/geologic models of two (2) representative cross-sections at the site and provided conclusions and recommendations regarding the following:

- Potential for fault-related ground rupture;
- Potential for soil liquefaction;
- Static slope stability analyses of final refuse slopes and monolithic soil cover system;
- Dynamic site-response analysis of the cross-sections; and
- Dynamic displacement analysis of sliding along the landfill/liner interface and monolithic soil cover system.

2 SITE AND SUBSURFACE CONDITIONS

2.1 Site Description

A brief description of the landfill is given in Section 1.1. The current project involves the combination of Landfills I and II, and raising the combined top deck elevation to El 3,200 feet.

2.2 Topography

The AVPL lies immediately north of the Anaverde Creek drainage, a linear topographic depression formed by the San Andreas Fault. A linear northwest-southeast trending set of continuous ridges located immediately north of Anaverde Creek forms the northern boundary of the property. Surface elevations at the site range from approximately 2,840 feet near the toe of the landfill to 3,200 feet in the ridgeline to the north. The ground surface at the AVPL slopes to the south and southeast, toward Anaverde Creek. Anaverde Creek drains to the east toward the City of Palmdale.

2.3 Geology and Underlying Soils

2.3.1 General

The AVPL is located at the southern margin of the Western Mojave Desert near the northern base of the Sierra Pelona Mountains. The site is located within the Transverse Ranges Geomorphic Province of southern California. The Transverse Ranges are characterized by east-west trending structural elements (linear topography, faulting and folding). Regional geology is characterized by pre-Tertiary granitic and metamorphic basement rocks as well as mid-to-late Cenozoic volcanic and sedimentary units underlying Quaternary alluvial and terrace deposits (Norris and Webb, 1990). Site geology consists of pre-Tertiary basement rock, Pliocene-aged claystone and sandstone of the Anaverde Formation, and Quaternary alluvial deposits (ETE-Virogroup, Inc., 1993). The site geologic map is presented as Figure 2-1.

2.3.2 Stratigraphy

2.3.2.1 Pre-Tertiary Basement Complex

The Little Rock Fault Zone separates the basement complex rock lithologies into northern and southern tectonic blocks. The northern block consists of quartz monzonite dikes through light and dark gneiss. The southern block consists of granodiorite (gray to greenish brown) and quartz monzonite (light gray to white) with some augen gneiss and schist (GCE Inc., 1999). The relative ages of the basement complex lithologies are unknown, however, they are thought to be of Mesozoic age (Barrows et. al., 1985). The quartz monzonite is highly fractured and moderately weathered. The granodiorite is highly weathered within the AVPL and becomes increasingly fractured with proximity to local faulting. Foliation of this unit suggests that the granodiorite may have undergone metamorphism, at least locally (ETE-Virogroup, Inc., 1993).

2.3.2.2 Pliocene Anaverde Formation

Three members of the Pliocene-age Anaverde Formation are exposed at the surface within the limits of the study area: the lower, red arkose (Tar), the medial, gray arkose (Tag), and the upper, gypsiferous claystone (Tac).

The lower, red arkosic sandstone (Tar) is in depositional contact with the underlying quartz monzonite at the site (GCE Inc., 1999). It is a red to pinkish tan, poorly to moderately indurated, silty, pebbly, fine- to coarse-grained arkosic sandstone. As fresh rock, it is very hard, but with exposure near the surface, the red arkose becomes weathered and friable.

The medial, gray, arkosic sandstone (Tag) is a resistant member of the Anaverde Formation, forming cliffs and ridges north of the San Andreas Fault Zone. It is a gray to tan, well indurated, pebbly, fine- to coarse-grained arkosic sandstone with thin interbeds of fine sandy shale and fine pebble to cobble conglomerate. It is moderately to slightly weathered and massive to well-bedded.

The upper, gypsiferous claystone (Tac) is in depositional contact with, and is much less resistant than, the underlying gray arkose. It is a brown to black, thinly bedded claystone with abundant interbeds of gypsum, anhydrite, halite, and other evaporitic salts. Occasional, thin to thick interbeds of gray, pebbly, fine- to coarse-grained arkose are also found in this unit. The claystone exhibits extensive folding and shearing associated with deformation along the nearby San Andreas Fault Zone.

2.3.2.3 Quaternary Alluvial Deposits

Three distinct, recent alluvial units have been identified within the boundaries of the AVPL. These are, from oldest to youngest, the Quaternary terrace deposits (Qt), the older Quaternary alluvium (Qoa), and the younger Quaternary alluvium (Qal).

The Quaternary terrace deposits (Qt) are deeply dissected terrace remnants composed predominately of interbedded sand and gravel, and massive silty sand. They are generally 5 to 15 feet thick (Joseph, 1999), but can be up to 50 feet in thickness (Kleinfelder, 1989a). The exact age of the terrace deposits is unknown, but is thought to be between 25,000 and 250,000 years (Kleinfelder, 1989b).

The older Quaternary alluvium (Qoa) are deeply dissected, gently sloping alluvial fans that form slightly elevated terraces along major drainages in the landfill area. The Qoa is composed primarily of silty sand and gravel. These units are 5 to 50 feet in thickness and are thought to be between 11,000 and 25,000 years old (GCE Inc., 1999).

The younger Quaternary alluvium (Qal) is composed of recent, unconsolidated, fluvial sediments. These include stream and sheet flow deposits. The Qal consists primarily of loose to dense, fine- to medium-grained sand, silty sand and gravel (GCE Inc., 1999).

2.3.3 Seismic Hazards

2.3.3.1 General

This section presents a review of the character of faulting, the strong ground motions, which can be expected from faulting, and an evaluation of the potential for surface rupture and liquefaction at the AVPL.

This seismic analysis was performed to comply with CCR Title 27 requirements for siting of Class III landfills (§20260). The Title 27 regulations require that expansions of Class III landfills shall not be located on a known Holocene (within the last 11,000 years) fault. Title 27 also requires that Class III waste management units shall be designed to withstand the "maximum probable earthquake" (MPE) without damage to the foundation or structures that control leachate, surface drainage, erosion, or gas. The CCR Title 27 definition for MPE is the maximum earthquake that is likely to occur during a 100-year interval. The CCR Title 27 definition for the MPE does not explicitly provide a probability of exceedance for use in the probabilistic analysis. Because of the proximity of the landfill to the San Andreas fault, the containment structures for the AVPL will be designed to withstand the shaking from the "maximum credible earthquake" (MCE) on the San Andreas fault. The CCR Title 27 definition for MCE is the maximum earthquake that can occur under the currently know tectonic setting.

2.3.3.2 Regional Faulting and Seismicity

The dominant geologic feature in the area of the AVPL is the San Andreas Fault Zone, which lies at the southwestern boundary of the site (see Figures 2-1 and 2-2). The San Andreas Fault system comprises the transform tectonic plate boundary along the western edge of the North American plate. The broad plate boundary is characterized primarily by a zone composed of several sub-parallel, right-lateral, strike-slip active faults. The San Andreas Fault has documented high rates of seismicity and is expressed by geomorphic and geologic evidence of rupture at the ground surface. The seismogenic sources within 100 km of the site are shown on Figure 2-2.

The closest documented active (i.e., Holocene) faults are the San Andreas Fault along the southwestern property boundary and an unnamed fault north of the landfill property. Mapped faults within the landfill property, which have been shown to be inactive during Holocene time, include the Little Rock Fault that crosses the northeastern corner of the landfill property. One unnamed fault (Fault A) has also been identified offsetting bedrock units but not younger soils within the landfill property. One fault previously mapped within the landfill (Fault B) has been re-evaluated and determined to be a geologic contact between two igneous rock units and is reclassified as such.

The San Andreas Fault is an active fault and has exhibited recurring displacement within the last 11,000 years (Holocene time). Historic movement occurred in 1857 along this portion of the fault. The surface wave magnitude (M_s) for this event has been estimated at 8.3 with the epicenter located approximately 47 miles northwest of the landfill at Fort Tejon (Barrows et al., 1985). Surface features from movement on the fault are visible along the trace of the San Andreas Fault near the landfill. The San Andreas Fault is a

right-lateral strike-slip fault that trends northwest. This fault has been identified as an Alquist-Priolo Special Studies Zone by the CDMG (CDMG, 1979).

The unnamed active fault trends roughly parallel to the San Andreas Fault and is approximately 250 feet north of the northeastern corner of the landfill property at it's closest approach (Kleinfelder, 1989a). The CDMG lists this structure as an active fault and also designates it as an Alquist-Priolo Special Studies Zone. Mapping by Barrows et al. (1985) indicates that the fault is reverse fault with moderate to steep dip (45 to 60 degrees) to the south. The fault has been mapped offsetting bedrock and Quaternary soil units on the northern slope of the ridge that lies to the north of the landfill. The fault does not cross or project into the landfill property.

The Little Rock Fault is thought to have been the ancestral trace of the modern San Andreas (Barrows et al., 1985). Studies conducted by Kleinfelder (1989a) and GCE (1999) indicate that the fault crosses the northeastern portion of the landfill property. These studies also concluded that no Holocene movement has occurred along the portion of the Little Rock Fault in and around the AVPL. Direct observations of exposures created during grading for the Phase IV, Landfill I expansion identified alluvial and debris soils estimated to be 25,000 to 250,000 years old that overlie the trace of the fault and are not offset. The Little Rock Fault has been described as a dip-slip fault with a dip of 82 degrees to the south (GCE Inc., 1999).

Fault A has been mapped through the center of the landfill property. This fault trends in a northwesterly direction and defines a non-depositional contact between varying geologic units. Previous studies have described Fault A as inactive during Holocene time (Kleinfelder, 1989b; GCE, 1999) based on observations in exploratory trenches of Quaternary surficial deposits overlying these fault traces that were undisturbed by fault activity. ETE-Virogroup (1993) attributed a dip-slip movement to the fault. GCE (1999) reclassified what was previously mapped as Fault B as a geologic contact, based on information obtained from excavations at the landfill in 1998.

2.3.3.3 Seismic Design Parameters

This section describes the character of strong ground motions which can be expected at the site from faulting. For the evaluation of the landfill slopes under seismic loads, a site-specific deterministic analysis was performed to develop design earthquake motions including peak ground acceleration (PGA), spectral acceleration and acceleration time histories (Pyke 1994 and Pyke 2000, see Appendix A). As indicated in Section 2.3.3.1, the design event for this project has been selected as the MCE on the San Andreas Fault with a moment magnitude (M_w) equal to 8.0. The attenuation relationships developed by Abrahamson and Silva (1997) were used to model the dependency of the maximum horizontal rock acceleration (MHA) and spectral acceleration on earthquake magnitude and distance for the M_w 8 earthquake at a very close distance (i.e., < 1 km) to the site. Abrahamson and Silva (1997) attenuation relationships have been developed for both rock and soil site conditions, the relationships for a rock site were used for this site.

The current analysis utilizes a synthetic earthquake record developed from fitted, composite acceleration histories to develop a acceleration-time history with a duration

suitable for a $M_w = 8$ earthquake on the San Andreas Fault occurring at a distance of less than 1 km from the site. The resulting bedrock acceleration-time histories (i.e., one for each horizontal orthogonal direction) have peak horizontal accelerations of 0.89g and 0.74 g, respectively, perpendicular and parallel to the San Andreas Fault (see Appendix A). Separate time histories were developed for the fault normal and fault parallel components of motion (Pyke 2000). The fault normal acceleration-time history is a composite of the 1940 El Centro motion and one of the records from the 1979 Imperial Valley Earthquake. The fault parallel acceleration-time history is a composite of the Lucerne and Joshua Tree records from the 1992 Landers Earthquake. These motions were matched to the median target response spectra developed from the Abrahamson and Silva (1997) relationships in the frequency domain (Pyke 2000). The current bedrock acceleration-time histories have a duration about twice as long as the previously used 1994 earthquake motions (Pyke 2000, see Appendix A).

2.3.3.4 Evaluation of Surface Rupture Potential

The potential for rupture of the ground surface due to an earthquake event or movement on a fault at the site was evaluated in previous mapping, aerial photograph interpretations and trenching studies (Kleinfelder, 1989a; Kleinfelder, 1989b; and GCE, 1999). The southwestern boundary of the AVPL is located within a Special Studies (Alquist-Priolo) Zone (CDMG, 1979) for the San Andreas Fault. A special studies zone is an area delineated by the State Geologist (Chief of the California Division of Mines and Geology) as having active faults that may be hazardous in terms of surface fault-rupture for structures built aside such faults. The surface trace of the San Andreas Fault ruptured during the 1857 Fort Tejon Earthquake. This surface trace is clearly visible on the ground and on pre-development aerial photographs. The potential for surface rupture at the AVPL is high along the trace of the San Andreas Fault Zone. In accordance with 40 CFR §258.14, a 200-foot setback from the mapped trace has been established for the design of waste containment structures. This setback exceeds the requirements of Title 27 CCR.

The previous studies also evaluated the Little Rock, Fault A, and former Fault B for surface rupture potential. Based on the lack of offsets in overlying Quaternary soils, these structures are not considered active. Kleinfelder (1989a, 1989b) considered that there is a potential for sympathetic movement on the other faults during a major earthquake on the San Andreas Fault. However, data supporting this conclusion have not been observed in previous studies of excavations or trenches at the site.

2.3.3.5 Liquefaction

All recent alluvial soils will be excavated during landfill grading operations and the site is underlain by dense bedrock. Accordingly, liquefaction of site soils from strong ground motions is not considered a concern.

3 LANDFILL SLOPE STABILITY ANALYSES

3.1 General

This section presents the results of static slope stability analyses and dynamic deformation analyses performed for basal sliding surfaces and monolithic soil cover system configurations within the proposed landfill. The general geologic conditions of the project area are described in Section 2. As part of the continued development of the landfill, existing slopes and ridges will be graded to provide a foundation for the planned liner system.

This section presents the design criteria, analytical methods, material properties, cross-section configurations, and results of the analyses.

3.2 Design Criteria

The development of the seismic design criteria was discussed in Section 2.3.3. The final refuse fill and soil cover system slopes were designed to satisfy a minimum static factor-of-safety against failure of 1.5. Pseudostatic and dynamic deformation analyses were performed for the final refuse slopes and soil cover system. As discussed in Section 2.3.3.3, the design earthquake event for the landfill is the MCE event on the San Andreas Fault. Dynamic site response analyses were performed to estimate the loading used in the seismic analysis.

3.3 Analytical Methods

3.3.1 General

The stability evaluation of the landfill included static slope stability and deformation analyses. Slope stability calculations were performed for two-dimensional (2D) cross-sections to evaluate the performance of the proposed landfill design. Pseudostatic slope stability analyses and 2D dynamic site response analyses were performed in support of dynamic deformation analyses.

3.3.2 Slope Stability Analyses

The computer program UTEXAS3 (Wright, 1993) was used to calculate the factors-of-safety against potential failure for the selected cross-sections. This program uses 2D limit equilibrium theory to provide general solutions to slope stability problems. The potential sliding surface, both circular and noncircular, could be pre-selected or automatically generated. Spencer's procedure was used for the analyses conducted for this study. In Spencer's procedure side forces are assumed to have the same inclination and all requirements for static equilibrium are satisfied. The trial and error solution involves successive assumptions for the factor-of-safety and side force inclination until both force and moment equilibrium were satisfied. Critical potential failure mechanisms, including block failures along liner system interfaces, were considered in the study.

3.3.2.1 Refuse Slope Stability Analyses

Static and pseudostatic slope stability analyses were performed for the final waste fill slopes at the landfill. Static Slope stability analyses were conducted using UTEXAS3 to evaluate potential slip surfaces along the base liner system. The static slope stability analyses were performed using reasonable bound estimates of the material properties (see Section 3.5). For the stability analysis of potential circular failure surfaces, several trial failure surfaces were systematically generated from a number of different initiation points near the toe of the slope to obtain the minimum factor of safety. For block failures, the shear surface is systematically moved from an initial position until a minimum factor-of-safety is calculated.

Pseudostatic stability analyses were performed on the final refuse fill cross-sections using the program UTEXAS3 (Wright 1990) to evaluate the yield resistance of the critical pseudostatic slip surface. The yield resistance can be represented as the average acceleration producing a horizontal inertial force on a potential sliding mass, which gives a factor of safety of unity in a pseudostatic analysis.

3.3.2.2 Cover System Slope Stability Analyses

Static and pseudostatic slope stability of the earthen cover system was also evaluated in this study. Static stability of the cover system was evaluated using the method proposed by Koerner and Hwu (1991). In this method, a 2D limit equilibrium analysis that satisfies horizontal and vertical force equilibrium is performed to determine the factor of safety against direct sliding of the cover soil. The cover soil is treated as a rigid block that rests on underlying materials and the factor of safety is calculated by considering a two-part wedge failure mechanism. The interface between the cover soil and underlying material is taken to be the surface along which sliding occurs. By varying certain parameters such as the thickness of the cover soil, the length of the slope, and the inclination of the slope, several cover system configurations were analyzed.

Ling and Leshchinsky (1997) describe a method to evaluate the pseudostatic stability of cover systems that is an extension the Koerner and Hwu static method described above. By applying a horizontal seismic coefficients to account for the inertial forces acting on the cover soil, a pseudostatic analysis is conducted using a procedure that is very similar to the static case. Using this method, the yield resistance was obtained for critical pseudostatic slip surfaces through the final monolithic soil cover.

3.3.3 Dynamic Site Response Analyses

3.3.3.1 General

Two-dimensional (2D) dynamic site response analyses were performed on landfill cross sections. A 2D finite element (FE) analysis was performed to estimate the distribution of static stresses within the landfill. Section 3.3.3.2 discusses the static finite element analyses performed for AVPL. Using the static stresses in the landfill to estimate the dynamic material properties (see Section 3.3.3.3), a 2D plane strain, dynamic FE analysis of the landfill was performed.

3.3.3.2 Static Finite Element Analysis

Method of Analysis

To estimate the static stresses within the landfill, 2D, static finite element analyses were performed on two sections through the landfill (see Section 3.4) using the computer code TELSTA (Pyke, 1984a). This program is a static finite-element computer code capable of computing stresses and strains induced within the landfill. TELSTA utilizes the Duncan and Chang (1970) nonlinear stress-strain relationships for soils. Derivation and summary of the material parameters in the model are discussed below.

The static finite element mesh for each cross section was arranged to be compatible with the dynamic finite element mesh discussed in Section 3.3.3.3. The element sizes were selected such that the ratio of the element width to element height would be less than or equal to two.

To model the nonlinear behavior of the refuse, hyperbolic stress-strain relationships were used. In each load increment, the stress-strain behavior of the compacted soil backfill and bedrock is treated as linear and the relationship between stress and strain are governed by the generalized Hooke's Law of elastic deformations. By varying the values of Young's modulus and bulk modulus appropriately as a function of level of stress developed within each soil element, it is possible to capture the nonlinearity, stress-dependency, and inelasticity of the stress-strain behavior of the soils. Additional details of relationships used to develop hyperbolic parameters for the landfill are described below.

Derivation of Hyperbolic Material Parameters

According to Kondner (1963) the nonlinearity of the stress-strain behavior of soil can be modeled using a hyperbolic approximation of the stress-strain curve with the following equation.

$$(\sigma_1-\sigma_3) = \varepsilon/[(1/E_i) + \varepsilon/(\sigma_1-\sigma_3)_{ult}]$$

In this equation, E_i is the initial tangent modulus or initial slope of the stress-strain curve and $(\sigma_1-\sigma_3)_{ult}$ is the asymptotic value of stress difference.

For all soils, except fully saturated soils tested under unconsolidated-undrained condition, an increase in confining pressure will result in steeper stress-strain curve and higher strength. Therefore, values of E_i and $(\sigma_1-\sigma_3)_{ult}$ will increase with increasing confining pressure. This stress dependency characteristic of soil behavior is taken into account by using empirical equations to represent the variations of E_i and $(\sigma_1-\sigma_3)_{ult}$ as a function of confining pressure (σ_3).

Janbu (1963) developed the following empirical equation to approximate this relationship.

$$E_i = K_e P_a (\sigma_3/P_a)^n$$

The parameter K_e is the modulus number, n is the modulus exponent, and P_a is the atmospheric pressure. The variation of $(\sigma_1-\sigma_3)_{ult}$ with confining pressure is accounted for by first relating $(\sigma_1-\sigma_3)_{ult}$ to the compressive strength at failure, $(\sigma_1-\sigma_3)_f$.

$$(\sigma_1-\sigma_3)_{ult} = R_f/(\sigma_1-\sigma_3)_f \qquad R_f = \text{failure ratio}$$

Then $(\sigma_1-\sigma_3)_f$ is related to confining pressure using the Mohr-Coulomb strength equation.

$$(\sigma_1-\sigma_3)_f = [2c^*(\cos\phi) + 2\sigma_3(\sin\phi)]/(1-\sin\phi)$$

In the equation above, c is the cohesion parameter and ϕ is the friction angle. Inelasticity of soil behavior is modeled by using a different modulus for unloading/reloading than from loading. With E_i as the loading modulus, E_{ur} is the unload/reload modulus.

$$E_{ur} = K_{ur}P_a(\sigma_3/Pa)^n$$

The parameter K_{ur} is the unload/reload modulus number. K_{ur} can be 20% larger than K_e for stiff materials (i.e. dense sands) and three times as large as K_e for soft materials (i.e. loose sands and municipal solid-waste) (Duncan et al. 1980).

Nonlinear and stress-dependent volume change characteristics and accounted for by varying the bulk modulus (B) with confining pressure.

$$B = K_bP_a(\sigma_3/P_a)^m$$

The parameter K_b is the bulk modulus constant and m is the bulk modulus exponent. Table 3-1 summarizes the nine parameters required by the Duncan hyperbolic model and their function in the model.

For dynamic analysis, the shear modulus at low strains, G_{max}, is given as a function of the mean effective stress, σ_m.

$$G_{max} = K_gP_a(\sigma_m/P_a)^{ng}$$

The parameter K_g is the shear modulus constant and n_g is the shear modulus exponent.

Static Input Material Parameters

In calculating the Duncan hyperbolic parameters for the refuse, the following relationships for shear modulus (G), elastic modulus (E), and bulk modulus (B) were used.

$$G = (V_s^2)\,\rho$$

$$E = 2G^*(1+\nu)$$

$$B = E/[3^*(1-2\nu)]$$

In the above equations, V_s is the shear wave velocity, ρ is the mass density, and ν is the Poisson's ratio. In the absence of laboratory data, K_{ur} was approximated as 1.2 K_e (Duncan, 1980) for the waste material.

In the analysis, the landfill was divided into six material zones. These six material zones consist of bedrock, compacted fill and four refuse material zones. The bedrock and compacted fill were modeled with linear material properties. The refuse material was subdivided into four zones to develop a reasonable unit weight profile within the refuse. Hyperbolic parameters for refuse were derived from published data for similar materials. Table 3-2 is a summary of assumed refuse and soil strength parameters for the static finite element analyses. Bedrock and compacted fill elastic parameters are summarized in Table 3-3. Table 3-4 presents a summary of the static FE hyperbolic parameters for the refuse.

3.3.3.3 Dynamic Finite Element Analysis

Technical Approach

1. Evaluate location and geometry of analysis cross-sections.

2. Develop site-specific seismic design criteria for dynamic analysis of the landfill. The site-specific seismic design criteria, presented in terms of the design ground acceleration time histories, are discussed in Section 2.3.3.3.

3. Estimate the static stresses in the landfill before the earthquake. The finite element program TELSTA was used for this purpose (see Section 3.3.3.2).

4. Evaluate the dynamic properties of the soils comprising the landfill using the stresses computed in Step 3. The dynamic material properties include shear modulus, damping characteristics, and bulk modulus. Since these material characteristics are nonlinear, it was also necessary to determine how the properties vary with stress and strain.

5. Compute the acceleration-time histories induced within the landfill and foundation during the design earthquake. The finite element technique, the computer program TELDYN (Pyke, 1984b), and dynamic properties estimated in Step 4 are used to perform the dynamic analysis. A two-dimensional model of the landfill has been developed for dynamic analysis.

6. Perform dynamic deformation analyses to estimate the magnitude of permanent deformations during the design earthquake using a Newmark-type deformation analysis procedure. Evaluate the magnitude of overall deformations likely to result from combined static and dynamic loads, and assess their potential impact on landfill stability and performance.

Dynamic Finite Element Mesh Development

Finite element sizes for TELDYN were selected based on the wave transmission criteria.

$$H < 1/5\ (\lambda)$$

Where H is the element height and λ is the wavelength corresponding to the highest frequency of the analysis. The wavelength, λ, is obtained by dividing the shear wave velocity by the highest frequency considered in the analysis ($\lambda = V_s/f_{max}$). A frequency cut off, f_{max}, of 40 Hz (cycles per second) was used in the dynamic analyses. As discussed below, the shear wave velocity of the landfill was assumed to be 600 feet per second (ft/s) near the surface and 1,274 ft/s at the base. Therefore, the calculated element heights varied from 5 feet near the crest to 10 feet near the base of the landfill.

The analyses were conducted in the time domain and the soil nonlinearities were modeled using the equivalent linear technique. In this method, dynamic soil properties are estimated and assigned to all elements and a linear time domain analysis is carried out. The induced shear strain time histories are computed for each element and dynamic properties are adjusted accordingly. Using the revised dynamic soil properties, the analysis is repeated. The analyses continue in an iterative manner until the computed soil properties are within 5 percent of the assumed values.

Dynamic Input Parameters

Material parameters for the dynamic response analysis consist of selecting shear modulus and damping relationships that best represent the anticipated material behavior based on published literature. Dynamic properties for compacted fill and bedrock were assumed to be linear. Dynamic properties for refuse, compacted fill, and bedrock are summarized in Table 3-5.

To model the dependency of shear modulus and damping with shear strain amplitude, the results of laboratory testing performed by Schnabel and Seed (1972) was used to model bedrock, the results of laboratory testing performed by Seed et al. (1984) was used to model compacted fill, and the results of dynamic back-analyses by Augello et al. (1998) was used to model the refuse.

3.3.4 Seismically Induced Permanent Deformations

3.3.4.1 Methodology

Newmark (1965) proposed that the seismic performance of earth dams be evaluated in terms of the permanent deformations that developed during strong shaking. The analysis assumes that relative slope movements would be initiated when the force on a potential slide mass was large enough to overcome the yield resistance along the slip surface and these movements would stop when the inertial force decrease below the yield resistance and the velocities of the ground and the sliding mass coincided. By integrating the average acceleration acting on the sliding mass as a function of time, the relative velocity and the displacement of the sliding mass can be estimated.

The general approach for calculating the seismically induced permanent deformations for a landfill slope is to develop the average horizontal equivalent acceleration-time histories (HEA) along potential failure surfaces using the program TELDYN. The

Franklin and Chang (1977) procedure is then used to calculate the permanent deformation of a slip surface by double integrating the HEA-time history in excess of the yield resistance.

Dynamic deformation analyses were performed to estimate slip at the landfill/foundation interface and along interfaces within the soil cover system. For the cover system, the vertical slope height between benches was assumed to be 40 to 50 ft for the calculation of the horizontal equivalent acceleration-time histories. The cover system was assumed to be approximately 5-ft thick for the calculation of the horizontal equivalent acceleration-time histories.

Deformation analyses were performed using the procedure developed by Newmark with the computer code TNMN (Pyke and Beikae, 1991). TNMN was developed for the situation in which the yield acceleration in one direction is much less than that in the opposite direction (one-way sliding). This program double integrates the difference between the average induced ground acceleration and the yield resistance to compute the magnitude of seismically induced permanent deformation. The average induced acceleration time histories are output for a particular slip surface from the TELDYN analysis. For each acceleration time history, the deformation was computed using the "positive" and "negative" values of acceleration, with the deformation computed separately for each.

3.3.4.2 Seismically Induced Permanent Deformation Analyses

The two main input parameters are: (1) the average acceleration time histories generated by TELDYN induced by the design earthquake for each potential slip surface; and (2) the yield resistance computed for each shear potential slip using pseudostatic slope stability analysis.

The magnitude of slope movement during an earthquake is directly proportional to the average induced ground acceleration within the potential sliding mass and inversely proportional to the yield resistance. The average induced acceleration is normally higher for shallow cover sliding surfaces near the crest as compared with deep-seated refuse slip surfaces extending from the crest to the toe. The yield resistance is higher for shallow slopes near the crest as compared to the yield resistance for deep-seated sliding planes extending from the crest to the toe. Therefore, to bracket the range of expected deformations, various sliding surfaces are normally considered for deformation analysis.

3.4 Slope Stability Cross-Sections

3.4.1 General

This section presents a description of cross-sections evaluated for AVPL (see Figures 3.1 and 3.2). The cross sections were developed from Golder's concept grading designs with a top deck elevation of 3,200 feet and 2.8H:1V average side slopes (i.e., 2.5H:1V between benches). Two cross-sections were analyzed, these sections are referred to, herein, as the "long" section (Section B-B') and "short" section (Section A-A'). The "long" section has a top deck width of approximately 480 feet and the short section has a top deck width of

approximately 100 feet. Figure 3-1 shows the final refuse plan for AVPL and the location of the cross sections and the cross-sections are presented on Figure 3-2. No piezometeric surfaces were modeled, consistent with observations made during prior studies at the landfill.

3.4.2 Cover System

The cover system at the AVPL consists of a monolithic soil cover of uniform thickness underlain by refuse. The thickness of the monolithic soil cover was assumed to vary from 4 to 5 feet. The cover slope had an inclination of 2.5H:1V with benches every 50 vertical feet (i.e., average slope inclination of 2.8H:1V).

3.4.3 "Long" Section (Section B-B')

The "long" section is oriented to be perpendicular to the San Andreas fault which is located near the base of the landfill (see Figure 2-1). This cross-section consists of a refuse fill slope that is overlain by a 5-ft thick monolithic soil cover and that is butressed at its toe by a 75-foot-high embankment berm. The refuse slope is approximately 240 feet in height and it is underlain by a geosynthetic base liner system. The base liner was modeled as having a thickness of 3 feet in the slope stability analyses to ensure that potential deep sliding surfaces passed entirely through it and not through the overlying refuse or underlying bedrock materials. A refuse slope of approximately 2.8H:1V was modeled beginning at the toe of the slope and extending to a deck elevation of approximately 3,200 feet above MSL. The maximum thickness of refuse is approximately 310 feet.

3.4.4 "Short" Section(Section A-A')

The "short" section has also been oriented to be perpendicular to the San Andreas fault. This cross-section consists of a refuse fill slope overlain by 5 ft thick monolithic soil soil cover butressed by a 60-ft high embankment berm. The refuse slope is approximately 160 feet in height and underlain by a geosynthetic base liner system. The base liner system was modeled as having a thickness of 3 feet in the slope stability analyses to ensure that potential deep sliding surfaces passed entirely through it and not through the overlying refuse or underlying bedrock materials. The slope has an inclination of 2.8H:1V and this slope was modeled beginning at the toe of the slope and extending to a deck elevation of approximately 3,124 feet above MSL, which corresponds to a maximum waste thickness of about 220 ft.

3.5 Material Properties

Geotechnical material parameters for slope stability calculations and the dynamic response analyses were based on laboratory testing, published information, and geosynthetic manufacturers technical data. The selected material parameters assumed in the analyses are presented in Table 3-2, and discussed in detail below.

3.5.1 Bedrock Materials

An effective friction angle (ϕ') of 39 degrees and an effective cohesion intercept (c') of 500 psf were considered appropriate strength parameters to model the bedrock. The unit weight of the bedrock was assumed to be 130 pcf.

For stability calculations under seismic loading, the strengths for the bedrock were increased by 20 percent to account for gain in strength under rapid loading.

3.5.2 Liner Interface Properties

The use of a geomembrane and geosynthetic clay liner (GCL) in the bottom and side-slope liner system introduces potential weak planes. For the landfill expansion liner system, the base and side slope liner systems are anticipated to be a double-sided textured HDPE placed on a geosynthetic clay liner lying on the prepared subgrade. A recent interface shear strength testing program completed by Golder for another landfill in southern California indicated Mohr-Coulomb strength parameters of $\phi' = 17$ degrees and $c = 435$ psf for the GCL/geomembrane interface. For the slope stability analyses of this study, conservative liner interface strength parameters were chosen ($\phi' = 15$ degrees and $c = 0$ psf).

3.5.3 Waste Material Properties

Published data and information from Golder's files were used for waste shear strength properties. For the static slope stability analyses, municipal solid waste was assigned a friction angle of 0 degrees and a cohesion of 480 psf for depths of 0 to 15 feet below the ground surface and a friction angle of 33 degrees and a cohesion of 0 psf for waste deeper than 10 feet. These waste strength parameters are considered very conservative, but consistent with past analyses by Golder of waste fills and other published studies (Kavazanjian et. al., 1994). For the pseudostatic analyses, the refuse was modeled with a $\phi' = 0$ degrees and $c' = 1000$ psf for depths of 0 to 13 feet below the ground surface and a $\phi' = 38$ degrees and $c' = 0$ psf for refuse deeper than 13 feet. These values are referred to as the dynamic refuse strengths herein. These strengths were developed from a summary of published refuse fill strengths (Augello, 1997).

The dynamic properties of solid waste necessary for the analysis of this landfill are: shear wave velocity (V_s) profile, unit weight profile, shear modulus degradation and damping characteristics and shear strength. A unit weight profile based upon direct measurements of initial weight upon placement; in situ measurements from borehole and test trenches; inferred values from SASW measurements based upon a correlation with depth, V_s, and calibrated unit weights from borehole data; and one-dimensional compression tests on large reconstituted samples was recently developed (Augello et al. 1997). The unit weight profile was modified based upon direct measurements of initial weight upon placement at the AVPL. The unit weight profile used for the refuse was: 65 pcf at depths of 4 to 13 ft below ground surface; 70 pcf at depths of 13 to 47 ft below ground surface; 82 pcf at depths of 47 to 80 ft below ground surface; and 85 pcf at depths of 80 ft below ground surface and deeper.

The shear modulus degradation and damping curves for solid waste estimated by Augello et al. (1998) from a back analysis of the Operating Industries Landfill (OII) during the 1994 Northridge Earthquake are used to represent the stain dependent shear modulus and damping of solid waste. The median shear wave velocity profile for solid waste developed by Kavazanjian et al., 1996 based on SASW measurements at six landfills in southern California was used to calculate the initial shear modulus of the waste fill for the dynamic analyses.

3.5.4 Monolithic Soil Cover

The shear strength parameters for the monolithic soil cover system were a $\phi = 36°$ and c = 125 psf. These strength parameters were based on laboratory direct shear test data performed on representative soil samples obtained from the site. The results of the laboratory tests are presented in Appendix B.

3.6 Stability Analyses Results

The following sections present the results of the slope stability analyses.

3.6.1 Waste Fill Slopes

3.6.1.1 "Long" Section (Section B-B')

The "long" section had a minimum static factor of safety against failure of 2.15 for sliding along the base liner system. In this case, the critical noncircular shear surface ran from the front of the top deck of the slope to the base liner, along the base liner, and exited at the toe of the slope (top of the embankment berm). The pseudostatic slope stability analysis gave a yield acceleration 0.24g for sliding along the base liner system. The slope stability output for the static and pseudostatic analysis of the "long" section is included in Appendix C.

3.6.1.2 Short Section (Section A-A')

The "short" section had a minimum static factor of safety against sliding of 1.88 for sliding along the base liner system. In this case, the critical noncircular slip surface ran from the front of the top deck of the slope to the base liner, along the base liner, and exited at the toe of the slope (top of the embankment berm). The pseudostatic slope stability analysis gave a yield acceleration 0.25g for sliding along the base liner system. The slope stability output for the static and pseudostatic analysis of the "short" section is included in Appendix C.

3.6.1.3 Cover System Sections

For a slope inclination of 2.5H:1V (between benches), a cover soil thickness of 4 feet resulted in a static safety factor of 2.75 and a yield acceleration of 0.52g. The slope stability calculations for the static and pseudostatic analysis of the monolithic soil cover system are included in Appendix C.

3.7 Results of Deformation Analyses

The next several paragraphs discuss the seismically-induced permanent deformation analyses performed for the monolithic cover system sliding surfaces and deep basal sliding failure surfaces of both cross-sections. The results of the dynamic deformation analyses for the "long" section and "short" section are discussed below.

3.7.1 "Long" Section (Section B-B')

The calculated seismically induced permanent deformations of a deep basal failure surface were calculated as a part of this study. For the critical base sliding pseudostatic failure surface of the "long" section the seismically induced permanent deformations are expected to be less than 6 inches.

The calculated seismically induced permanent deformations of the monolithic cover system are summarized in Table 3-6 as a function of location. Table 3-6 indicates that the seismically-induced permanent deformations are 24 to 36 inches for slopes 1 and 2 (i.e., upper two slopes). Table 3-6 indicates that the seismically induced permanent deformations decrease considerably for slopes 3 and 4 (i.e., less than 24 inches). The seismically-induced permanent deformations of the monolithic cover system were calculated using HEA-time histories developed from the finite element mesh (ie., average 2.8H:1V slope).

3.7.2 "Short" Section (Section A-A')

The calculated seismically induced permanent deformations of a deep basal failure surface were also calculated as a part of this study. For the critical base sliding pseudostatic failure surface of the "short" section the seismically induced permanent deformations are expected to be less than 6 inches.

The calculated seismically induced permanent deformations of the monolithic cover system are summarized in Table 3-7 as a function of location. Table 3-7 indicates that the seismically-induced permanent deformations are 30 to 36 inches for slopes 1 and 2(i.e., upper two slopes). Table 3-7 indicates that the seismically induced permanent deformations decrease significantly for slope 3 (i.e., less than 12 inches). The seismically-induced permanent deformations of the monolithic cover system were calculated using HEA-time histories developed from the finite element mesh (ie., average 2.8H:1V slope).

3.8 Conclusions and Recommendations

A comprehensive evaluation of stability of planned slopes for the development of the AVPL has been performed in support of the landfill expansion. The evaluation has included an assessment of final refuse fill and monolithic soil cover system slopes. The analyses incorporated site-specific laboratory testing and published data on the geotechnical properties of the geologic materials, liner system interfaces, and refuse fill materials.

A site-specific seismic risk analysis was performed to provide earthquake ground motions for use in evaluating deformations due to strong ground shaking at the site. The studies incorporated the minimum design and analysis criteria as contained within CCR Title 27 regulations. Based on the analyses, the following conclusions can be made:

- The "long" section had a minimum static factor of safety of 2.15 for deep sliding surfaces along the base liner system. The yield resistance for this failure surface was 0.24g and the expected seismically induced permanent deformations were less than 6-inches.

- The "short" section had a minimum static factor of safety of 1.9 for deep sliding surfaces along the base liner system. The yield resistance for this failure surface was 0.25g and the expected seismically induced permanent deformations were less than 6-inches.

- The monolithic soil cover system had a minimum factor of safety against failure in excess of 2.5. Seismically induced permanent deformations of approximately 12 to 36 inches are expected for the monolithic cover system within the upper two slopes for both cross sections.

The results of the seismically induced permanent deformations for deep basal failure surfaces indicated deformations that were less than 6 inches for both cross-sections evaluated in this study. Seismically induced permanent deformations of this magnitude are acceptable for basal stability.

The results of the seismically induced permanent deformation analyses for the monolithic cover system shown in Tables 3-6 and 3-7 indicate that large permanent deformations are expected for the upper two slopes for both cross sections (i.e., "long" and "short" cross sections). Seismically induced permanent deformations of this magnitude are considered acceptable if provisions are made for the repair of the monolithic cover system after the earthquake.

Table 3-1

Definition of the Hyperbolic Static Model Parameters

Antelope Valley Public Landfill

Parameter	Name	Function
K_e , K_{ur}	Modulus number	Relate E_i and E_{ur} to σ_3
n	Modulus exponent	Relate E_i and E_{ur} to σ_3
C	Cohesion intercept	Relate $(\sigma_1-\sigma_3)_f$ to σ_3
ϕ, $\Delta\phi$	Friction angle parameters	Relate $(\sigma_1-\sigma_3)_f$ to σ_3
R_f	Failure ratio	Relate $(\sigma_1-\sigma_3)_{ult}$ to $(\sigma_1-\sigma_3)_f$
K_b	Bulk modulus number	Relate B to σ_3
m	Bulk modulus exponent	Relate B to σ_3

Note: ϕ is friction angle at atmospheric confining pressure and $\Delta\phi$ is the change in friction angle per log cycle of confining stress increase.

Table 3-2

Summary of Static Material Strength Parameters

Material Depth	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degree)	Poisson's Ratio
Refuse (0 to 13 feet)	65	500[1]	0	0.3
Refuse (13 to 47 feet)	70	0	33[1]	0.3
Refuse (47 to 80 feet)	82	0	33[1]	0.3
Refuse (>80 feet)	85	0	33[1]	0.3
Compacted Fill	125	0	36	0.4
Bedrock	150	0	50	0.25
Geosynthetic Liner System	65	0	15	-

[1] MSW dynamic strength parameters were increased to c = 1,000 psf (shallow) and $\phi = 38°$ (greater than 13 feet deep).

Table 3-3

Bedrock and Compacted Fill Elastic Parameters

Antelope Valley Public Landfill

Elastic Parameter	Bedrock	Compacted Fill
Young's Modulus, E (ksf)	117,000	1,270
Bulk Modulus, B (ksf)	196,000	1,058

Table 3-4

Refuse Hyperbolic Static Model Parameters

Antelope Valley Public Landfill

Hyperbolic Parameter	Refuse (0 to 13 ft)	Refuse (13 to 47 ft)	Refuse (47 to 80 ft)	Refuse (> 80 ft)
K_e	1,090	1,090	1,090	1,090
N	0.73	0.73	0.73	0.73
K_{ur}	1,308	1,308	1,308	1,308
ϕ	33	33	33	33
$\Delta\phi$	0	0	0	0
c	0	0	0	0
R_f	1	1	1	1
K_b	1,440	1,440	1,440	1,440
m	0.57	0.57	0.57	0.57
Unit Weight (pcf)	65	70	82	85

Table 3-5

Summary of Dynamic Material Properties

Antelope Valley Public Landfill

Material Property	Refuse	Compacted Fill	Bedrock
Shear Wave Velocity (ft/s)	600 to 1,350	1,400	3000
K_g	420	214	-
n_g	0.73	0.35	-

Table 3-6

Results of Dynamic Deformation Analyses for Monolithic Soil Cover – "Long" Section

Antelope Valley Public Landfill

Slip Surface Description	Maximum HEA (g)	Slope Inclination Between Benches	Yield Resistance (g)	Estimated Seismic Permanent Deformation (in.)
Slope 1	1.23	2.5H:1V	0.52	30-36
Slope 2	1.35	2.5H:1V	0.52	24-30
Slope 3	1.04	2.5H:1V	0.52	18-24
Slope 4	1.18	2.5H:1V	0.52	12-14

Table 3-7

Results of Dynamic Deformation Analyses for Monolithic Soil Cover – "Short" Section

Antelope Valley Public Landfill

Slip Surface Description	Maximum HEA (g)	Slope Inclination Between Benches	Yield Resistance (g)	Estimated Seismic Permanent Deformation (in.)
Slope 1	1.46	2.5H:1V	0.52	30-36
Slope 2	1.17	2.5H:1V	0.52	30-36
Slope 3	0.97	2.5H:1V	0.52	6-12

4 LIMITATIONS

This report has been prepared for the exclusive use of the Antelope Valley Landfill and their agents for specific application to the proposed project. The findings, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice that exists within the area at the time of the work. No other warranty, expressed or implied, is made.

The client has the responsibility to see that all parties to the project, including the, contractors, are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications. However, the report is not designed as a specification document and may not contain sufficient information for this use without proper modification.

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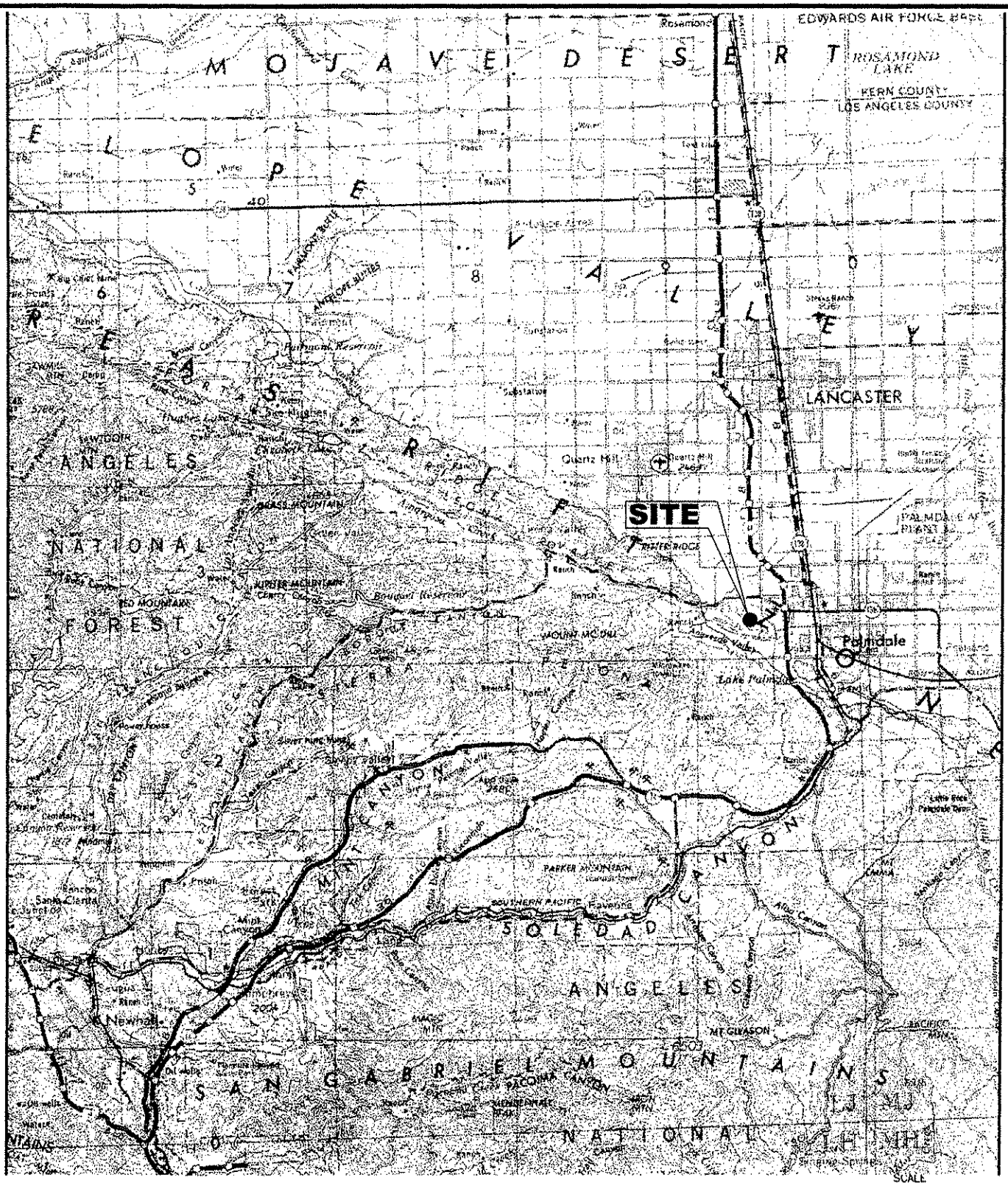


SOURCE: USGS TOPOGRAPHIC, LOS ANGELES COUNTY, SCALE 1:250,000, DATED 1975

SCALE 0 125,000 250,000

Date NOVEMBER 2000

Project No. 003-1971

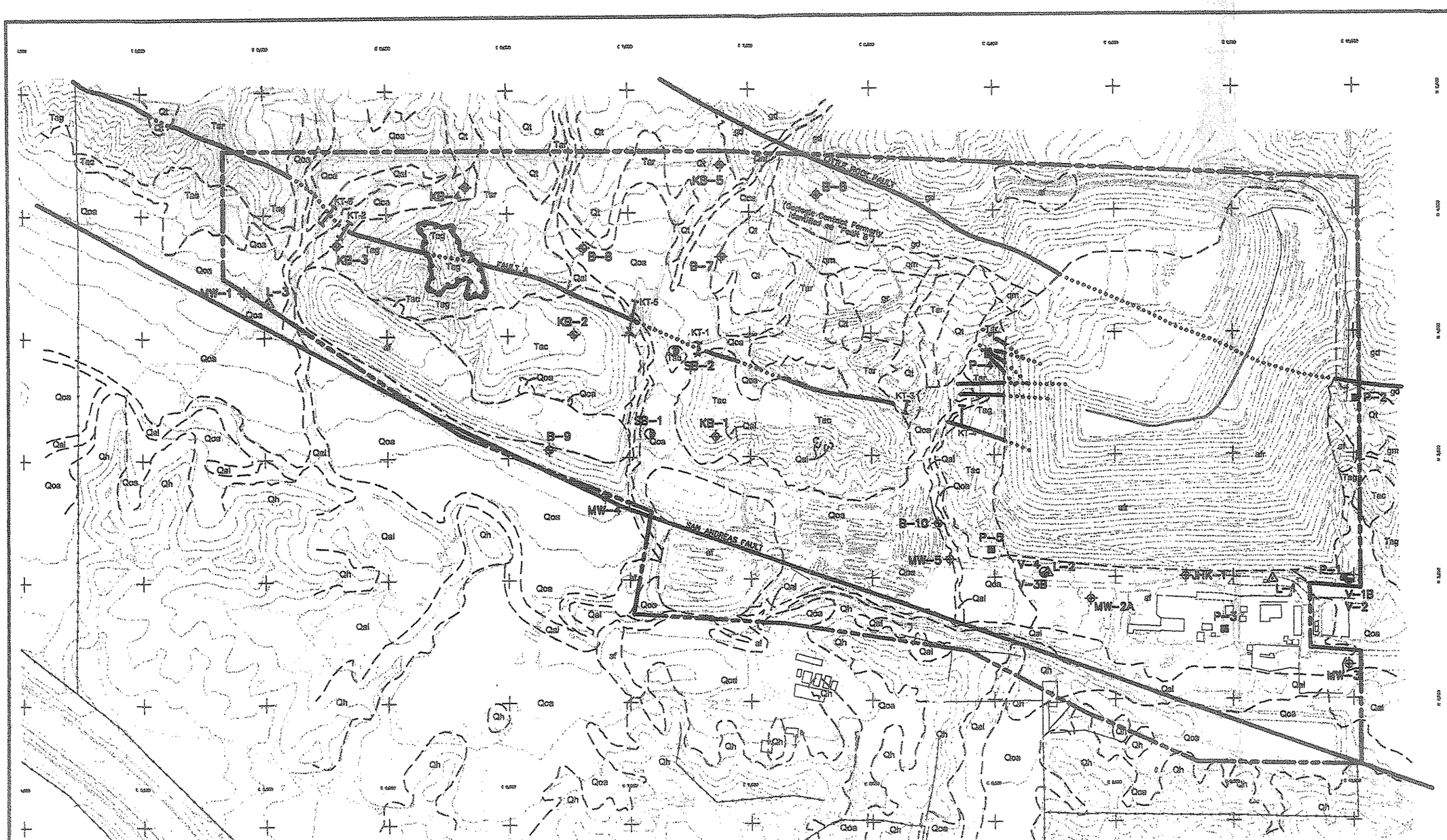
WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL SLOPE STABILITY REPORT
Palmdale, California

Scale	Drawn By:	Checked By:	Reviewed By:

Golder Associates
Irvine, California

FIGURE 1-1
SITE LOCATION MAP



EXPLANATION

PLEISTOCENE HOLOCENE

- af — Artificial fill
- afr — Refuse
- Qal — Younger Alluvium
- Qoa — Older Alluvial Deposits
- Qt — Terrace Deposits; Deposits of Paleodrainage
- Qh — Terrace Deposits of the Harold Formation

PRE-TERTIARY PLIOCENE

- Tac — Claystone of the Anaverde Formation
- Tag — Gray Arkose of the Anaverde Formation
- Ter — Red Arkose of the Anaverde Formation
- qm — Quartz Monzonite
- gd — Granodiorite

- GEOLOGIC CONTACT
- THRUST FAULT
- FAULT, Solid where mapped, dashed where inferred, dotted where concealed
- KT-3 EXPLORATION TRENCH
- PROPERTY LINE

- KB-2 EXPLORATORY BORING (KLEINFELDER, INC.)
- B-10 EXPLORATORY BORING (GC ENVIRONMENTAL)
- SB-1 EXPLORATORY BORING (SOUTHLAND GEOTECHNICAL)
- MW-5 GROUNDWATER MONITORING WELL
- L-3 PORE-SPACE WATER LYSIMETER
- V-4 VADOSE ZONE GAS PROBE
- P-5 LANDFILL GAS PERIMETER MONITORING PROBE

N

MODIFIED FROM KLEINFELDER GEOLOGIC MAP, PLATE 1, PROJECT # 50-1441-01, JULY 1989. SURVEYED WELL AND PROBE LOCATIONS HAVE BEEN PROVIDED BY GC ENVIRONMENTAL WITH THE EXCEPTION OF SB-1 AND SB-2.

200 0 200 400
scale feet

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
A	11/29/00	ISSUED DRAFT	MLR	JWB	MSS
B	02/22/01	ISSUED REVISED DRAFT	MLR	JWB	MSS

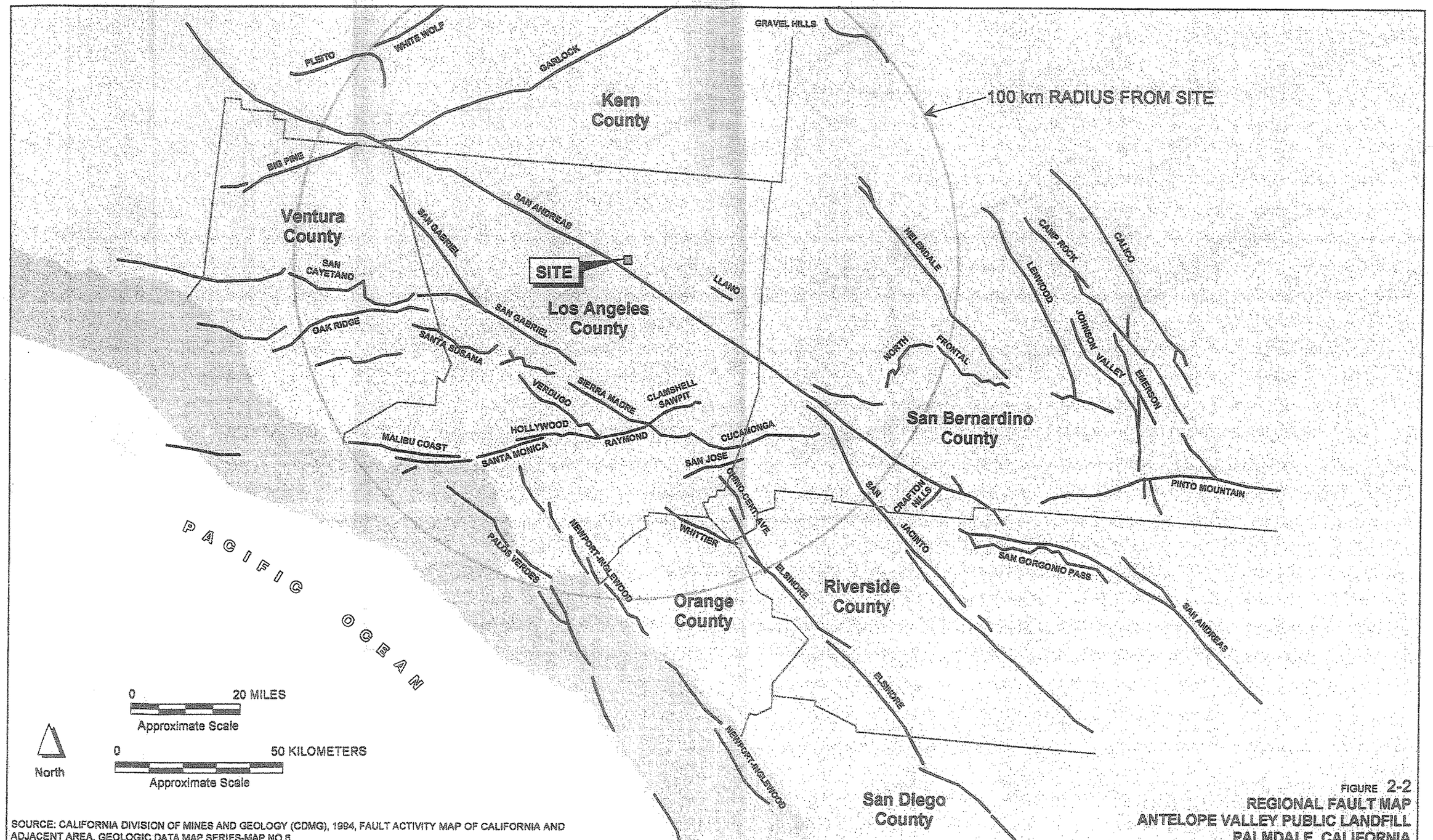
Golder Associates
10 Chrysler, Suite B
Irvine, California 92618
(949) 583-2700

WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
SLOPE STABILITY REPORT

SITE GEOLOGIC MAP

FIGURE
2-1



SOURCE: CALIFORNIA DIVISION OF MINES AND GEOLOGY (CDMG), 1994, FAULT ACTIVITY MAP OF CALIFORNIA AND ADJACENT AREA, GEOLOGIC DATA MAP SERIES-MAP NO.6.

FIGURE 2-2
REGIONAL FAULT MAP
ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA

PROJECT NO: 003-1971 DATE: 04-00 DRAWN BY: JKW

Golder Associates

REV	DATE	DESCRIPTION	DESIGN	DRAWN	REVIEW
-	-	-	-	-	-

Golder Associates
10 Chrysler, Suite B
Irvine, California 92618
(949) 583-2700

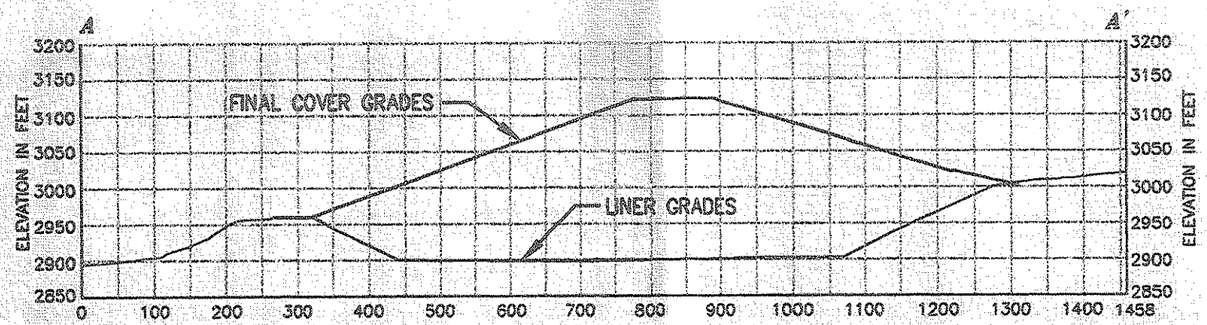
WASTE MANAGEMENT, INC.

ANTELOPE VALLEY PUBLIC LANDFILL
PALMDALE, CALIFORNIA
STABILITY REPORT

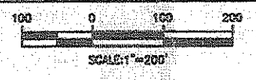
REFUSE FILL PLAN

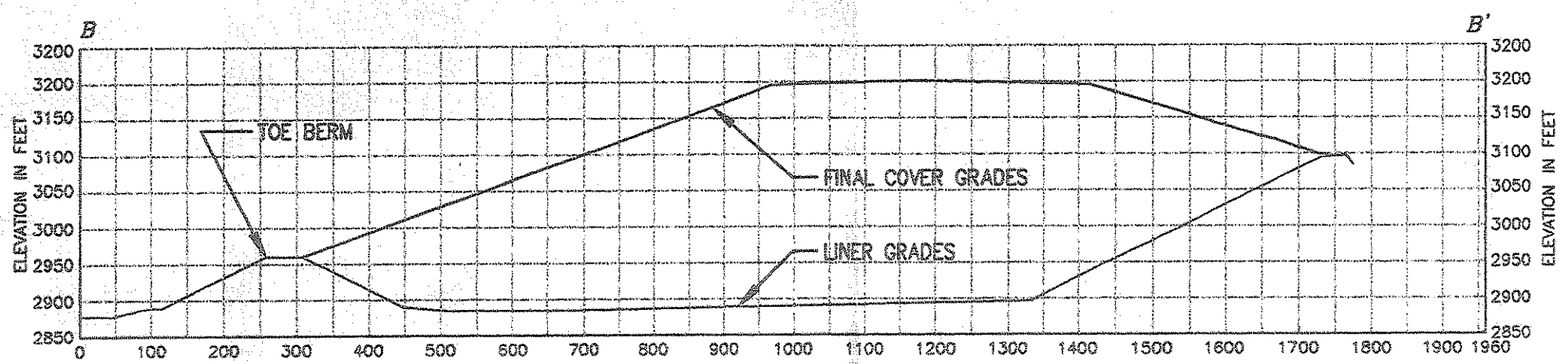
FIGURE NUMBER

3-1

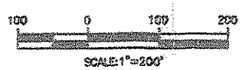


SHORT SECTION A–A'





LONG SECTION B–B'



Golder Associates	Project No. 003-1971	Date: Nov. 2000
	Drawn by: TMC	Checked by: MLR

FIGURE 3-2
SLOPE STABILITY CROSS SECTIONS
ANTELOPE VALLEY PUBLIC LANDFILL

File: cvsect.dwg

APPENDIX A

LETTER REPORTS BY BOB PYKE

Robert Pyke, Consulting Engineer

July 6, 1994

ViroGroup, Inc.
ETE Division
5301 Office Park Drive, Suite 420
Bakersfield, CA 93309

Attention: Hugh Walker

Re: New Palmdale Landfill
Supplemental Seismic Stability Analyses

1. Introduction

The analyses described in this report supplement those described in the report "Determination of Landfill Slope Stability, Palmdale Expansion Landfill", prepared by the ETE Division of ViroGroup, Inc. and dated August 1993, which was included in the Report of Waste Discharge prepared for the proposed new Palmdale Landfill. That report incorporated a further report: "Geotechnical Evaluation of Slope Stability, Palmdale Waste Disposal Facility Expansion", prepared by Southland Geotechnical, also dated August 1993. The Southland report included calculations of expected deformations for peak accelerations of 0.4g which was the estimated peak acceleration for a "maximum probable earthquake" as defined by previous State of California regulations. However, these regulations have now been superseded by the provisions of Subtitle D of the Federal Resource Conservation and Recovery Act. While many responsible engineers question the logic of the requirements of Subtitle D, which call for containment structures to be designed to resist earthquake ground motions with a 10 percent probability of exceedance in 250 years, I have been asked to re-evaluate the expected deformations for a peak acceleration in the order of 0.8g, as required by Subtitle D. However, the expected deformations under this higher level of ground motion will not necessarily increase from those reported by Southland because those calculations were made using the simplified Makdisi-Seed procedure which was originally developed for use in estimating deformations of embankment dams and has been shown to be rather conservative when applied to other landfills. I have repeated the worst case Southland

calculation using the same geometry and material properties but I have used a more detailed method of calculation in order to make improved estimates of the expected deformation of both the liner and the cover systems.

2. Method of Analysis

The approach taken to analyzing the expected deformation of both the liner and the cover systems

combines elements of the methods of analysis suggested by Newmark (1965) and Seed (1979). The approach consists of using a detailed analysis to compute the response of the slope to the design ground motions using "equivalent linear" soil properties, and then using the simplified procedure suggested by Newmark to obtain estimates of the displacements that might result from such shaking. While current practice is moving towards computing both the site response and the expected deformations in a single analysis which employs a nonlinear model of material behavior, such analyses involve a number complex issues and cannot at this time be used to reliably predict deformations. The newer, nonlinear analyses however do suggest that equivalent linear methods of computing response tend to be conservative for amplitudes of motion of the order that are considered in this study.

The Newmark method for computing displacements requires that one estimates two quantities: (1) the history of horizontal accelerations acting on a potential sliding mass; and (2) the yield acceleration, which is the value of horizontal acceleration (or seismic coefficient) that will reduce the factor of safety for the potential sliding mass to unity. An estimate of the displacements that will be caused by the application of a given history of accelerations can then be obtained by double-integrating the difference between the applied acceleration history and the yield acceleration.

In this case, application of the Newmark method has involved four steps:

(1) The yield acceleration for potential sliding through the liner system has been computed using the standard limit-equilibrium procedure embodied in the computer program TSLOPE and yield accelerations for potential sliding of the cover have been computed using a simple formula for infinite slope stability.

(2) A two-dimensional finite element mesh has been generated and the mean effective stresses throughout the slope have been estimated using the static finite element program TELSTA.
(3) These stresses were then passed to the dynamic finite element program TELDYN in which they were used to compute the low strain shear moduli used by TELDYN in computing the response of the slope to selected input acceleration histories. TELDYN was also used to compute the average history of horizontal accelerations acting on each of four potential sliding masses.

(4) The histories of accelerations obtained in Step 3 were then combined with the yield accelerations computed in Step 1 as inputs to the computer program TNMN which was used to compute the expected displacements.

3. Analysis Geometry and Properties

The analyses were conducted for Section A-A' as shown in plan view on Plate 3 of the Southland report and as shown in Figures 1 and 2 of this report. Details of the liner and cover systems are shown on

Sheet 13 of the ETE/ViroGroup drawings dated August 20, 1993. For both the liner and the cover systems, the critical interface with regard to slope stability is the contact between the textured HDPE and geocomposite layer. Consistent with the previous Southland studies, values for cohesion and friction angle of 150 psf and 20 degrees and 450 psf and 13 degrees have been assumed to apply for analyses of the cover (low confining pressure) and liner (high confining pressure) respectively. A recent review of the strength properties of MSW fills by Kavazanjian et al. (1995) suggests the use of a cohesion of 500 psf at low confining pressures and values of the cohesion and friction angle of 100 psf and 33 degrees at higher confining pressures; thus critical failure surface are not expected to pass through the fill itself.

4. Calculation of Yield Accelerations

The static factor of safety and the yield acceleration were computed using the option for Spencer's method contained in the computer program TSLOPE. As shown in Figure 1, the computed static factor of safety for the liner system was 2.49. Use of the same properties in determining the yield acceleration gave a value of 0.18g although this is likely conservative as the strength probably increases under faster rates of loading. Computer input and output files are not included in this report because of the voluminous files generated in subsequent analyses but all input files have been retained and can be made available on request. A yield acceleration of greater than 1g was computed for the cover in accordance with the methodology outlined by Matasovic (1991).

5. Static Finite Element Analyses

The computer program TELSTA used for the static finite element analyses is an enhanced version of the program FEADAM developed at the University of California, Berkeley. It employs the same "Duncan and Chang" hyperbolic representation of the tangent Young's Modulus and a pressure dependent bulk modulus as FEADAM. While TELSTA is capable of incrementally modelling the filling of the site, since the principal purpose of the analysis in this case was to determine the mean effective stresses for use in the subsequent TELDYN analyses, these stresses were determined simply by conducting a "turn-on gravity analysis" for the proposed final slope configuration. The finite element mesh that was used is shown in Figure 2. Four potential slip surfaces were also defined:
one running through the liner system and three of varying lengths running through the cover system down the front slope of the landfill.

6. Design Acceleration Histories

Each of the two horizontal components of the Lucerne record of the 1992 Landers Earthquake were used as input motions for the dynamic analyses. The peak ground motion parameters of the recorded motions are listed in Table 1 and plots of their acceleration, velocity and displacement histories and their acceleration response spectra are shown in Figures 3 through 6. While the peak accelerations of the longitudinal and tangential components are 0.85g and 0.72g respectively, it should be noted that the

tangential component is potentially more damaging to long period structures because of the large displacement pulse contained in the motion.

7. Dynamic Finite Element Analyses

The computer program TELDYN used for the dynamic finite element analyses is an enhanced version of the program QUAD4 developed at the University of California, Berkeley. It uses the same "equivalent linear" scheme for representing dynamic properties that is used in QUAD4 but it allows a flexible base and uses an improved damping scheme in which the specified damping ratio applies over a broad range of frequencies. It also allows for the computation of the average acceleration histories acting on designated potential sliding masses by summing the forces acting around the specified slip surfaces and dividing by their masses.

The low strain shear modulus, G_{max}, is computed within the program using the formula:

$$G_{max} = k_G \, p_a \, (_m / p_a)^{ng}$$

where: $_m$ is the mean effective stress and k_g and ng are dimensional parameters. The parameter k_G is numerically equal to 22 times the parameter K_{2max} used by Seed and Idriss (1970). In this case, analyses were run using assumed values for k_G of 300 and 600, resulting in the shear wave velocities at the maximum section that are listed in Table 2. This range is generally similar to the range of shear wave velocities recommended by Kavazanjian
et al. (1995).

For these analyses the default modulus reduction and damping curves that are built into TELDYN were used. These curves are based on a reference strain of 0.1 percent (Pyke et al., 1994), but closely approximate the upper bound of the modulus reduction curves and the lower bound of the damping curves suggested by Seed and Idriss (1970). Use of these modulus reduction and damping curves has been shown to result in reasonable agreement between predicted surface motions and the actual surface motions recorded at the Operating Industries Inc. (OII) Landfill in Monterey Park, California, in the 1994 Northridge earthquake (Pyke, 1995).

Four TELDYN runs were made as summarized in Table 3. The acceleration response spectra of the motions computed at the crest of the fill are compared to the response spectra of the input motion in Figures 7 and 8 for the longitudinal and tangential components of the Lucerne record, respectively. The acceleration histories computed at nodal points 23, 54 and 103 are shown in Figures 9 through 12 and the average acceleration histories computed for Slip Surfaces 2, 3 and 4, which pass through the cover system are shown in Figures 13 through 16.

Comparison of the acceleration histories shown in Figures 9 through 16 suggests that, while the average acceleration histories for Slip Surface 4 are similar to the acceleration history at nodal point 103, the average acceleration histories for Slip Surfaces 2 and 3 have lower amplitudes than the adjacent nodal points because, to some extent, the driving accelerations are indeed averaged over the longer slip surfaces. In any case, the peak accelerations in all cases are less than the computed yield acceleration for failure through the liner system, so negligibly small displacements of the cover are indicated.

8. Computation of Deformations in Liner System

The computed average acceleration histories for Slip Surface 1 are shown in the top frame of Figures 17 through 24 along with the previously computed yield acceleration of 0.18g. The computer program TNMN was used to compute the corresponding relative velocities and displacements for those cases where the average accelerations exceeded the yield acceleration, but the computed displacements were negligibly small in all cases except Case 6B where the computed displacement was 0.35 feet for the motion applied in the more unfavorable direction.

9. Conclusions

Detailed calculations using two-dimensional response analyses and the two horizontal components of the Lucerne record of the Landers earthquake, which have peak accelerations of 0.85g and 0.72g, suggest that deformations within both the cover and liner systems should be negligibly small. For the worst case considered in these analysis, a deformation of 0.35 feet was computed in the liner system but because the analysis methodology is still approximate, this should be interpreted as "a matter of inches".

10. Acknowledgements

I wish to note the co-operation of Hugh Walker and Vince Suryasasmita of ETE/ViroGroup and the assistance of Beng Hwee Koh in conducting these studies.

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Kavazanjian,E.,Jr., Matasovic,N., Bonaparte,R. and Schmertmann,G., "Evaluation of MSW Properties for Seismic Analysis", extended manuscript submitted for publication at the GeoEnvironment 2000 Conference, New Orleans, February 1995.

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Pyke,R.M., Stokoe,K.H., Anderson,D.G. and Idriss,I.M., "Development of Generic Modulus Reduction and Damping Curves", To appear in Spectra, 1994.

Pyke,R.M., "Dynamic Response of Waste Containment Facilities", invited paper, GeoEnviroment 2000 Conference, New Orleans, February 1995.

Seed,H.B., "Considerations in the Earthquake-Resistant Design of Earth and Rockfill Dams", Geotechnique, Vol. 29, No.3, September 1979.

oOo

Table 1 - Peak Parameters of Input Motion

Input Motion	Maximum Acceleration (g)	Maximum Velocity (fps)	Maximum Displacement (ft)
Lucerne - Longitudinal	0.85	0.88	0.35
Lucerne - Tangential	0.72	2.40	2.28

Table 2 - Variation of Density and Shear Wave Velocity

Sublayer Number	Sublayer Thickness (ft)	Sublayer Density (pcf)	Range of Shear Wave Velocity (fps)
1	33	48	500-780
2	25	55	619-950
3	25	61	646-1100
4	25	65	669-1180
5	25	69	683-1265
6	25	70	706-1310
7	25	72	723-1360
8	25	73	740-1400

Table 3 - Computed Displacements

Case	Input Motion	Shear Wave Velocity Profile	Computed Displacements (ft)
5A	Longitudinal	Minimum	0 - 0

5B	Longitudinal	Maximum	0 - 0
6A	Tangential	Minimum	0 - 0.005
6B	Tangential	Maximum	0.001 - 0.350

LIST OF FIGURES

Figure 1	TSLOPE Analysis - Slip Surface #1
Figure 2	Finite Element Mesh and Slip Surfaces
Figures 3 & 4	Time Histories and Response Spectrum of the Lucerne Record of the Landers Earthquake (longitudinal component)
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Figures 7 & 8	Comparison of Input Motion Spectrum and Computed Spectra at Nodal Point 200
Figures 9 & 10	Acceleration Time Histories Computed at Nodal Points 23, 54 and 103; Longitudinal Component of the Landers Earthquake
Figures 11 & 12	Acceleration Time Histories Computed at Nodal Points 23, 54 and 103; Tangential Component of the Landers Earthquake
Figures 13 & 14	Average Acceleration Time Histories Computed Along Slip Surfaces 2, 3 and 4; Longitudinal Component of the Landers Earthquake
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Figures 17 - 20	Newmark Calculations for Slip Surface 1; Longitudinal Component of the Landers Earthquake
Figures 21 - 24	Newmark Calculations for Slip Surface 1; Tangential Component of the Landers Earthquake

Robert Pyke, Consulting Engineer

May 24, 2000

Golder Associates
180 Grand Avenue, Suite 250
Oakland CA 94612

Attention: Dr Joseph Wartman

Re: Antelope Valley Public Landfill No.2

Dear Joe,

At your request I have prepared new acceleration histories for use in your current analyses of this proposed landfill. In 1994 I conducted analyses using the horizontal components of the Lucerne record of the Landers earthquake of 1992 as recorded with peak accelerations of 0.85 and 0.72g. While I continue to believe that these motions were representative of the motions that might be expected from a moderate to large earthquake on the nearby San Andreas fault, an event that constitutes the maximum probable earthquake (MPE) for this project, reviewers at that time questioned the adequacy of the durations of these records. Therefore, this time around I have adopted a different strategy and have fitted composite records with a longer duration to a target 5 percent damped response spectrum.

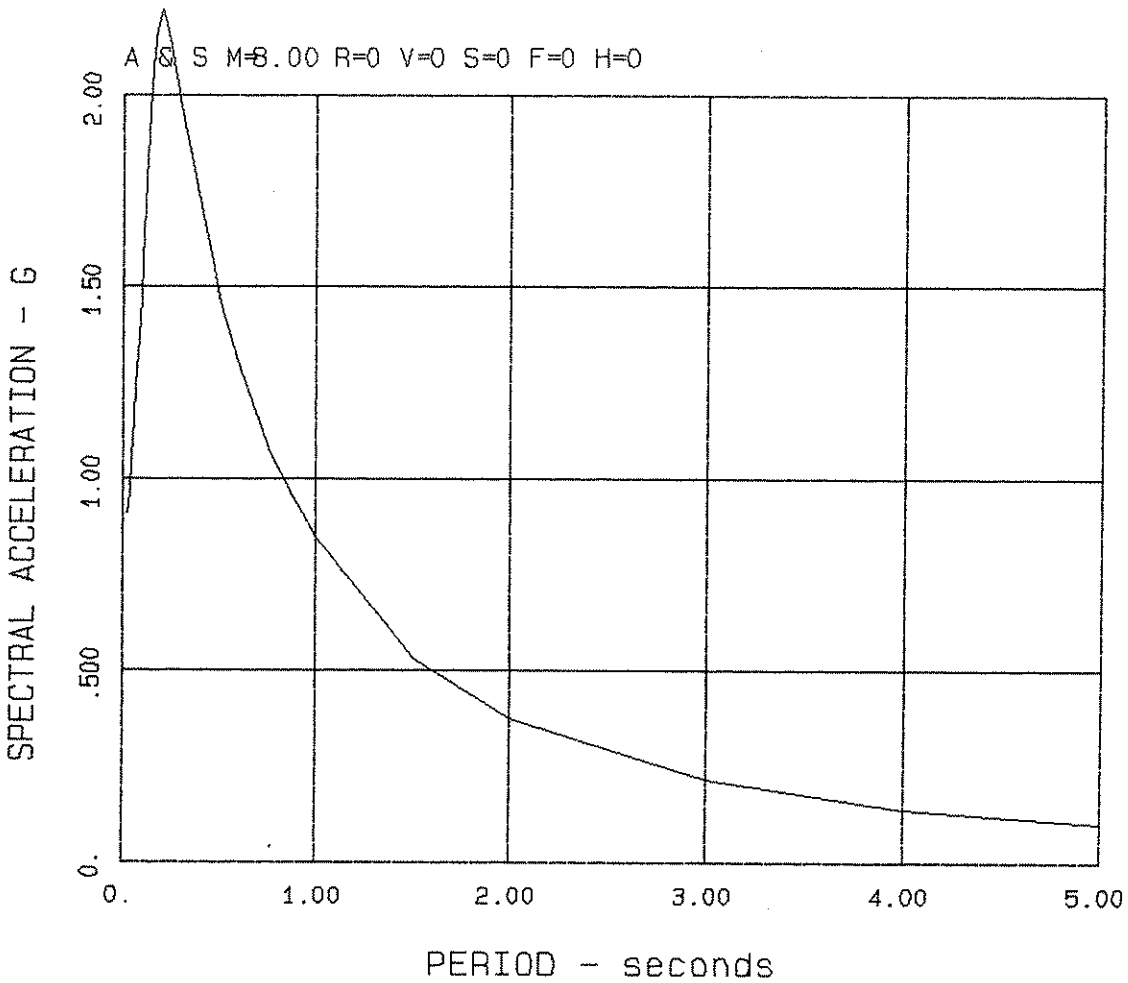
The target spectrum was constructed by using the mean attenuation relationships of Abrahamson and Silva (1997) for a moment magnitude 8 earthquake at a very close distance and has a peak acceleration of 0.89g. Although I normally recommend using the same target spectra for the transverse (fault normal) and the longitudinal (fault parallel) components of motion, I have chosen to use acceleration histories to match the target spectrum that show some directivity effects. To represent the MPE I have used the transverse or fault normal components of two sets of acceleration histories originally developed by Dr Norman Abrahamson for use in the design of the New East Bay Bridge. Motion No. 1 is a composite of the 1940 El Centro motion and one of the records from the 1979 Imperial Valley earthquake. Motion No.3 is a composite of the Lucerne and Joshua Tree records from the 1992 Landers earthquake. These motions have been fitted to the target spectra using a frequency domain fitting procedure that is included in the program TINKER (TAGAsoft, 1999). Plots showing both the fit to the target spectra and the acceleration, velocity and displacement histories of the modified motions are attached. After fitting to the target spectrum, Motion No.1 has a peak velocity of 2.38 feet per second and a peak displacement of 1.58 feet and Motion No. 3 has a peak velocity of 2.66 feet per second and a peak displacement of 1.13 feet.

Sincerely,

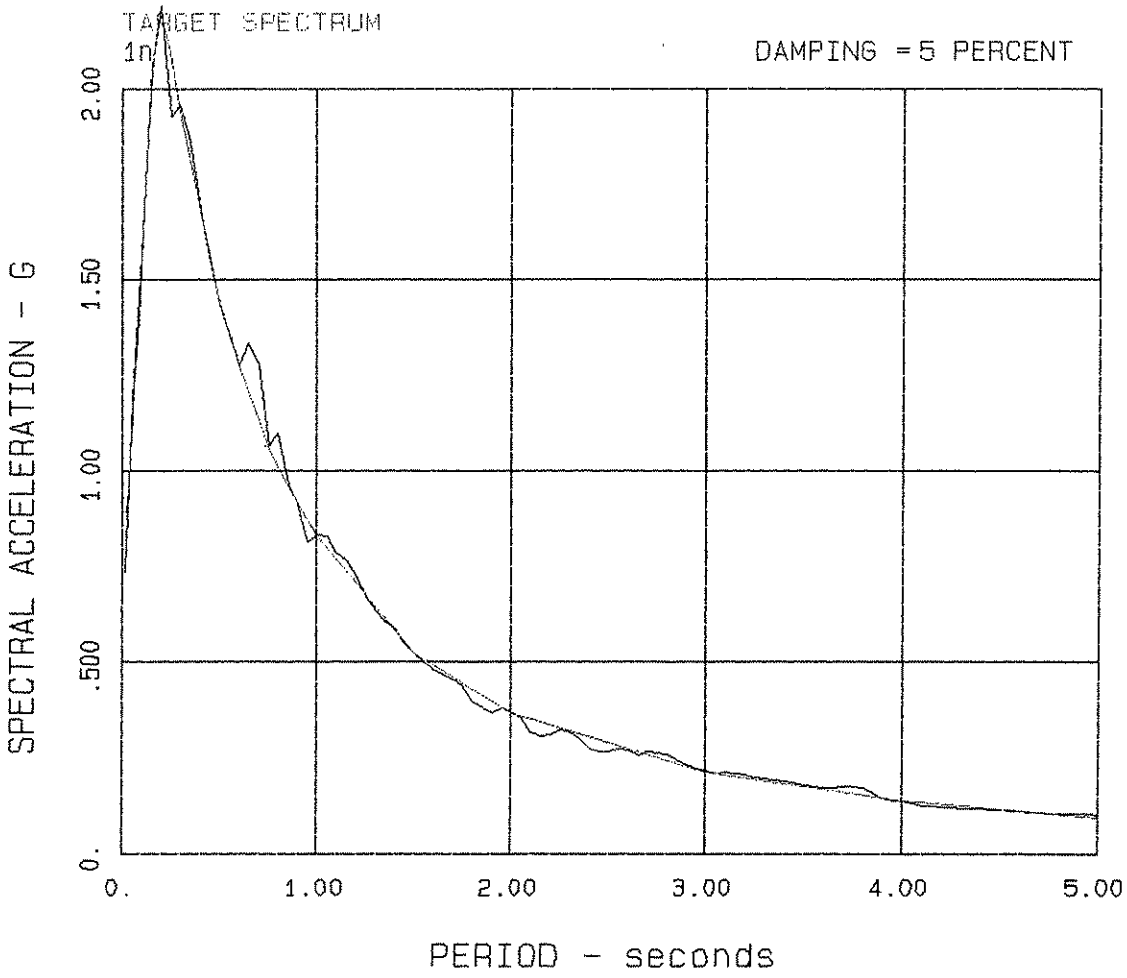
Robert Pyke

Robert Pyke, Ph.D., G.E.

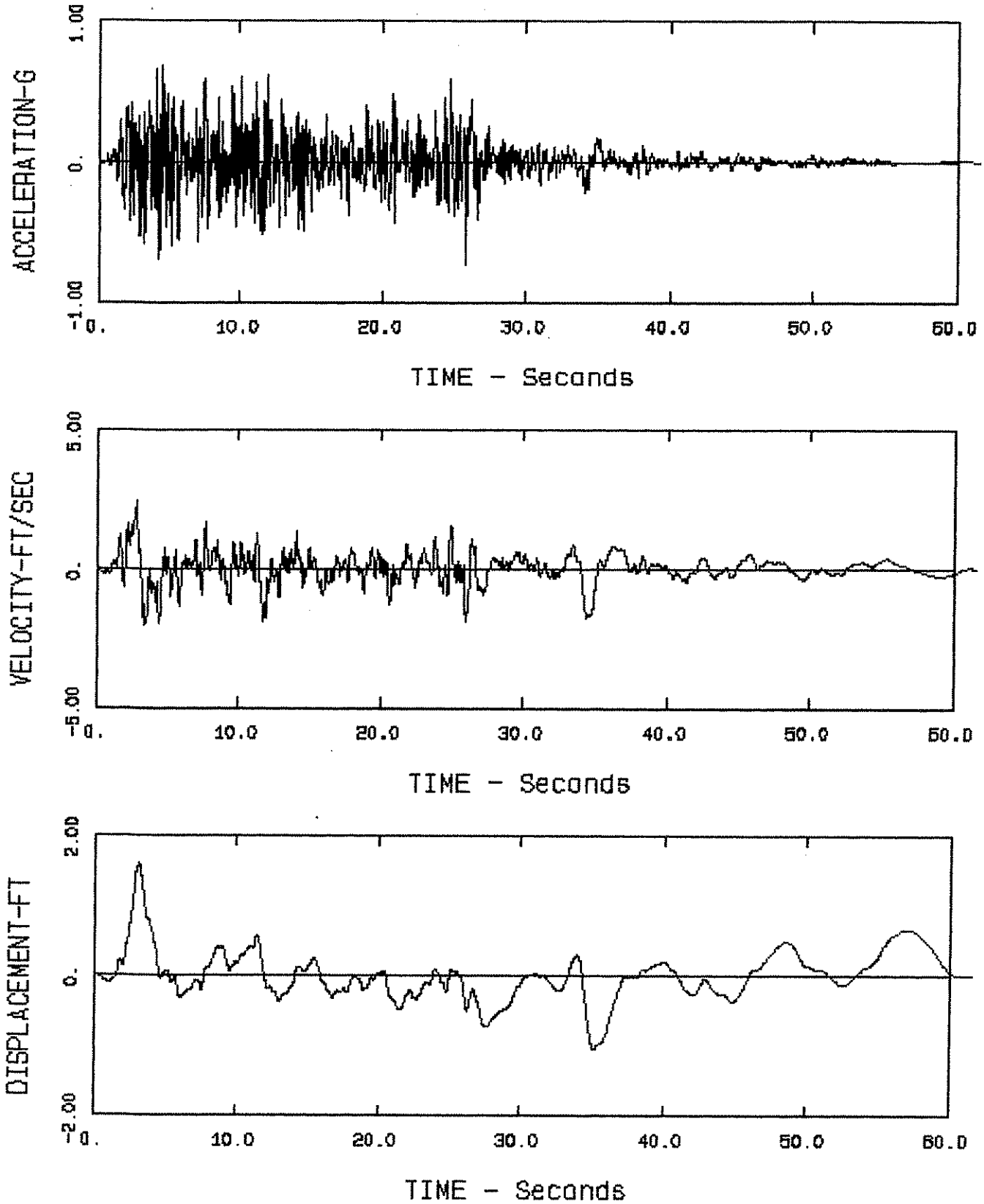
1076 Carol Lane, Suite 136, Lafayette, CA 94549
Telephone 925/283-6765 Fax 925/283-7614 e-mail: bobpyke@attglobal.net



Antelope Valley Public Landfill No.2
MPE Ground Motion



San Andreas No.1n
Fitted to Palmdale MPE



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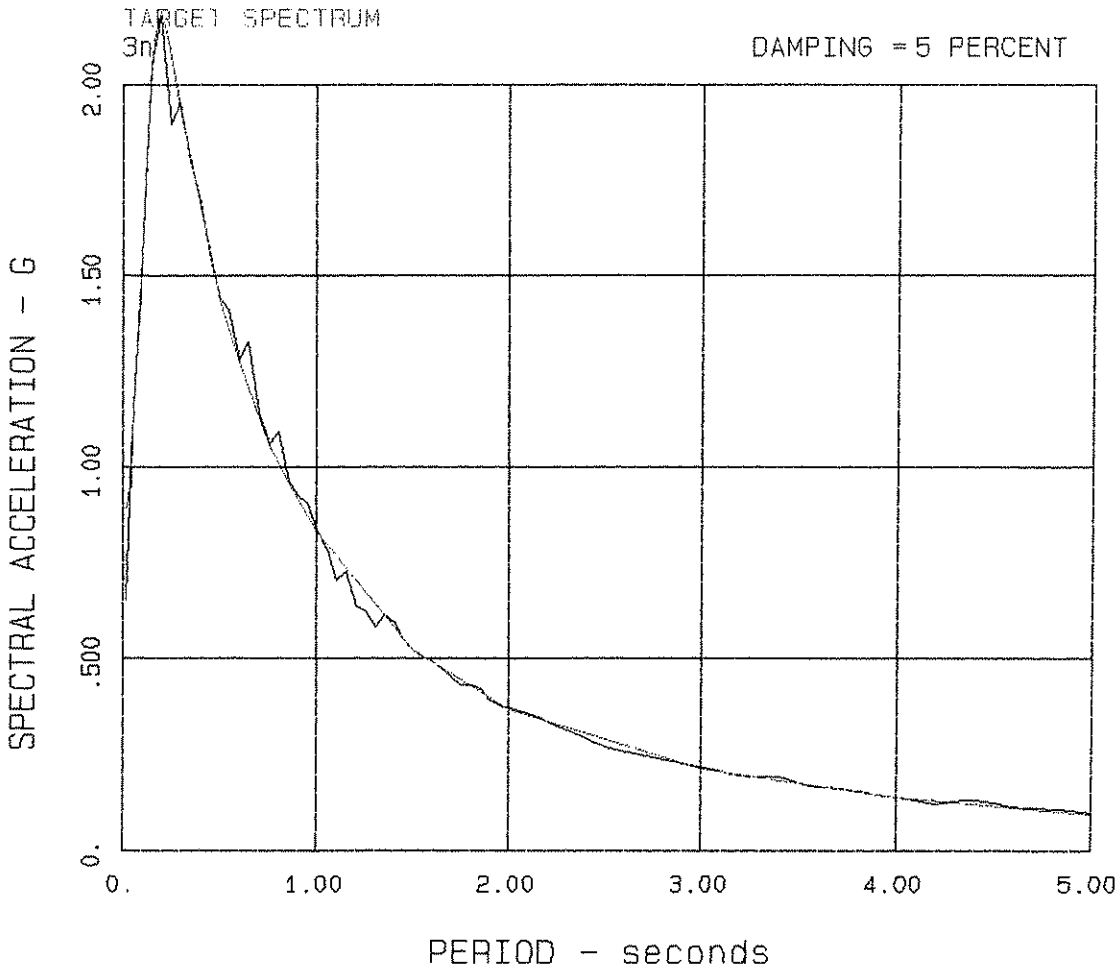

San Andreas No.3n
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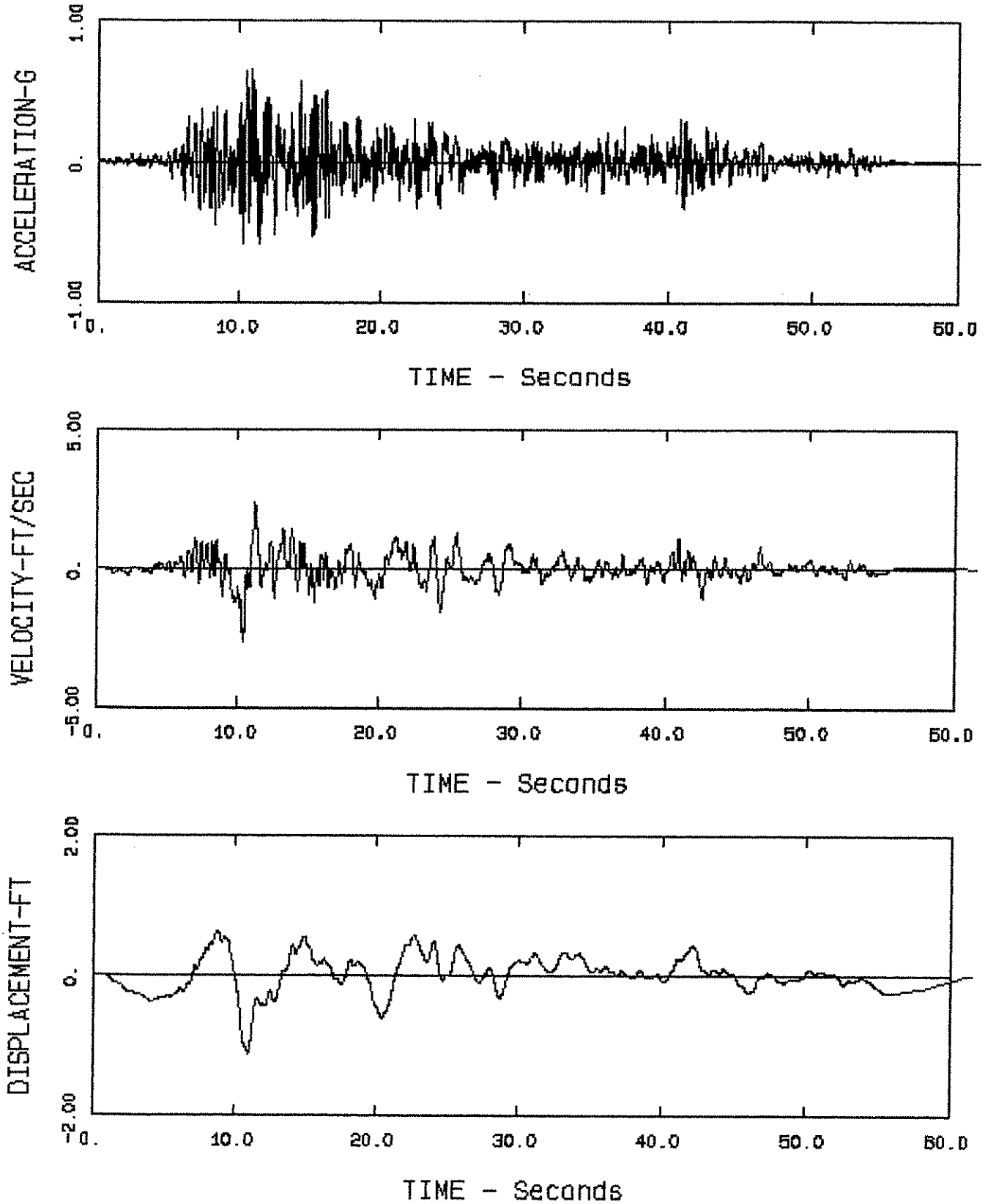


San Andreas No.3n
Fitted to Palmdale MPE

APPENDIX B

LABORATORY TEST DATA

ENVIRONMENTAL
GEOTECHNOLOGY
LABORATORY

April 19, 2000

Golder Associates, Inc.
10 Chrysler, Suite B
Irvine, CA 92618

Attn: Mr. Chris Giberson

RE: LABORATORY TEST RESULTS/REPORT
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

Dear Mr. Giberson:

We have completed the testing program conducted on samples from the above project. The tests were performed in accordance with testing procedures as follows:

TEST	METHOD
Modified Proctor	ASTM D1557
Direct Shear	ASTM D3080

Enclosed are the Direct Shear Test Results and Modified Proctor Curves.

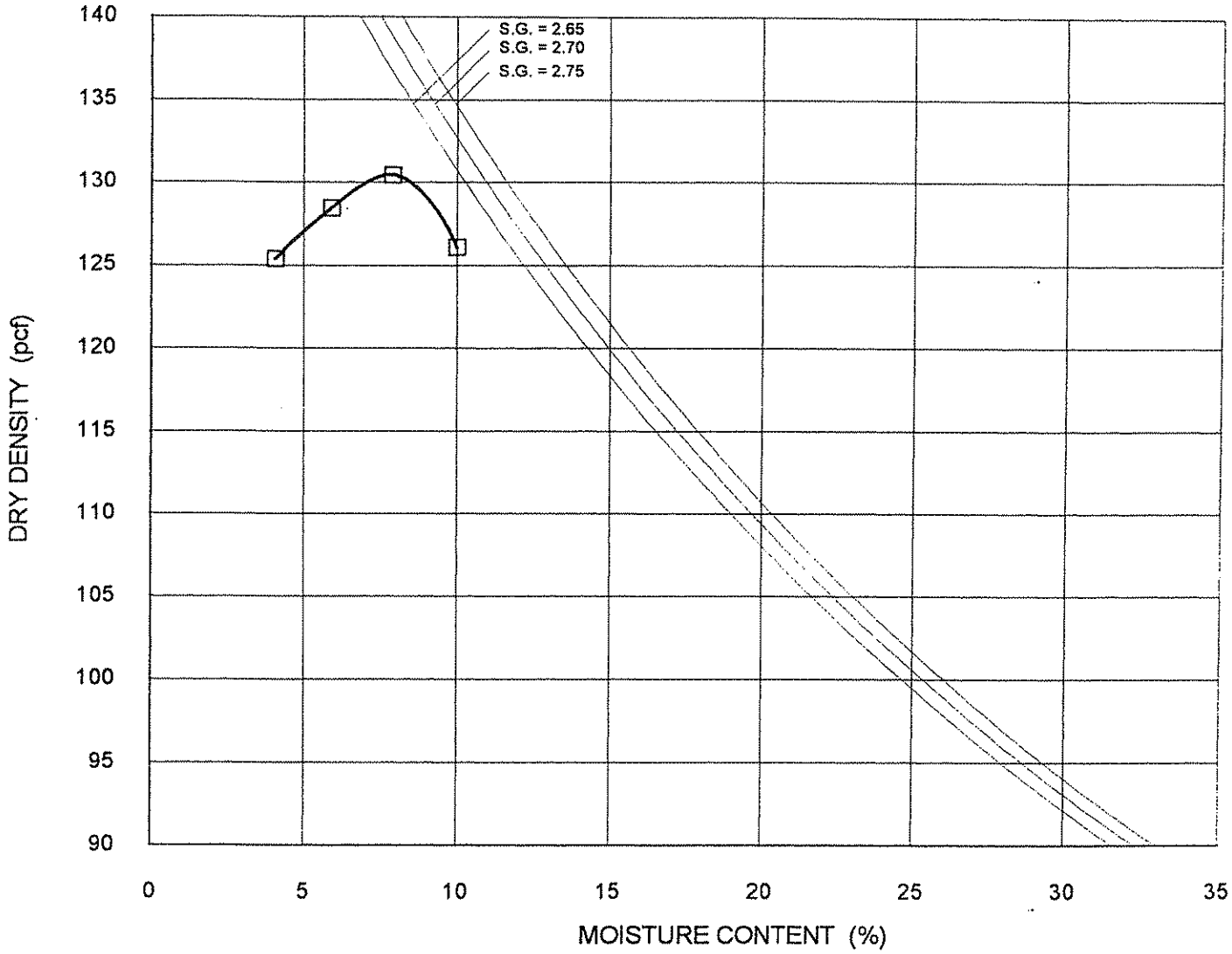
We appreciate the opportunity to provide testing services to Golder Associates, Inc. Should you have any questions, please call the undersigned.

Sincerely yours,
Environmental Geotechnology Laboratory, Inc.

Jack C. Lee, PE, GE
Manager

Enclosure

11823 Slauson Avenue, Unit 18, Santa Fe Springs, CA 90670 • Tel: (562)945-0689, Fax: (562)945-0364



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	VISUAL CLASSIFICATION	OPTIMUM MOISTURE (%)	MAX. DRY DENSITY (PCF)
□	SITE 1	N/A	N/A	SM	7.5	130.5

Environmental Geotechnology Laboratory

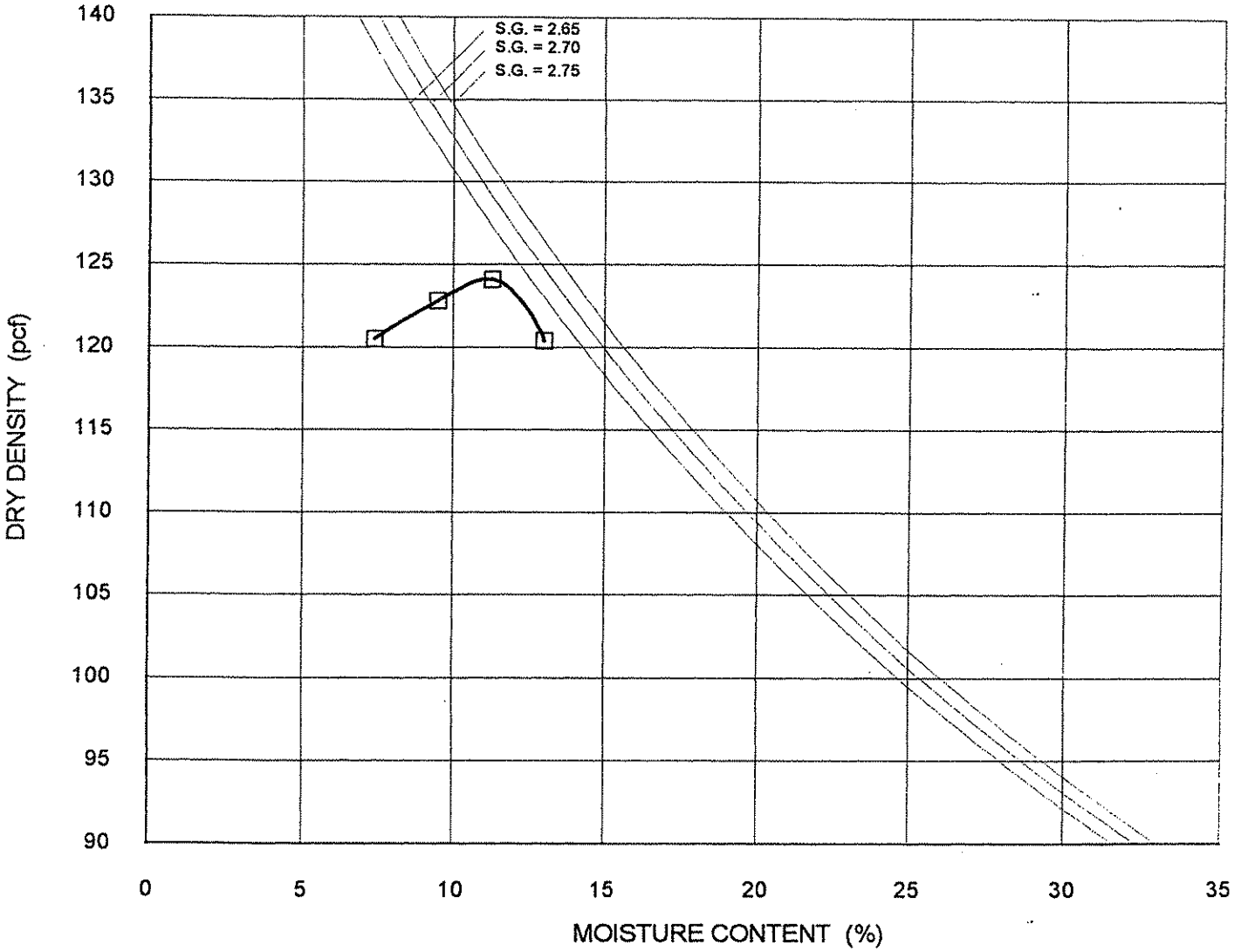
Client Name: Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

MODIFIED PROCTOR
(ASTM D1557-A)

4/00

FIGURE

11823 Slauson Avenue, Unit 18, Santa Fe Springs, CA 90670. Tel: (562)945-0689; Fax: (562)945-0364



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	VISUAL CLASSIFICATION	OPTIMUM MOISTURE (%)	MAX. DRY DENSITY (PCF)
□	SITE 3	N/A	N/A	SC	11.0	124.5

Environmental Geotechnology Laboratory

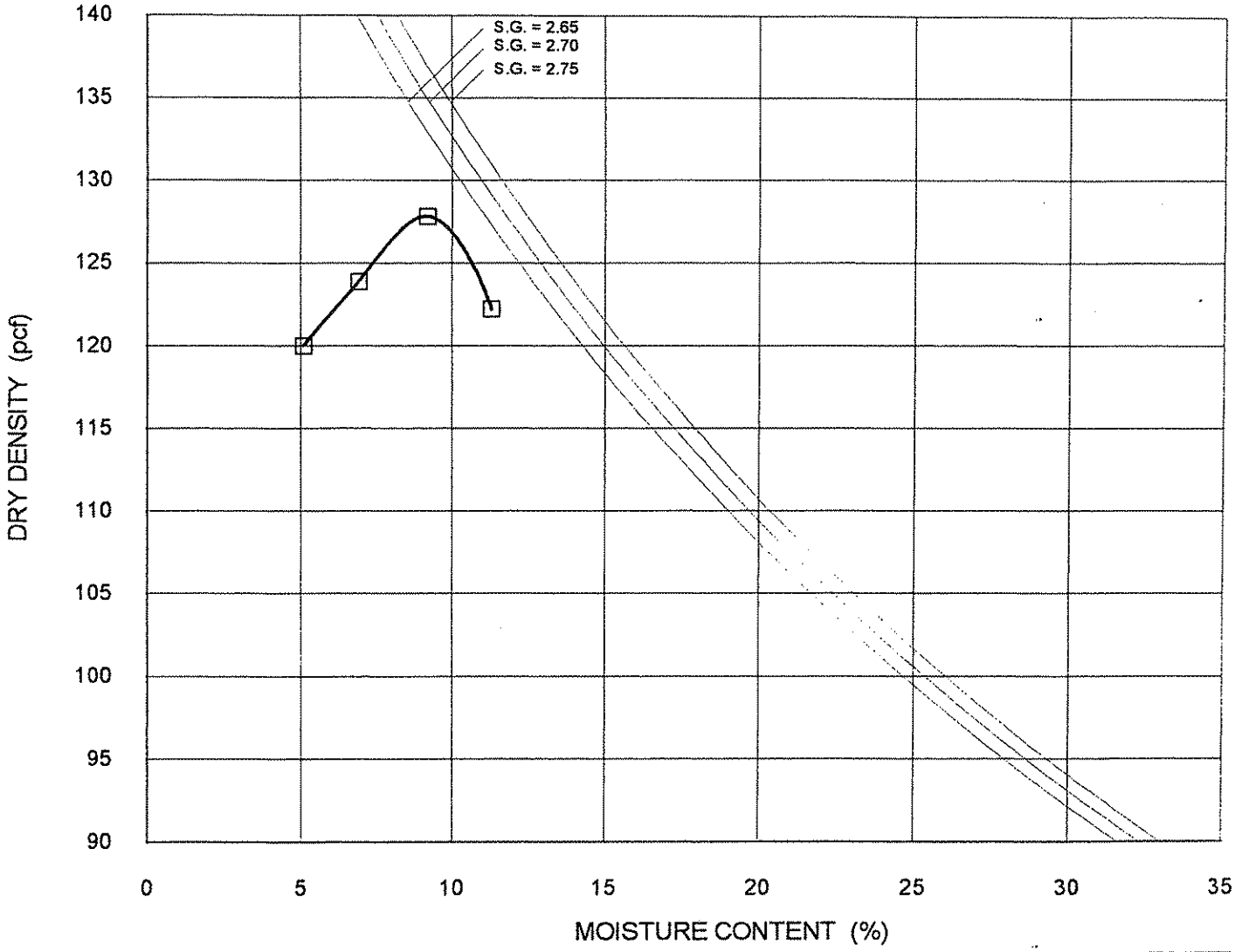
Client Name: Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

MODIFIED PROCTOR
(ASTM D1557-A)

4/00

FIGURE

11823 Slauson Avenue, Unit 18, Santa Fe Springs, CA 90670. Tel: (562)945-0689; Fax: (562)945-0364



SYMBOL	SAMPLE ID	DEPTH (FT)	SAMPLE TYPE	VISUAL CLASSIFICATION	OPTIMUM MOISTURE (%)	MAX. DRY DENSITY (PCF)
□	SITE 4	N/A	N/A	SM	9.0	128.0

Environmental Geotechnology Laboratory

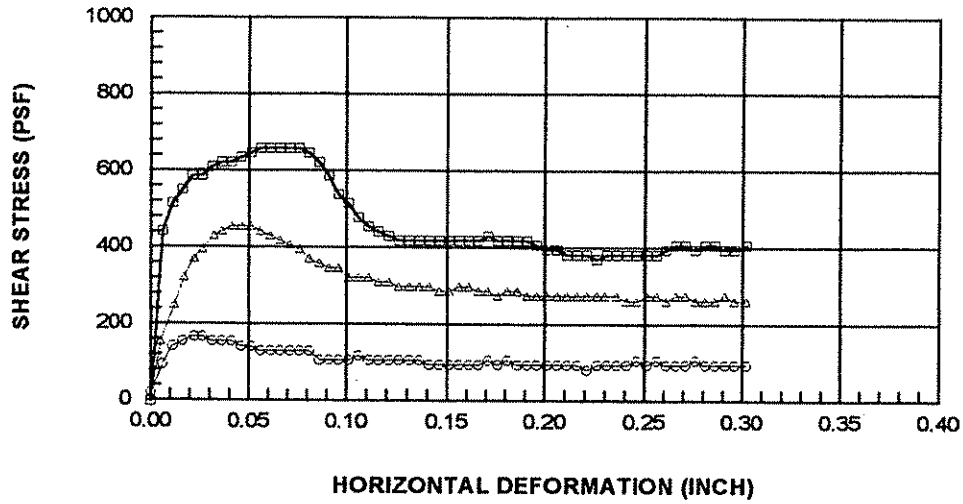
Client Name: Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

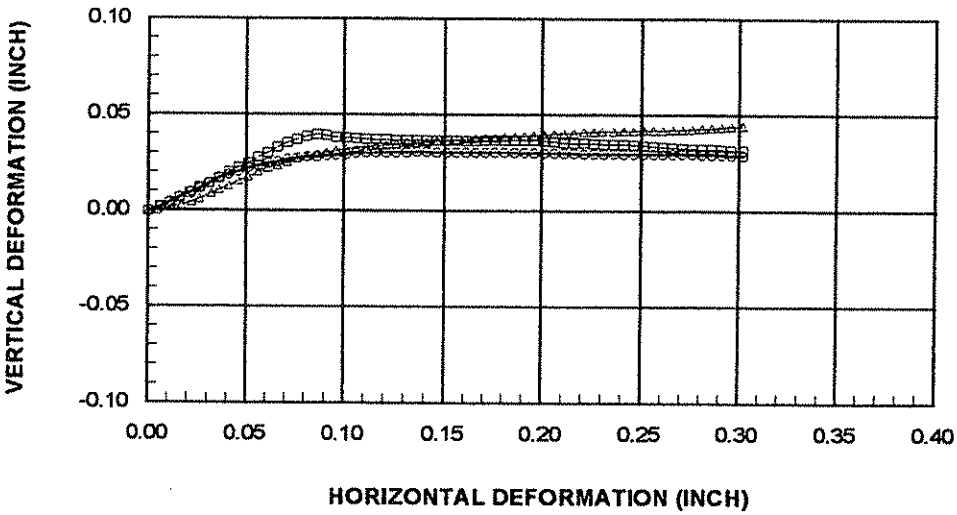
MODIFIED PROCTOR
(ASTM D1557-A)

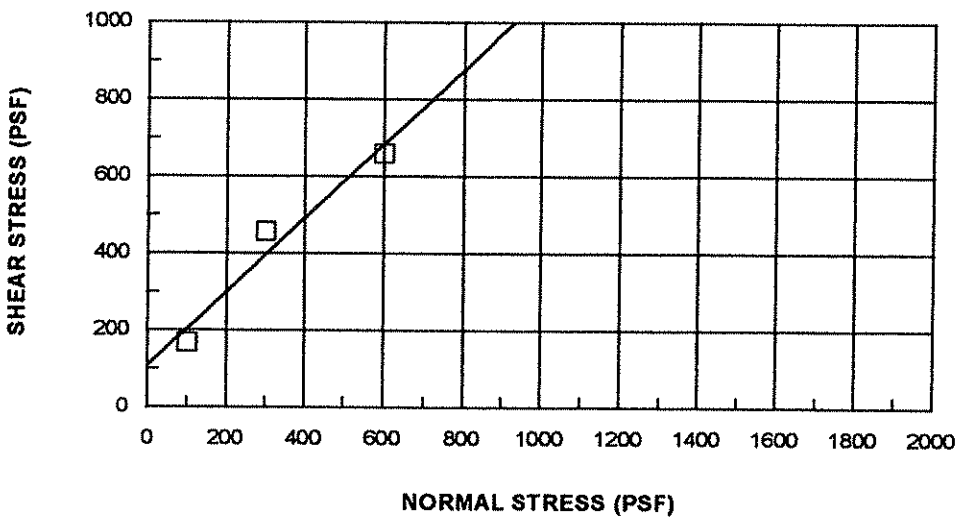
4/00

FIGURE

11823 Slauson Avenue, Unit 18, Santa Fe Springs, CA 90670. Tel: (562)945-0689; Fax: (562)945-0364







Boring No.:	**SITE 1**	Init. Moisture:	**9.5 %**
Depth:	**N/A**	Init. Dry Density:	**117.5 pcf**
Sample Type:	**Remold**	Cohesion:	**110 psf**
Soil Type:	**SM**	Friction Angle:	**44 deg.**

Symbol	Normal Stress (psf)	Peak Strength (psf)	Final Moisture (%)
○	100	168	13.6
△	300	456	14.4
□	600	660	13.2

Environmental Geotechnology Laboratory

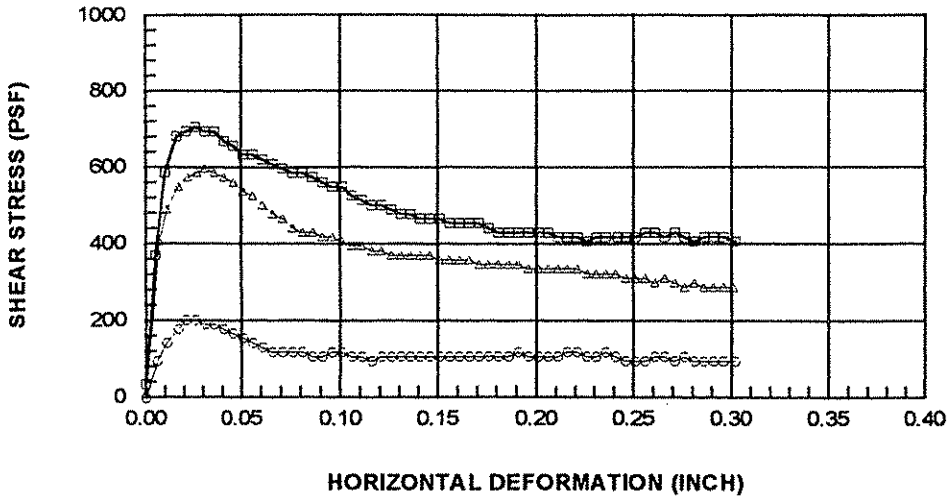
Client Name:Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

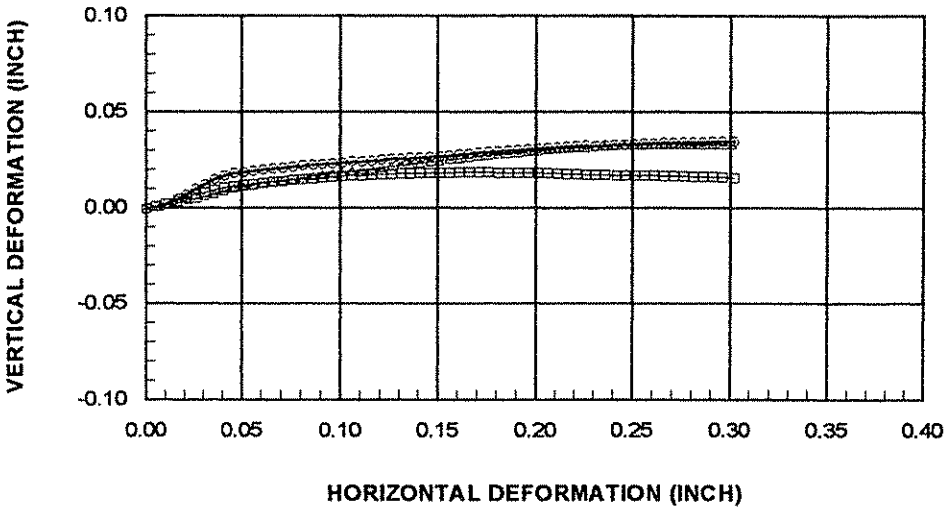
DIRECT SHEAR

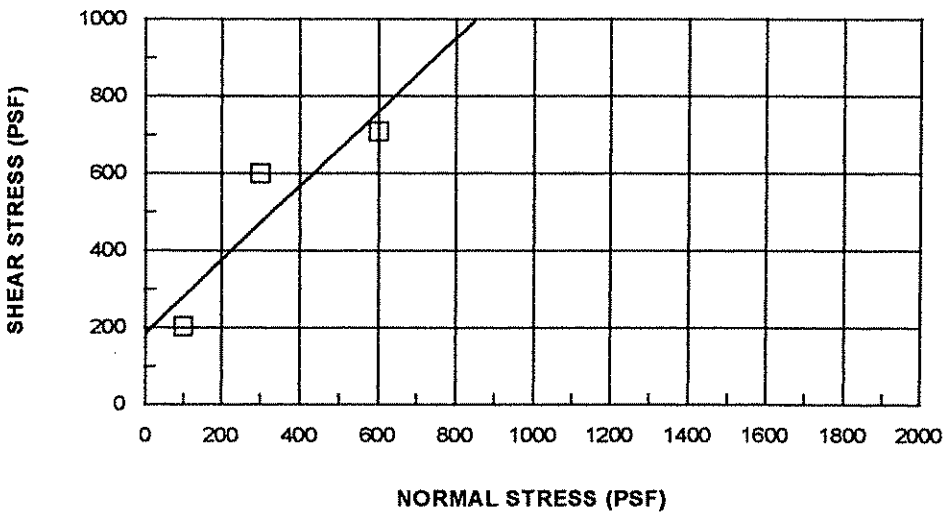
(ASTM D3080)

4/00

FIGURE







Boring No.:	**SITE 3**	Init. Moisture:	**13.0 %**
Depth:	**N/A**	Init. Dry Density:	**112.0 pcf**
Sample Type:	**Remold**	Cohesion:	**185 psf**
Soil Type:	**SC**	Friction Angle:	**44 deg.**

Symbol	Normal Stress (psf)	Peak Strength (psf)	Final Moisture (%)
○	100	204	21.5
△	300	600	21.2
□	600	708	19.9

Environmental Geotechnology Laboratory

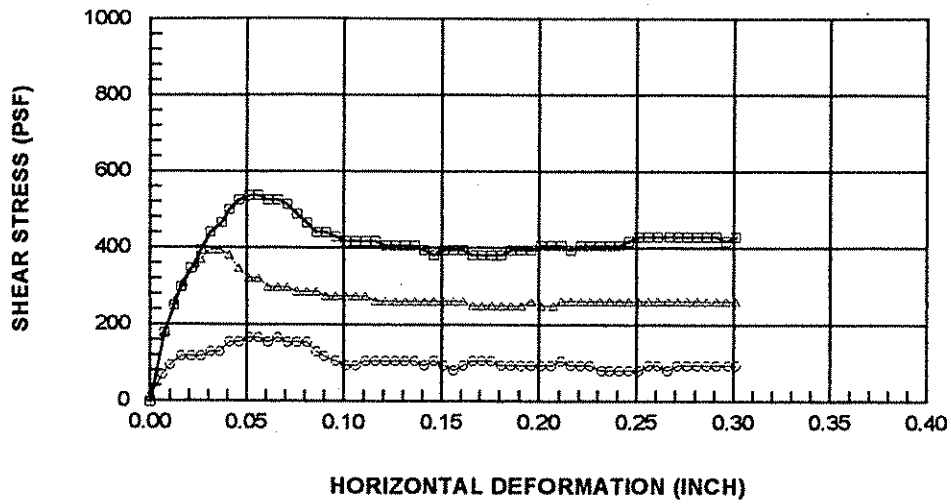
Client Name:Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

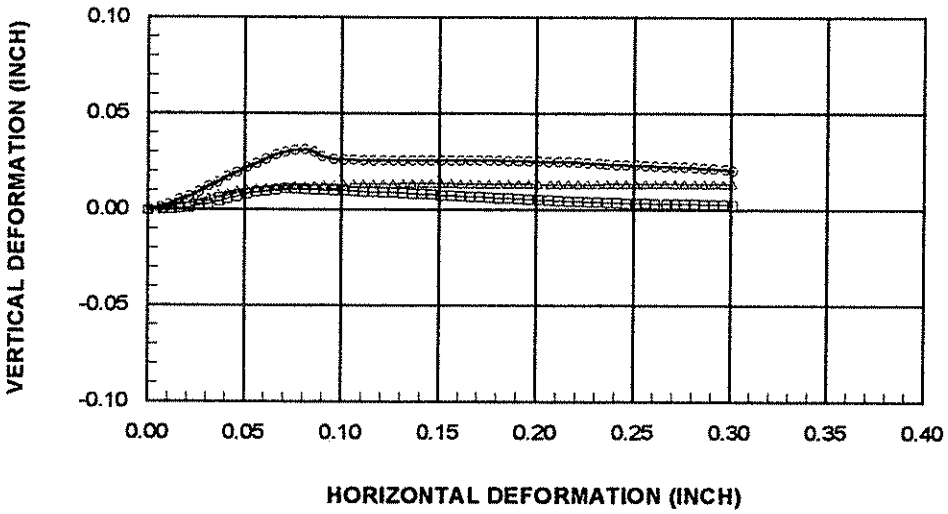
DIRECT SHEAR

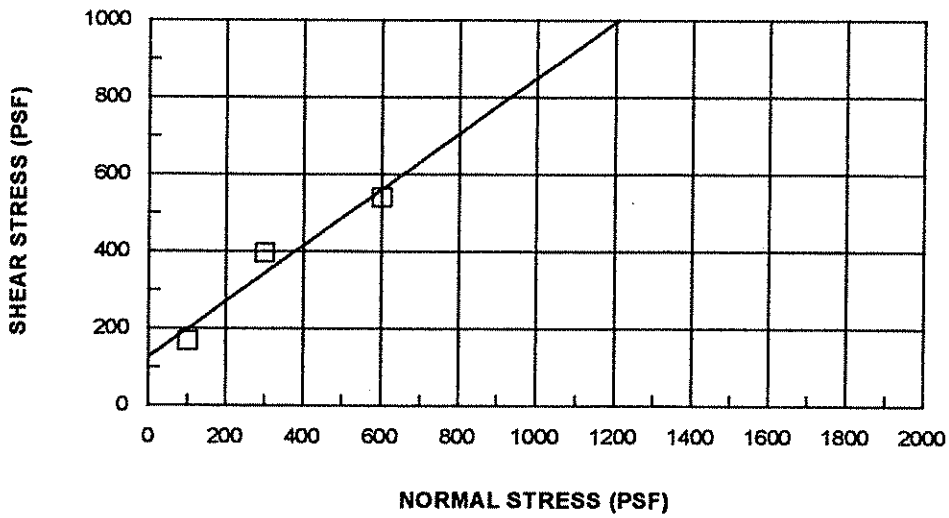
(ASTM D3080)

4/00

FIGURE







Boring No.:	**SITE 4**	Init. Moisture:	**11.0 %**
Depth:	**N/A**	Init. Dry Density:	**115.0 pcf**
Sample Type:	**Remold**	Cohesion:	**125 psf**
Soil Type:	**SM**	Friction Angle:	**36 deg.**

Symbol	Normal Stress (psf)	Peak Strength (psf)	Final Moisture (%)
○	100	168	14.7
△	300	396	13.9
□	600	540	14.4

Environmental Geotechnology Laboratory

Client Name:Golder Associates
Project Name: Antelope Valley Landfill
Project No.: 003-1971
EGL Job No.: 00-099-003

DIRECT SHEAR

(ASTM D3080)

4/00

FIGURE

APPENDIX C

SLOPE STABILITY ANALYSIS RESULTS

"SHORT" SECTION

1 UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat

TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

1 UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat
Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	330.000	2960.000
4	453.000	2899.000
5	607.000	2896.000
6	1078.000	2904.000
7	1292.000	3002.000
8	1292.100	3005.000
9	1319.000	3005.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	329.900	2963.000
2	453.000	2902.000
3	607.000	2899.000
4	1078.000	2907.000

5	1292.100	3005.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse (0-5 feet)

Point	X	Y
1	329.900	2963.000
2	793.000	3124.000
3	894.000	3126.000
4	1292.100	3005.000

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse (5-10 feet)

Point	X	Y
1	335.980	2960.030
2	793.000	3119.000
3	894.000	3121.000
4	1285.290	3001.930

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse (10-15 feet)

Point	X	Y
1	342.030	2957.030
2	793.000	3114.000
3	894.000	3116.000
4	1278.460	2998.800

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse (15-20 feet)

Point	X	Y
1	348.210	2953.970
2	793.000	3109.000
3	894.000	3111.000
4	1271.520	2995.620

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse (20-30 feet)

Point	X	Y
1	354.460	2950.870
2	793.000	3104.000
3	894.000	3106.000
4	1264.420	2992.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse (below 30 feet)

Point	X	Y
1	366.410	2944.940
2	793.000	3094.000
3	894.000	3096.000
4	1251.040	2986.240

All new profile lines defined - No old lines retained
1 UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat
Antelope Valley Public Landfill - Revised Short Section (9/7/00)

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 33.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 7
Refuse (20-30 feet)

Unit weight of material = 66.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 33.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 8
Refuse (below 30 feet)

Unit weight of material = 80.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 33.000 degrees

No (or zero) pore water pressures

All new material properties defined - No old data retained
UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat
Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 15
****
* NEW ANALYSIS/COMPUTATION DATA *
****

Noncircular Shear Surface(s)

Automatic Search Performed

Coordinates of points on shear surface which are to be shifted -

Point	X	Y	Shift Angle
1	325.970	2962.000	angle to be computed - moveable
2	452.720	2899.850	angle to be computed - moveable
3	607.010	2896.930	angle to be computed - moveable
4	644.450	2899.520	angle to be computed - moveable
5	881.110	3114.030	angle to be computed - moveable

Initial distance for shifting points on shear surface = 2.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

---

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Seismic coefficient = .000

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
1 UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat
Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	793.000	3124.000
4	894.000	3126.000
5	1292.100	3005.000
6	1319.000	3005.000

1 UTEXAS3 - VER. 1.209 - 2/28/98 - (C) 1985-2000 S. G. WRIGHT
One (1) copy licensed to Golder Associates, Oakland, CA
Date: 10:26:2000 Time: 11:43:14 Input file: short1.dat
Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 22
****
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE *
****

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
THE TOE OF THE SLOPE A DISTANCE = 1.00
SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
VERY LARGE

Crack depth computed to be - - - 11.71

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.885
Side Force Inclination - - - - - - - - - - 14.35
Number of Iterations - - - - - - - - - - - 6

TABLE NO. 23
****
* SEARCH TRIAL NUMBER 1 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	323.97	2962.00	2.108	12.46	8
1	327.97	2962.00	1.887	14.37	7
2	452.23	2897.91	3.035	13.19	4
2	453.21	2901.79	1.891	14.44	14
3	606.96	2898.93	1.893	14.46	7
3	607.06	2894.93	2.692	16.57	8
4	643.57	2901.32	1.961	14.81	5
4	645.33	2897.72	1.897	14.39	5
5	879.11	3113.99	1.885	14.38	7
5	883.11	3114.07	1.884	14.32	5

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.95	2962.00
2	452.96	2900.81
3	606.99	2897.91
4	644.77	2898.87
5	883.11	3114.07

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.896
Side Force Inclination - - - - - - - - - - 14.44
Number of Iterations - - - - - - - - - - - 6
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 2 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations

1	324.57	2962.00	2.049	12.71	7
1	327.37	2962.00	1.886	14.37	8
2	452.37	2898.49	2.841	12.85	14
2	453.07	2901.21	1.889	14.42	10
3	606.97	2898.33	1.890	14.42	6
3	607.05	2895.53	2.418	16.19	12
4	643.84	2900.78	1.949	14.75	5
4	645.06	2898.26	1.893	14.38	12
5	879.71	3114.00	1.885	14.37	5
5	882.51	3114.06	1.885	14.33	7

Maximum distance shifted for new estimate of shear
surface is 1.400 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.65	2962.00
2	452.89	2900.52
3	606.99	2897.62
4	644.69	2899.03
5	882.51	3114.06

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to .800 as a result of the above
error and search was continued
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 3 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .80

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	325.17	2962.00	1.976	13.18	5
1	326.77	2962.00	1.886	14.36	9
2	452.52	2899.07	2.528	12.36	5
2	452.92	2900.63	1.887	14.39	6
3	606.99	2897.73	1.887	14.39	5
3	607.03	2896.13	1.882	14.32	6
4	644.10	2900.24	1.928	14.62	5
4	644.80	2898.80	1.889	14.37	9
5	880.31	3114.01	1.885	14.36	5
5	881.91	3114.05	1.885	14.34	13

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .800 at point 3

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.36	2962.00
2	452.82	2900.24
3	607.03	2896.13
4	644.59	2899.23
5	881.91	3114.05

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.885
Side Force Inclination - - - - - - - - - - 14.33
Number of Iterations - - - - - - - - - - - 5
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Static Stability Analysis

TABLE NO. 23
****
* SEARCH TRIAL NUMBER 4 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .20

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	325.77	2962.00	1.899	14.09	6
1	326.17	2962.00	1.885	14.35	10
2	452.67	2899.66	1.884	14.34	5
2	452.77	2900.04	1.885	14.36	12
3	607.01	2897.13	1.885	14.36	7
3	607.02	2896.73	1.884	14.34	5
4	644.36	2899.70	1.890	14.39	5
4	644.54	2899.34	1.886	14.36	6
5	880.91	3114.03	1.885	14.36	6
5	881.31	3114.03	1.885	14.35	16

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .200 at point 2

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.07	2962.00
2	452.67	2899.66
3	607.02	2896.73
4	644.48	2899.46
5	881.31	3114.03

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.884
Side Force Inclination - - - - - - - - - - 14.33
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 5 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .20

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	325.87	2962.00	1.893	14.16	6
1	326.27	2962.00	1.884	14.33	5
2	452.62	2899.46	1.883	14.32	7
2	452.72	2899.85	1.884	14.34	6
3	607.01	2896.93	1.885	14.34	6
3	607.02	2896.53	1.883	14.32	8
4	644.39	2899.64	1.883	14.33	9
4	644.57	2899.28	1.885	14.34	5
5	881.11	3114.03	1.884	14.34	14
5	881.51	3114.04	1.884	14.33	8

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .200 at point 2

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.16	2962.00
2	452.62	2899.46
3	607.02	2896.53
4	644.39	2899.64
5	881.51	3114.04

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - 1.882
Side Force Inclination - - - - - - - - - - 14.31
Number of Iterations - - - - - - - - - - - 7
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 6 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .20

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations

1	325.96	2962.00	1.882	14.31	6
1	326.36	2962.00	1.882	14.31	6
2	452.57	2899.27	1.882	14.30	10
2	452.67	2899.66	1.883	14.32	7
3	607.01	2896.73	1.883	14.32	5
3	607.03	2896.33	1.882	14.30	9
4	644.30	2899.82	1.896	14.40	8
4	644.48	2899.46	1.883	14.31	5
5	881.31	3114.03	1.882	14.31	6
5	881.71	3114.04	1.882	14.31	9

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .200 at point 3

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	325.96	2962.00
2	452.57	2899.27
3	607.03	2896.33
4	644.43	2899.56
5	881.71	3114.04

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.883
Side Force Inclination - - - - - - - - - - 14.25
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 25
****
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER 6 TRIAL POSITIONS) *
****

X	Y
326.16	2962.00
452.62	2899.46
607.02	2896.53
644.39	2899.64
881.51	3114.04

1-Stage Factor of Safety = 1.882

Side Force Inclination = 14.31
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Static Stability Analysis

TABLE NO. 26
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *

```
*  (Information is for the Critical Shear Surface in the     *
*  Case of an Automatic Search.)                             *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	326.2	2962.0					
1	328.0	2961.1	935.2	1	500.00	39.00	.0
	329.9	2960.2					
2	329.9	2960.1	26.7	1	500.00	39.00	.0
	330.0	2960.1					
3	330.0	2960.1	.6	2	.00	15.00	.0
	330.0	2960.1					
4	333.0	2958.6	2004.5	2	.00	15.00	.0
	336.0	2957.1					
5	339.0	2955.6	3905.7	2	.00	15.00	.0
	342.0	2954.2					
6	345.1	2952.6	5987.3	2	.00	15.00	.0
	348.2	2951.1					
7	351.3	2949.6	8149.3	2	.00	15.00	.0
	354.5	2948.0					
8	360.4	2945.1	21610.7	2	.00	15.00	.0
	366.4	2942.1					
9	373.6	2938.5	37759.4	2	.00	15.00	.0
	380.8	2935.0					
10	388.0	2931.4	51678.7	2	.00	15.00	.0
	395.1	2927.9					
11	402.3	2924.3	65597.8	2	.00	15.00	.0
	409.5	2920.8					
12	416.7	2917.2	79517.1	2	.00	15.00	.0
	423.9	2913.7					
13	431.1	2910.1	93436.3	2	.00	15.00	.0
	438.3	2906.6					
14	445.4	2903.0	107355.4	2	.00	15.00	.0
	452.6	2899.5					
15	452.8	2899.5	3017.0	2	.00	15.00	.0
	453.0	2899.5					
16	461.6	2899.3	140679.6	2	.00	15.00	.0
	470.1	2899.1					
17	478.7	2899.0	149278.8	2	.00	15.00	.0
	487.2	2898.8					
18	495.8	2898.6	157877.6	2	.00	15.00	.0
	504.3	2898.5					
19	512.9	2898.3	166476.9	2	.00	15.00	.0
	521.4	2898.2					
20	530.0	2898.0	175075.2	2	.00	15.00	.0
	538.6	2897.8					

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Static Stability Analysis

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure

	538.6	2897.8					
21	547.1	2897.7	183674.3	2	.00	15.00	.0
	555.7	2897.5					
22	564.2	2897.3	192273.2	2	.00	15.00	.0
	572.8	2897.2					
23	581.3	2897.0	200872.3	2	.00	15.00	.0
	589.9	2896.9					
24	598.4	2896.7	209472.7	2	.00	15.00	.0
	607.0	2896.5					
25	607.0	2896.5	254.7	2	.00	15.00	.0
	607.0	2896.5					
26	613.2	2897.0	157092.8	2	.00	15.00	.0
	619.5	2897.6					
27	625.7	2898.1	160549.2	2	.00	15.00	.0
	631.9	2898.6					
28	638.1	2899.1	164004.7	2	.00	15.00	.0
	644.3	2899.6					
29	644.4	2899.6	866.4	8	.00	33.00	.0
	644.4	2899.6					
30	651.1	2905.7	176010.8	8	.00	33.00	.0
	657.9	2911.9					
31	664.7	2918.0	167890.1	8	.00	33.00	.0
	671.4	2924.1					
32	678.2	2930.2	159769.4	8	.00	33.00	.0
	684.9	2936.3					
33	691.7	2942.4	151648.7	8	.00	33.00	.0
	698.4	2948.5					
34	705.2	2954.6	143528.0	8	.00	33.00	.0
	711.9	2960.7					
35	718.7	2966.8	135407.3	8	.00	33.00	.0
	725.5	2972.9					
36	732.2	2979.0	127286.6	8	.00	33.00	.0
	739.0	2985.1					
37	745.7	2991.3	119165.8	8	.00	33.00	.0
	752.5	2997.4					
38	759.2	3003.5	111045.1	8	.00	33.00	.0
	766.0	3009.6					
39	772.7	3015.7	102924.6	8	.00	33.00	.0
	779.5	3021.8					
40	786.2	3027.9	94805.5	8	.00	33.00	.0
	793.0	3034.0					

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	793.0	3034.0					
41	799.8	3040.1	84614.6	8	.00	33.00	.0
	806.6	3046.3					
42	813.4	3052.4	71592.3	8	.00	33.00	.0
	820.1	3058.5					
43	826.9	3064.7	58570.3	8	.00	33.00	.0
	833.7	3070.8					

44	840.5	3076.9	45547.7	8	.00	33.00	.0
	847.3	3083.1					
45	854.1	3089.2	32525.5	8	.00	33.00	.0
	860.8	3095.3					
46	866.5	3100.5	17922.3	7	.00	33.00	.0
	872.1	3105.6					
47	875.0	3108.1	6169.6	6	.00	33.00	.0
	877.8	3110.7					
48	879.7	3112.4	3067.2	5	500.00	.00	.0
	881.5	3114.0					

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TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
1	328.0	0.	2962.0	0.	0.	.0	.0
2	329.9	0.	2961.3	0.	0.	.0	.0
3	330.0	0.	2961.6	0.	0.	.0	.0
4	333.0	0.	2961.3	0.	0.	.0	.0
5	339.0	0.	2960.9	0.	0.	.0	.0
6	345.1	0.	2960.4	0.	0.	.0	.0
7	351.3	0.	2959.9	0.	0.	.0	.0
8	360.4	0.	2959.1	0.	0.	.0	.0
9	373.6	0.	2957.7	0.	0.	.0	.0
10	388.0	0.	2956.0	0.	0.	.0	.0
11	402.3	0.	2954.7	0.	0.	.0	.0
12	416.7	0.	2953.4	0.	0.	.0	.0
13	431.1	0.	2952.2	0.	0.	.0	.0
14	445.4	0.	2951.0	0.	0.	.0	.0
15	452.8	0.	2950.5	0.	0.	.0	.0
16	461.6	0.	2951.9	0.	0.	.0	.0
17	478.7	0.	2954.7	0.	0.	.0	.0
18	495.8	0.	2957.4	0.	0.	.0	.0
19	512.9	0.	2960.2	0.	0.	.0	.0
20	530.0	0.	2963.0	0.	0.	.0	.0
21	547.1	0.	2965.8	0.	0.	.0	.0
22	564.2	0.	2968.6	0.	0.	.0	.0
23	581.3	0.	2971.4	0.	0.	.0	.0
24	598.4	0.	2974.2	0.	0.	.0	.0
25	607.0	0.	2975.6	0.	0.	.0	.0
26	613.2	0.	2976.9	0.	0.	.0	.0
27	625.7	0.	2979.5	0.	0.	.0	.0
28	638.1	0.	2982.0	0.	0.	.0	.0
29	644.4	0.	2983.3	0.	0.	.0	.0
30	651.1	0.	2987.6	0.	0.	.0	.0
31	664.7	0.	2996.1	0.	0.	.0	.0
32	678.2	0.	3004.5	0.	0.	.0	.0
33	691.7	0.	3013.0	0.	0.	.0	.0
34	705.2	0.	3021.5	0.	0.	.0	.0
35	718.7	0.	3030.0	0.	0.	.0	.0
36	732.2	0.	3038.5	0.	0.	.0	.0

37	745.7	0.	3047.0	0.	0.	.0	.0
38	759.2	0.	3055.5	0.	0.	.0	.0
39	772.7	0.	3064.0	0.	0.	.0	.0

TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for  *
*  Individual Slices for Conventional  Computations or the *
*  First Stage of Multi-Stage Computations.                *
*  (Information is for the Critical Shear Surface in the   *
*  Case of an Automatic Search.)                           *
************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
40	786.2	0.	3072.5	0.	0.	.0	.0
41	799.8	0.	3080.0	0.	0.	.0	.0
42	813.4	0.	3086.4	0.	0.	.0	.0
43	826.9	0.	3092.9	0.	0.	.0	.0
44	840.5	0.	3099.5	0.	0.	.0	.0
45	854.1	0.	3106.4	0.	0.	.0	.0
46	866.5	0.	3112.7	0.	0.	.0	.0
47	875.0	0.	3116.8	0.	0.	.0	.0
48	879.7	0.	3119.0	0.	0.	.0	.0

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TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Iter-ation	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.3845E+06	-.1028E+10		
First-order corrections to F and THETA					-.172E+01	-.195E+00
Values factored by .291E+00 - Deltas too large					-.500E+00	-.567E-01
2	2.50000	14.9433	.2510E+06	-.6712E+09		
First-order corrections to F and THETA					-.794E+00	-.238E+00
Values factored by .629E+00 - Deltas too large					-.500E+00	-.150E+00
3	2.00000	14.7935	.5507E+05	-.1462E+09		
First-order corrections to F and THETA					-.121E+00	-.354E+00
Second-order correction - Iteration 1					-.115E+00	-.354E+00
Second-order correction - Iteration 2					-.115E+00	-.354E+00
4	1.88484	14.4398	-.1750E+03	.9368E+06		
First-order corrections to F and THETA					-.262E-02	-.129E+00
Second-order correction - Iteration 1					-.261E-02	-.129E+00

```
Second-order correction - Iteration   2 ........  -.261E-02 -.129E+00

   5   1.88223    14.3112   .6122E-01  -.3331E+03
First-order corrections to F and THETA .........   .943E-06  .465E-04
Second-order correction - Iteration   1 ........   .946E-06  .466E-04

   6   1.88223    14.3112   .1160E+00   .1282E+03
First-order corrections to F and THETA .........  -.298E-05 -.122E-03
Second-order correction - Iteration   1 ........  -.298E-05 -.122E-03

   7   1.88223    14.3111  -.4724E-01  -.8858E+02
First-order corrections to F and THETA .........   .144E-05  .598E-04

Factor of Safety - - - - - - - -     1.882
Side Force Inclination - - - - -     14.31
Number of Iterations - - - - - -     7
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TABLE NO. 38
*****************************************************************
*  Final Results for Stresses Along the Shear Surface           *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =  1.882     Side Force Inclination =  14.31 Degrees

       -------- VALUES AT CENTER OF BASE OF SLICE---------
```

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	328.0	2961.1	815.0	815.0	616.3
2	329.9	2960.1	860.4	860.4	635.8
3	330.0	2960.1	238.4	238.4	33.9
4	333.0	2958.6	437.0	437.0	62.2
5	339.0	2955.6	841.5	841.5	119.8
6	345.1	2952.6	1262.9	1262.9	179.8
7	351.3	2949.6	1699.7	1699.7	242.0
8	360.4	2945.1	2357.4	2357.4	335.6
9	373.6	2938.5	3425.7	3425.7	487.7
10	388.0	2931.4	4688.4	4688.4	667.4
11	402.3	2924.3	5951.2	5951.2	847.2
12	416.7	2917.2	7214.0	7214.0	1027.0
13	431.1	2910.1	8476.8	8476.8	1206.7
14	445.4	2903.0	9739.8	9739.8	1386.5
15	452.8	2899.5	8327.4	8327.4	1185.5
16	461.6	2899.3	8598.7	8598.7	1224.1
17	478.7	2899.0	9124.3	9124.3	1298.9
18	495.8	2898.6	9649.9	9649.9	1373.7
19	512.9	2898.3	10175.5	10175.5	1448.6
20	530.0	2898.0	10701.1	10701.1	1523.4
21	547.1	2897.7	11226.7	11226.7	1598.2
22	564.2	2897.3	11752.3	11752.3	1673.0
23	581.3	2897.0	12277.9	12277.9	1747.8
24	598.4	2896.7	12803.5	12803.5	1822.7
25	607.0	2896.5	13093.6	13093.6	1864.0
26	613.2	2897.0	12673.8	12673.8	1804.2
27	625.7	2898.1	12952.7	12952.7	1843.9
28	638.1	2899.1	13231.5	13231.5	1883.6
29	644.4	2899.6	13860.9	13860.9	4782.3

30	651.1	2905.7	8956.6	8956.6	3090.2
31	664.7	2918.0	8543.4	8543.4	2947.6
32	678.2	2930.2	8130.2	8130.2	2805.1
33	691.7	2942.4	7716.9	7716.9	2662.5
34	705.2	2954.6	7303.7	7303.7	2519.9
35	718.7	2966.8	6890.4	6890.4	2377.3
36	732.2	2979.0	6477.2	6477.2	2234.8
37	745.7	2991.3	6064.0	6064.0	2092.2
38	759.2	3003.5	5650.7	5650.7	1949.6
39	772.7	3015.7	5237.5	5237.5	1807.0

1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	786.2	3027.9	4824.2	4824.2	1664.4
41	799.8	3040.1	4287.7	4287.7	1479.3
42	813.4	3052.4	3627.8	3627.8	1251.7
43	826.9	3064.7	2967.9	2967.9	1024.0
44	840.5	3076.9	2308.0	2308.0	796.3
45	854.1	3089.2	1648.2	1648.2	568.6
46	866.5	3100.5	1089.7	1089.7	376.0
47	875.0	3108.1	750.2	750.2	258.8
48	879.7	3112.4	530.8	530.8	265.6

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION    =          .12  (=  .117E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION  =          .29  (=  .294E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -197.15  (= -.197E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =          .05  (=  .470E-01)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE
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```

TABLE NO. 39

```
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 1.882 Side Force Inclination = 14.31 Degrees

--------------- VALUES AT RIGHT SIDE OF SLICE ----------------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	329.9	3933.	2961.6	.492	1272.6	1402.6
2	330.0	4038.	2961.5	.490	1256.0	1414.9
3	330.0	4039.	2961.5	.490	1258.1	1410.7
4	336.0	5756.	2962.0	.605	1141.8	258.0
5	342.0	9103.	2960.9	.517	743.2	607.1

6	348.2	14233.	2959.2	.444	502.4	1007.4
7	354.5	21215.	2957.4	.398	337.3	1409.7
8	366.4	39732.	2954.0	.353	136.9	2154.9
9	380.8	72084.	2949.9	.326	-67.7	3124.6
10	395.1	116362.	2945.8	.311	-266.7	4168.2
11	409.5	172565.	2941.9	.302	-447.6	5231.9
12	423.9	240695.	2938.1	.297	-612.8	6301.2
13	438.3	320750.	2934.3	.295	-766.3	7371.9
14	452.6	412737.	2930.6	.293	-910.9	8442.3
15	453.0	413262.	2930.6	.293	-905.8	8437.0
16	470.1	437762.	2933.1	.302	-710.7	8243.9
17	487.2	463759.	2935.5	.308	-568.4	8127.8
18	504.3	491254.	2937.6	.313	-467.3	8073.6
19	521.4	520247.	2939.7	.316	-398.7	8069.4
20	538.6	550737.	2941.6	.318	-355.9	8106.2
21	555.7	582725.	2943.5	.319	-333.7	8176.8
22	572.8	616210.	2945.2	.320	-328.1	8275.6
23	589.9	651193.	2946.9	.319	-336.0	8398.1
24	607.0	687677.	2948.4	.319	-354.9	8540.6
25	607.0	687722.	2948.4	.319	-354.9	8540.8
26	619.5	697344.	2950.9	.321	-300.2	8436.2
27	631.9	707177.	2953.3	.323	-251.9	8342.4
28	644.3	717222.	2955.7	.325	-209.4	8258.6
29	644.4	717466.	2955.7	.325	-211.3	8262.5
30	657.9	647639.	2964.7	.320	-304.0	7902.4
31	671.4	581034.	2973.7	.315	-395.4	7537.4
32	684.9	517650.	2982.7	.309	-484.6	7166.2
33	698.4	457489.	2991.7	.303	-570.8	6787.1
34	711.9	400548.	3000.6	.295	-652.4	6397.9
35	725.5	346830.	3009.6	.287	-727.4	5995.6
36	739.0	296333.	3018.5	.278	-793.1	5576.0
37	752.5	249057.	3027.5	.268	-845.2	5133.7
38	766.0	205004.	3036.5	.256	-877.9	4660.5
39	779.5	164172.	3045.5	.243	-882.6	4145.4
40	793.0	126559.	3054.7	.230	-846.0	3571.4

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	806.6	92991.	3064.0	.228	-732.4	3043.0
42	820.1	64589.	3073.4	.225	-618.6	2515.2
43	833.7	41353.	3082.7	.220	-505.1	1989.3
44	847.3	23283.	3091.9	.211	-394.1	1468.5
45	860.8	10379.	3100.9	.187	-294.8	965.3
46	872.1	3269.	3108.0	.124	-199.4	516.2
47	877.8	822.	3111.4	.046	-91.4	197.5
48	881.5	0.	-5144.6	BELOW	-17.7	17.7

CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION = .12 (= .117E+00)
SHOULD NOT EXCEED .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION = .29 (= .294E+00)
SHOULD NOT EXCEED .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN = -197.15 (= -.197E+03)
SHOULD NOT EXCEED .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM = .05 (= .470E-01)
SHOULD NOT EXCEED .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

END-OF-FILE ENCOUNTERED WHILE READING COMMAND

WORDS - END OF PROBLEM(S) ASSUMED

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Seismic Stability Analysis

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	330.000	2960.000
4	453.000	2899.000
5	607.000	2896.000
6	1078.000	2904.000
7	1292.000	3002.000
8	1292.100	3005.000
9	1319.000	3005.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	329.900	2963.000
2	453.000	2902.000
3	607.000	2899.000
4	1078.000	2907.000

5	1292.100	3005.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse (0-5 feet)

Point	X	Y
1	329.900	2963.000
2	793.000	3124.000
3	894.000	3126.000
4	1292.100	3005.000

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse (5-10 feet)

Point	X	Y
1	335.980	2960.030
2	793.000	3119.000
3	894.000	3121.000
4	1285.290	3001.930

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse (10-15 feet)

Point	X	Y
1	342.030	2957.030
2	793.000	3114.000
3	894.000	3116.000
4	1278.460	2998.800

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse (15-20 feet)

Point	X	Y
1	348.210	2953.970
2	793.000	3109.000
3	894.000	3111.000
4	1271.520	2995.620

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse (20-30 feet)

Point	X	Y
1	354.460	2950.870
2	793.000	3104.000
3	894.000	3106.000
4	1264.420	2992.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse (below 30 feet)

Point	X	Y
1	366.410	2944.940
2	793.000	3094.000
3	894.000	3096.000
4	1251.040	2986.240

All new profile lines defined - No old lines retained
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TABLE NO. 3

```
*********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
```

DATA FOR MATERIAL TYPE 1
Bedrock

Unit weight of material = 130.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - 39.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 2
Liner

Unit weight of material = 62.400

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 15.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 3
Refuse (0-5 feet)

Unit weight of material = 60.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 4
Refuse (5-10 feet)

Unit weight of material = 62.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 5
Refuse (10-15 feet)

Unit weight of material = 63.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 6
Refuse (15-20 feet)

Unit weight of material = 64.500

```
     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  7
Refuse (20-30 feet)

     Unit weight of material =   66.500

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  8
Refuse (below 30 feet)

     Unit weight of material =   80.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

All new material properties defined - No old data retained
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TABLE NO. 15
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Noncircular Shear Surface(s)

Computations Performed for Single Shear Surface


Shear Surface Coordinates -

     Point          X              Y

       1         325.970       2962.000
       2         452.720       2899.850
       3         607.010       2896.930
       4         644.450       2899.520
       5         881.110       3114.030

Seismic coefficient =  .240

-----------------------------------------------------------------------
THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety =   3.000

Initial trial estimate for side force inclination =  15.000 degrees
(Applicable to Spencer's procedure only)
```

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	793.000	3124.000
4	894.000	3126.000
5	1292.100	3005.000
6	1319.000	3005.000

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TABLE NO. 26
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the Critical Shear Surface in the *
* Case of an Automatic Search.) *
****

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	326.0	2962.0					
1	327.9	2961.0	1003.1	1	500.00	39.00	.0
	329.9	2960.1					
2	329.9	2960.0	28.2	1	500.00	39.00	.0
	330.0	2960.0					
3	330.0	2960.0	.2	2	.00	15.00	.0
	330.0	2960.0					

4	333.0	2958.6	2028.8	2	.00	15.00	.0
	336.0	2957.1					
5	339.0	2955.6	3920.8	2	.00	15.00	.0
	342.0	2954.1					
6	345.1	2952.6	5992.9	2	.00	15.00	.0
	348.2	2951.1					
7	351.3	2949.6	8144.9	2	.00	15.00	.0
	354.5	2948.0					
8	360.4	2945.1	21573.5	2	.00	15.00	.0
	366.4	2942.2					
9	373.6	2938.6	37716.4	2	.00	15.00	.0
	380.8	2935.1					
10	388.0	2931.6	51613.3	2	.00	15.00	.0
	395.2	2928.1					
11	402.4	2924.5	65510.6	2	.00	15.00	.0
	409.6	2921.0					
12	416.8	2917.5	79407.6	2	.00	15.00	.0
	424.0	2914.0					
13	431.1	2910.4	93305.1	2	.00	15.00	.0
	438.3	2906.9					
14	445.5	2903.4	107201.6	2	.00	15.00	.0
	452.7	2899.9					
15	452.9	2899.8	2223.4	2	.00	15.00	.0
	453.0	2899.8					
16	461.6	2899.7	140263.3	2	.00	15.00	.0
	470.1	2899.5					
17	478.7	2899.4	148860.9	2	.00	15.00	.0
	487.2	2899.2					
18	495.8	2899.0	157458.7	2	.00	15.00	.0
	504.3	2898.9					
19	512.9	2898.7	166056.4	2	.00	15.00	.0
	521.4	2898.5					
20	530.0	2898.4	174653.7	2	.00	15.00	.0
	538.6	2898.2					

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	538.6	2898.2					
21	547.1	2898.1	183251.2	2	.00	15.00	.0
	555.7	2897.9					
22	564.2	2897.7	191849.1	2	.00	15.00	.0
	572.8	2897.6					
23	581.3	2897.4	200446.7	2	.00	15.00	.0
	589.9	2897.3					
24	598.4	2897.1	209046.2	2	.00	15.00	.0
	607.0	2896.9					
25	607.0	2896.9	124.8	2	.00	15.00	.0
	607.0	2896.9					
26	613.3	2897.4	157415.0	2	.00	15.00	.0
	619.5	2897.8					
27	625.7	2898.2	161032.5	2	.00	15.00	.0

	632.0	2898.7					
28	638.2	2899.1	164650.5	2	.00	15.00	.0
	644.5	2899.5					
29	644.5	2899.6	1740.3	2	.00	15.00	.0
	644.6	2899.6					
30	651.3	2905.8	175848.9	8	.00	33.00	.0
	658.1	2911.9					
31	664.8	2918.0	167716.3	8	.00	33.00	.0
	671.6	2924.1					
32	678.3	2930.2	159584.0	8	.00	33.00	.0
	685.1	2936.3					
33	691.8	2942.4	151451.4	8	.00	33.00	.0
	698.6	2948.6					
34	705.3	2954.7	143319.2	8	.00	33.00	.0
	712.0	2960.8					
35	718.8	2966.9	135186.6	8	.00	33.00	.0
	725.5	2973.0					
36	732.3	2979.1	127054.6	8	.00	33.00	.0
	739.0	2985.2					
37	745.8	2991.4	118921.8	8	.00	33.00	.0
	752.5	2997.5					
38	759.3	3003.6	110789.8	8	.00	33.00	.0
	766.0	3009.7					
39	772.8	3015.8	102657.0	8	.00	33.00	.0
	779.5	3021.9					
40	786.3	3028.1	94524.5	8	.00	33.00	.0
	793.0	3034.2					

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	793.0	3034.2					
41	799.7	3040.3	84026.9	8	.00	33.00	.0
	806.5	3046.4					
42	813.2	3052.5	71105.7	8	.00	33.00	.0
	820.0	3058.6					
43	826.7	3064.8	58184.5	8	.00	33.00	.0
	833.5	3070.9					
44	840.2	3077.0	45263.3	8	.00	33.00	.0
	847.0	3083.1					
45	853.7	3089.2	32341.7	8	.00	33.00	.0
	860.5	3095.3					
46	866.1	3100.4	17877.2	7	.00	33.00	.0
	871.8	3105.6					
47	874.6	3108.1	6154.1	6	.00	33.00	.0
	877.4	3110.7					
48	879.3	3112.4	3059.6	5	500.00	.00	.0
	881.1	3114.0					

Seismic Stability Analysis

TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
1	327.9	241.	2962.0	0.	0.	.0	.0
2	329.9	7.	2961.3	0.	0.	.0	.0
3	330.0	0.	2961.5	0.	0.	.0	.0
4	333.0	487.	2961.3	0.	0.	.0	.0
5	339.0	941.	2960.8	0.	0.	.0	.0
6	345.1	1438.	2960.4	0.	0.	.0	.0
7	351.3	1955.	2959.9	0.	0.	.0	.0
8	360.4	5178.	2959.2	0.	0.	.0	.0
9	373.6	9052.	2957.7	0.	0.	.0	.0
10	388.0	12387.	2956.1	0.	0.	.0	.0
11	402.4	15723.	2954.8	0.	0.	.0	.0
12	416.8	19058.	2953.5	0.	0.	.0	.0
13	431.1	22393.	2952.3	0.	0.	.0	.0
14	445.5	25728.	2951.2	0.	0.	.0	.0
15	452.9	534.	2950.6	0.	0.	.0	.0
16	461.6	33663.	2952.0	0.	0.	.0	.0
17	478.7	35727.	2954.8	0.	0.	.0	.0
18	495.8	37790.	2957.6	0.	0.	.0	.0
19	512.9	39854.	2960.4	0.	0.	.0	.0
20	530.0	41917.	2963.2	0.	0.	.0	.0
21	547.1	43980.	2966.0	0.	0.	.0	.0
22	564.2	46044.	2968.8	0.	0.	.0	.0
23	581.3	48107.	2971.5	0.	0.	.0	.0
24	598.4	50171.	2974.3	0.	0.	.0	.0
25	607.0	30.	2975.7	0.	0.	.0	.0
26	613.3	37780.	2977.0	0.	0.	.0	.0
27	625.7	38648.	2979.5	0.	0.	.0	.0
28	638.2	39516.	2982.0	0.	0.	.0	.0
29	644.5	418.	2983.3	0.	0.	.0	.0
30	651.3	42204.	2987.6	0.	0.	.0	.0
31	664.8	40252.	2996.1	0.	0.	.0	.0
32	678.3	38300.	3004.6	0.	0.	.0	.0
33	691.8	36348.	3013.1	0.	0.	.0	.0
34	705.3	34397.	3021.6	0.	0.	.0	.0
35	718.8	32445.	3030.0	0.	0.	.0	.0
36	732.3	30493.	3038.5	0.	0.	.0	.0
37	745.8	28541.	3047.0	0.	0.	.0	.0
38	759.3	26590.	3055.5	0.	0.	.0	.0
39	772.8	24638.	3064.1	0.	0.	.0	.0

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TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
```

```
*  First Stage of Multi-Stage Computations.                    *
*  (Information is for the Critical Shear Surface in the       *
*  Case of an Automatic Search.)                               *
***************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
40	786.3	22686.	3072.6	0.	0.	.0	.0
41	799.7	20166.	3080.0	0.	0.	.0	.0
42	813.2	17065.	3086.4	0.	0.	.0	.0
43	826.7	13964.	3092.9	0.	0.	.0	.0
44	840.2	10863.	3099.5	0.	0.	.0	.0
45	853.7	7762.	3106.4	0.	0.	.0	.0
46	866.1	4291.	3112.7	0.	0.	.0	.0
47	874.6	1477.	3116.8	0.	0.	.0	.0
48	879.3	734.	3119.0	0.	0.	.0	.0

```
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```

TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Iteration	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.1437E+07	-.3908E+10		
First-order corrections to F and THETA					-.677E+01	.146E+01
Values factored by .738E-01 - Deltas too large					-.500E+00	.108E+00
2	2.50000	15.1075	.1311E+07	-.3566E+10		
First-order corrections to F and THETA					-.435E+01	.157E+01
Values factored by .115E+00 - Deltas too large					-.500E+00	.180E+00
3	2.00000	15.2879	.1125E+07	-.3062E+10		
First-order corrections to F and THETA					-.243E+01	.177E+01
Values factored by .206E+00 - Deltas too large					-.500E+00	.364E+00
4	1.50000	15.6520	.8209E+06	-.2241E+10		
First-order corrections to F and THETA					-.101E+01	.224E+01
Values factored by .494E+00 - Deltas too large					-.500E+00	.111E+01
5	1.00000	16.7575	.2138E+06	-.6115E+09		
On iteration 5 the following slices produced low denominators in the equations for the factor of safety - 1 2						
First-order corrections to F and THETA					-.808E-01	.503E+01
Second-order correction - Iteration 1					-.625E-01	.503E+01
Second-order correction - Iteration 2					-.622E-01	.503E+01
Second-order correction - Iteration 3					-.622E-01	.503E+01
6	.93782	21.7842	-.7671E+05	.1782E+09		
On iteration 6 the following slices produced low denominators in the equations for the factor of safety - 1 2						
First-order corrections to F and THETA					.824E-01	.307E+01

```
Second-order correction - Iteration   1 ........   .892E-01  .307E+01
Second-order correction - Iteration   2 ........   .897E-01  .307E+01
Second-order correction - Iteration   3 ........   .897E-01  .307E+01

   7   1.02753    24.8557  -.1709E+05   .5168E+08
On iteration   7 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.236E-01 -.844E+00
Second-order correction - Iteration   1 ........  -.208E-01 -.844E+00
Second-order correction - Iteration   2 ........  -.203E-01 -.844E+00
Second-order correction - Iteration   3 ........  -.203E-01 -.844E+00

   8   1.00725    24.0113   .7680E+04  -.1929E+08
On iteration   8 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.170E-02 -.122E-01
Second-order correction - Iteration   1 ........  -.167E-02 -.122E-01
Second-order correction - Iteration   2 ........  -.167E-02 -.122E-01

   9   1.00557    23.9992  -.5271E+01   .2230E+05
On iteration   9 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.238E-04 -.930E-03
Second-order correction - Iteration   1 ........  -.238E-04 -.930E-03

  10   1.00555    23.9982   .5325E-01  -.3919E+03
On iteration  10 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .698E-06  .267E-04
Second-order correction - Iteration   1 ........   .698E-06  .267E-04

  11   1.00555    23.9983  -.8627E-01   .6026E+03
On iteration  11 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.104E-05 -.398E-04
Second-order correction - Iteration   1 ........  -.104E-05 -.398E-04

  12   1.00555    23.9982  -.3471E+00   .8684E+03
On iteration  12 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .856E-07  .980E-06
Second-order correction - Iteration   1 ........   .856E-07  .980E-06

  13   1.00555    23.9982   .4374E+00  -.1019E+04
On iteration  13 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.316E-06 -.910E-05
Second-order correction - Iteration   1 ........  -.316E-06 -.910E-05

  14   1.00555    23.9982  -.3914E+00   .1046E+04
On iteration  14 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.870E-07 -.581E-05
Second-order correction - Iteration   1 ........  -.870E-07 -.581E-05

  15   1.00555    23.9982  -.3915E+00   .7363E+03
On iteration  15 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
```

```
First-order corrections to F and THETA .........   .765E-06  .263E-04
Second-order correction - Iteration   1 ........   .765E-06  .263E-04

  16   1.00555    23.9982  -.3227E+00   .7622E+03
On iteration  16 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .204E-06  .561E-05
Second-order correction - Iteration   1 ........   .204E-06  .561E-05

  17   1.00555    23.9982   .2655E+00  -.6630E+03
On iteration  17 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.692E-07 -.889E-06
Second-order correction - Iteration   1 ........  -.692E-07 -.889E-06

  18   1.00555    23.9982  -.2021E+00   .5492E+02
On iteration  18 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .129E-05  .473E-04

Factor of Safety - - - - - - - -     1.006
Side Force Inclination - - - - -     24.00
Number of Iterations - - - - - -    18

DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   2 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1     2
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TABLE NO. 38
*************************************************************
*  Final Results for Stresses Along the Shear Surface       *
*  (Results for Critical Shear Surface in Case of a Search.) *
*************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =  1.006     Side Force Inclination =  24.00 Degrees

       -------- VALUES AT CENTER OF BASE OF SLICE---------
```

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	327.9	2961.0	24477.7	24477.7	20209.4
2	329.9	2960.0	24846.0	24846.0	20506.1
3	330.0	2960.0	364.7	364.7	97.2
4	333.0	2958.6	569.1	569.1	151.7
5	339.0	2955.6	1087.2	1087.2	289.7
6	345.1	2952.6	1626.8	1626.8	433.5
7	351.3	2949.6	2186.2	2186.2	582.6
8	360.4	2945.1	3028.5	3028.5	807.0
9	373.6	2938.6	4398.4	4398.4	1172.0
10	388.0	2931.6	6019.0	6019.0	1603.9
11	402.4	2924.5	7639.7	7639.7	2035.7
12	416.8	2917.5	9260.3	9260.3	2467.6
13	431.1	2910.4	10881.0	10881.0	2899.5
14	445.5	2903.4	12501.7	12501.7	3331.3
15	452.9	2899.8	8173.4	8173.4	2178.0
16	461.6	2899.7	8435.7	8435.7	2247.9

17	478.7	2899.4	8952.7	8952.7	2385.6
18	495.8	2899.0	9469.8	9469.8	2523.4
19	512.9	2898.7	9986.9	9986.9	2661.2
20	530.0	2898.4	10504.0	10504.0	2799.0
21	547.1	2898.1	11021.1	11021.1	2936.8
22	564.2	2897.7	11538.1	11538.1	3074.6
23	581.3	2897.4	12055.2	12055.2	3212.4
24	598.4	2897.1	12572.9	12572.9	3350.3
25	607.0	2896.9	12888.9	12888.9	3434.5
26	613.3	2897.4	12105.9	12105.9	3225.9
27	625.7	2898.2	12384.1	12384.1	3300.0
28	638.2	2899.1	12662.1	12662.1	3374.1
29	644.5	2899.6	7806.6	7806.6	2080.2
30	651.3	2905.8	6841.7	6841.7	4418.6
31	664.8	2918.0	6525.3	6525.3	4214.2
32	678.3	2930.2	6208.9	6208.9	4009.9
33	691.8	2942.4	5892.5	5892.5	3805.5
34	705.3	2954.7	5576.1	5576.1	3601.2
35	718.8	2966.9	5259.7	5259.7	3396.8
36	732.3	2979.1	4943.3	4943.3	3192.5
37	745.8	2991.4	4626.9	4626.9	2988.1
38	759.3	3003.6	4310.5	4310.5	2783.8
39	772.8	3015.8	3994.1	3994.1	2579.5

1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	786.3	3028.1	3677.4	3677.4	2375.0
41	799.7	3040.3	3268.1	3268.1	2110.6
42	813.2	3052.5	2765.6	2765.6	1786.1
43	826.7	3064.8	2263.0	2263.0	1461.5
44	840.2	3077.0	1760.5	1760.5	1136.9
45	853.7	3089.2	1257.9	1257.9	812.4
46	866.1	3100.4	832.1	832.1	537.4
47	874.6	3108.1	572.9	572.9	370.0
48	879.3	3112.4	362.0	362.0	497.2

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .18  (=  .175E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .40  (=  .401E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =       -35.82  (= -.358E+02)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .06  (=  .599E-01)
     SHOULD NOT EXCEED      .100E+03
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TABLE NO. 39
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =  1.006     Side Force Inclination =  24.00 Degrees
```

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	329.9	138306.	2961.9	.627	76188.2	10146.4
2	330.0	141846.	2961.9	.625	75412.3	10683.4
3	330.0	141847.	2961.9	.625	75417.6	10657.3
4	336.0	144133.	2964.5	.922	57935.6	-25107.3
5	342.0	148552.	2966.8	.971	39663.1	-18930.9
6	348.2	155306.	2968.8	.971	29701.3	-14170.1
7	354.5	164486.	2970.3	.948	23591.2	-10807.0
8	366.4	188798.	2971.6	.879	16842.5	-6552.1
9	380.8	231304.	2970.6	.778	12366.4	-3093.7
10	395.2	289472.	2967.4	.682	9590.7	-413.4
11	409.6	363302.	2963.0	.602	7681.9	1843.7
12	424.0	452794.	2958.1	.540	6273.7	3847.5
13	438.3	557948.	2953.1	.492	5180.3	5688.6
14	452.7	678764.	2948.1	.456	4297.6	7418.9
15	453.0	678896.	2948.1	.456	4304.3	7403.1
16	470.1	687140.	2952.3	.471	4605.5	6581.7
17	487.2	695888.	2956.1	.480	4732.1	5997.9
18	504.3	705143.	2959.5	.486	4726.2	5599.9
19	521.4	714902.	2962.5	.488	4618.9	5349.0
20	538.6	725167.	2965.0	.486	4433.6	5215.5
21	555.7	735937.	2967.2	.482	4188.0	5176.7
22	572.8	747212.	2968.9	.476	3895.5	5214.6
23	589.9	758993.	2970.2	.467	3566.7	5315.3
24	607.0	771296.	2971.1	.457	3209.5	5467.8
25	607.0	771304.	2971.1	.457	3209.3	5467.9
26	619.5	762578.	2973.2	.455	3055.2	5344.1
27	632.0	753651.	2975.1	.451	2881.2	5249.5
28	644.5	744520.	2976.8	.447	2689.4	5181.3
29	644.6	743350.	2976.9	.447	2692.1	5169.5
30	658.1	670823.	2985.3	.445	2477.6	4940.6
31	671.6	601649.	2993.7	.441	2261.8	4709.6
32	685.1	535829.	3002.1	.438	2044.6	4475.9
33	698.6	473364.	3010.4	.434	1826.0	4238.9
34	712.0	414253.	3018.7	.429	1606.1	3997.6
35	725.5	358496.	3027.0	.423	1385.1	3751.0
36	739.0	306093.	3035.2	.417	1163.4	3497.6
37	752.5	257045.	3043.4	.408	941.4	3235.1
38	766.0	211350.	3051.5	.399	720.1	2960.7
39	779.5	169010.	3059.5	.386	501.2	2670.1
40	793.0	130020.	3067.4	.370	287.2	2357.3

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	806.5	95363.	3075.1	.369	236.9	2000.8
42	820.0	66036.	3082.9	.368	190.2	1640.7
43	833.5	42038.	3090.7	.368	148.4	1275.7
44	847.0	23369.	3098.6	.370	112.8	904.6
45	860.5	10030.	3106.6	.377	80.0	530.8
46	871.8	2656.	3114.1	.429	69.9	172.8
47	877.4	118.	3155.0	ABOVE	113.1	-98.7
48	881.1	0.	1527.7	BELOW	-7.2	7.3

CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION = .18 (= .175E+00)
SHOULD NOT EXCEED .100E+03

```
SUM OF FORCES IN HORIZONTAL DIRECTION  =          .40  (=  .401E+00)
     SHOULD NOT EXCEED     .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =       -35.82  (= -.358E+02)
     SHOULD NOT EXCEED     .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =          .06  (=  .599E-01)
     SHOULD NOT EXCEED     .100E+03

***** CAUTION ***** SOME OF THE FORCES BETWEEN SLICES ACT AT POINTS
                    ABOVE THE SURFACE OF THE SLOPE OR BELOW THE
                    SHEAR SURFACE - EITHER A TENSION CRACK MAY BE
                    NEEDED OR THE SOLUTION MAY NOT BE A VALID SOLUTION.


END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Static Stability Analysis

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	330.000	2960.000
4	453.000	2899.000
5	607.000	2896.000
6	1078.000	2904.000
7	1292.000	3002.000
8	1292.100	3005.000
9	1319.000	3005.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	329.900	2963.000
2	453.000	2902.000
3	607.000	2899.000
4	1078.000	2907.000

5	1292.100	3005.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse (0-5 feet)

Point	X	Y
1	329.900	2963.000
2	793.000	3124.000
3	894.000	3126.000
4	1292.100	3005.000

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse (5-10 feet)

Point	X	Y
1	335.980	2960.030
2	793.000	3119.000
3	894.000	3121.000
4	1285.290	3001.930

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse (10-15 feet)

Point	X	Y
1	342.030	2957.030
2	793.000	3114.000
3	894.000	3116.000
4	1278.460	2998.800

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse (15-20 feet)

Point	X	Y
1	348.210	2953.970
2	793.000	3109.000
3	894.000	3111.000
4	1271.520	2995.620

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse (20-30 feet)

Point	X	Y
1	354.460	2950.870
2	793.000	3104.000
3	894.000	3106.000
4	1264.420	2992.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse (below 30 feet)

Point	X	Y
1	366.410	2944.940
2	793.000	3094.000
3	894.000	3096.000
4	1251.040	2986.240

All new profile lines defined - No old lines retained
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TABLE NO. 3

```
*********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************
```

DATA FOR MATERIAL TYPE 1
Bedrock

Unit weight of material = 130.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - 39.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 2
Liner

Unit weight of material = 62.400

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 15.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 3
Refuse (0-5 feet)

Unit weight of material = 60.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 4
Refuse (5-10 feet)

Unit weight of material = 62.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 5
Refuse (10-15 feet)

Unit weight of material = 63.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 6
Refuse (15-20 feet)

Unit weight of material = 64.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 38.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 7
Refuse (20-30 feet)

Unit weight of material = 66.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 38.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 8
Refuse (below 30 feet)

Unit weight of material = 80.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 38.000 degrees

No (or zero) pore water pressures

All new material properties defined - No old data retained
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TABLE NO. 15
****
* NEW ANALYSIS/COMPUTATION DATA *
****

Noncircular Shear Surface(s)

Automatic Search Performed

Coordinates of points on shear surface which are to be shifted -

Point	X	Y	Shift Angle
1	326.390	2962.000	angle to be computed - moveable
2	452.580	2899.310	angle to be computed - moveable
3	607.020	2896.040	angle to be computed - moveable
4	668.980	2900.050	angle to be computed - moveable
5	871.790	3113.850	angle to be computed - moveable

Initial distance for shifting points on shear surface = 1.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

---

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Seismic coefficient = .000

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	793.000	3124.000
4	894.000	3126.000
5	1292.100	3005.000
6	1319.000	3005.000

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TABLE NO. 22
****
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE *
****

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
THE TOE OF THE SLOPE A DISTANCE = 1.00
SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
VERY LARGE

Crack depth computed to be - - - 11.71

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.070
Side Force Inclination - - - - - - - - - - 14.02
Number of Iterations - - - - - - - - - - - 5

TABLE NO. 23
****
* SEARCH TRIAL NUMBER 1 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	325.39	2962.00	2.413	12.02	7
1	327.39	2962.00	2.072	14.02	6
2	452.33	2898.34	3.634	13.79	9
2	452.83	2900.28	2.074	14.06	6
3	607.00	2897.04	2.075	14.07	13
3	607.04	2895.04	3.109	15.91	4
4	668.49	2900.92	2.180	14.60	5
4	669.47	2899.18	2.077	14.03	9
5	870.79	3113.83	2.071	14.03	13
5	872.79	3113.87	2.070	14.00	9

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 1.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.89	2962.00
2	452.70	2899.79
3	607.01	2896.54
4	669.19	2899.67
5	872.79	3113.87

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.078
Side Force Inclination - - - - - - - - - - 14.06
Number of Iterations - - - - - - - - - - - 7
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 2 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .70

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations

1	325.69	2962.00	2.283	12.30	7
1	327.09	2962.00	2.071	14.02	17
2	452.40	2898.63	3.566	13.79	10
2	452.76	2899.99	2.073	14.05	16
3	607.00	2896.74	2.074	14.06	10
3	607.04	2895.34	3.005	15.86	3
4	668.64	2900.66	2.155	14.47	11
4	669.32	2899.44	2.075	14.03	5
5	871.09	3113.84	2.071	14.03	8
5	872.49	3113.86	2.070	14.00	12

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .700 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.74	2962.00
2	452.67	2899.65
3	607.01	2896.39
4	669.13	2899.78
5	872.49	3113.86

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.076
Side Force Inclination - - - - - - - - - - 14.05
Number of Iterations - - - - - - - - - - - 6
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 3 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	325.99	2962.00	2.070	14.01	5
1	326.79	2962.00	2.071	14.02	5
2	452.48	2898.92	3.261	13.53	14
2	452.68	2899.70	2.072	14.03	5
3	607.01	2896.44	2.072	14.04	5
3	607.03	2895.64	2.821	15.75	14
4	668.78	2900.40	2.123	14.31	7
4	669.18	2899.70	2.073	14.02	16
5	871.39	3113.84	2.071	14.02	5
5	872.19	3113.86	2.070	14.01	5

Maximum distance shifted for new estimate of shear
surface is .400 at point 1

Coordinates For New Estimate of Shear Surface

Point	X	Y

1	325.99	2962.00
2	452.63	2899.50
3	607.02	2896.24
4	669.07	2899.89
5	872.19	3113.86

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.072
Side Force Inclination - - - - - - - - - - 14.03
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 4 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .10

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	326.29	2962.00	2.070	14.01	7
1	326.49	2962.00	2.070	14.02	6
2	452.55	2899.21	2.125	13.98	6
2	452.61	2899.41	2.071	14.02	8
3	607.02	2896.14	2.071	14.02	13
3	607.02	2895.94	2.318	14.91	5
4	668.93	2900.14	2.085	14.10	12
4	669.03	2899.96	2.071	14.02	12
5	871.69	3113.85	2.070	14.02	9
5	871.89	3113.85	2.070	14.01	20

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .100 at point 1

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	326.29	2962.00
2	452.59	2899.36
3	607.02	2896.09
4	669.00	2900.01
5	871.89	3113.85

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.071
Side Force Inclination - - - - - - - - - - 14.02
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 25

```
*****************************************************************
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER   4 TRIAL POSITIONS) *
*****************************************************************
```

X	Y
326.39	2962.00
452.58	2899.31
607.02	2896.04
668.98	2900.05
871.79	3113.85

1-Stage Factor of Safety = 2.070

Side Force Inclination = 14.02

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	326.4	2962.0					
1	328.1	2961.1	854.1	1	500.00	39.00	.0
	329.9	2960.3					
2	329.9	2960.2	24.8	1	500.00	39.00	.0
	330.0	2960.2					
3	330.0	2960.2	1.2	2	.00	15.00	.0
	330.0	2960.2					
4	333.0	2958.7	1967.9	2	.00	15.00	.0
	336.0	2957.2					
5	339.0	2955.7	3873.8	2	.00	15.00	.0
	342.0	2954.2					
6	345.1	2952.7	5960.0	2	.00	15.00	.0
	348.2	2951.2					
7	351.3	2949.6	8127.3	2	.00	15.00	.0
	354.5	2948.1					
8	360.4	2945.1	21583.7	2	.00	15.00	.0
	366.4	2942.1					
9	373.6	2938.6	37732.3	2	.00	15.00	.0
	380.8	2935.0					
10	388.0	2931.4	51667.5	2	.00	15.00	.0
	395.1	2927.8					
11	402.3	2924.3	65602.8	2	.00	15.00	.0
	409.5	2920.7					
12	416.7	2917.1	79538.0	2	.00	15.00	.0
	423.9	2913.6					
13	431.0	2910.0	93473.3	2	.00	15.00	.0
	438.2	2906.4					
14	445.4	2902.9	107408.3	2	.00	15.00	.0
	452.6	2899.3					
15	452.8	2899.3	3348.3	2	.00	15.00	.0

	453.0	2899.3					
16	461.6	2899.1	140864.2	2	.00	15.00	.0
	470.1	2898.9					
17	478.7	2898.8	149502.9	2	.00	15.00	.0
	487.2	2898.6					
18	495.8	2898.4	158142.0	2	.00	15.00	.0
	504.3	2898.2					
19	512.9	2898.0	166780.8	2	.00	15.00	.0
	521.4	2897.9					
20	530.0	2897.7	175419.3	2	.00	15.00	.0
	538.6	2897.5					

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	538.6	2897.5					
21	547.1	2897.3	184058.0	2	.00	15.00	.0
	555.7	2897.1					
22	564.2	2896.9	192697.0	2	.00	15.00	.0
	572.8	2896.8					
23	581.3	2896.6	201335.8	2	.00	15.00	.0
	589.9	2896.4					
24	598.4	2896.2	209976.1	2	.00	15.00	.0
	607.0	2896.0					
25	607.0	2896.0	250.7	2	.00	15.00	.0
	607.0	2896.0					
26	614.8	2896.5	196820.9	2	.00	15.00	.0
	622.5	2897.0					
27	630.3	2897.5	202460.5	2	.00	15.00	.0
	638.0	2898.0					
28	645.7	2898.5	208099.8	2	.00	15.00	.0
	653.5	2899.0					
29	661.2	2899.5	213739.2	2	.00	15.00	.0
	669.0	2900.1					
30	669.0	2900.1	35.8	2	.00	15.00	.0
	669.0	2900.1					
31	675.2	2906.6	169037.8	8	.00	38.00	.0
	681.4	2913.1					
32	687.6	2919.7	160348.9	8	.00	38.00	.0
	693.8	2926.2					
33	700.0	2932.7	151660.0	8	.00	38.00	.0
	706.2	2939.3					
34	712.4	2945.8	142971.1	8	.00	38.00	.0
	718.6	2952.3					
35	724.8	2958.9	134282.2	8	.00	38.00	.0
	731.0	2965.4					
36	737.2	2972.0	125593.3	8	.00	38.00	.0
	743.4	2978.5					
37	749.6	2985.0	116904.4	8	.00	38.00	.0
	755.8	2991.6					
38	762.0	2998.1	108215.6	8	.00	38.00	.0
	768.2	3004.6					

39	774.4	3011.2	99526.7	8	.00	38.00	.0
	780.6	3017.7					
40	786.8	3024.3	90838.5	8	.00	38.00	.0
	793.0	3030.8					

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Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	793.0	3030.8					
41	799.1	3037.2	79056.7	8	.00	38.00	.0
	805.2	3043.7					
42	811.3	3050.1	66696.4	8	.00	38.00	.0
	817.4	3056.6					
43	823.6	3063.0	54336.1	8	.00	38.00	.0
	829.7	3069.4					
44	835.8	3075.9	41975.8	8	.00	38.00	.0
	841.9	3082.3					
45	848.0	3088.8	29615.5	8	.00	38.00	.0
	854.1	3095.2					
46	858.9	3100.3	15323.1	7	.00	38.00	.0
	863.8	3105.4					
47	866.2	3107.9	5275.0	6	.00	38.00	.0
	868.6	3110.5					
48	870.2	3112.2	2625.7	5	600.00	.00	.0
	871.8	3113.9					

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Static Stability Analysis

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

				FORCES DUE TO SURFACE PRESSURES			
Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
1	328.1	0.	2962.1	0.	0.	.0	.0
2	329.9	0.	2961.4	0.	0.	.0	.0
3	330.0	0.	2961.6	0.	0.	.0	.0
4	333.0	0.	2961.4	0.	0.	.0	.0
5	339.0	0.	2960.9	0.	0.	.0	.0
6	345.1	0.	2960.4	0.	0.	.0	.0

7	351.3	0.	2959.9	0.	0.	.0	.0
8	360.4	0.	2959.2	0.	0.	.0	.0
9	373.6	0.	2957.7	0.	0.	.0	.0
10	388.0	0.	2956.0	0.	0.	.0	.0
11	402.3	0.	2954.6	0.	0.	.0	.0
12	416.7	0.	2953.4	0.	0.	.0	.0
13	431.0	0.	2952.2	0.	0.	.0	.0
14	445.4	0.	2951.0	0.	0.	.0	.0
15	452.8	0.	2950.4	0.	0.	.0	.0
16	461.6	0.	2951.8	0.	0.	.0	.0
17	478.7	0.	2954.6	0.	0.	.0	.0
18	495.8	0.	2957.3	0.	0.	.0	.0
19	512.9	0.	2960.1	0.	0.	.0	.0
20	530.0	0.	2962.9	0.	0.	.0	.0
21	547.1	0.	2965.7	0.	0.	.0	.0
22	564.2	0.	2968.4	0.	0.	.0	.0
23	581.3	0.	2971.2	0.	0.	.0	.0
24	598.4	0.	2974.0	0.	0.	.0	.0
25	607.0	0.	2975.4	0.	0.	.0	.0
26	614.8	0.	2976.9	0.	0.	.0	.0
27	630.3	0.	2980.0	0.	0.	.0	.0
28	645.7	0.	2983.2	0.	0.	.0	.0
29	661.2	0.	2986.3	0.	0.	.0	.0
30	669.0	0.	2987.8	0.	0.	.0	.0
31	675.2	0.	2992.2	0.	0.	.0	.0
32	687.6	0.	3000.9	0.	0.	.0	.0
33	700.0	0.	3009.6	0.	0.	.0	.0
34	712.4	0.	3018.3	0.	0.	.0	.0
35	724.8	0.	3027.0	0.	0.	.0	.0
36	737.2	0.	3035.8	0.	0.	.0	.0
37	749.6	0.	3044.5	0.	0.	.0	.0
38	762.0	0.	3053.2	0.	0.	.0	.0
39	774.4	0.	3062.0	0.	0.	.0	.0

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Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

				FORCES DUE TO SURFACE PRESSURES			
Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
40	786.8	0.	3070.7	0.	0.	.0	.0
41	799.1	0.	3078.5	0.	0.	.0	.0
42	811.3	0.	3085.2	0.	0.	.0	.0
43	823.6	0.	3092.0	0.	0.	.0	.0
44	835.8	0.	3098.9	0.	0.	.0	.0
45	848.0	0.	3106.1	0.	0.	.0	.0
46	858.9	0.	3112.6	0.	0.	.0	.0
47	866.2	0.	3116.6	0.	0.	.0	.0
48	870.2	0.	3118.8	0.	0.	.0	.0

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TABLE NO. 29

```
*****************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*****************************************************************
```

Iter-ation	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.3082E+06	-.8215E+09		
First-order corrections to F and THETA					-.128E+01	-.328E+00
Values factored by .390E+00 - Deltas too large					-.500E+00	-.128E+00
2	2.50000	14.8721	.1651E+06	-.4395E+09		
First-order corrections to F and THETA					-.496E+00	-.412E+00
Second-order correction - Iteration 1					-.429E+00	-.412E+00
Second-order correction - Iteration 2					-.427E+00	-.412E+00
Second-order correction - Iteration 3					-.427E+00	-.412E+00
3	2.07257	14.4596	-.4492E+04	.1371E+08		
First-order corrections to F and THETA					-.257E-02	-.455E+00
Second-order correction - Iteration 1					-.250E-02	-.455E+00
Second-order correction - Iteration 2					-.250E-02	-.455E+00
4	2.07007	14.0041	.8581E+00	-.4238E+05		
First-order corrections to F and THETA					.279E-03	.110E-01
Second-order correction - Iteration 1					.279E-03	.110E-01
5	2.07035	14.0151	-.6946E-01	-.7500E+02		
First-order corrections to F and THETA					.198E-05	.719E-04

Factor of Safety - - - - - - - - 2.070
Side Force Inclination - - - - - 14.02
Number of Iterations - - - - - - 5
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Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis

TABLE NO. 38

```
*************************************************************
*  Final Results for Stresses Along the Shear Surface       *
*  (Results for Critical Shear Surface in Case of a Search.) *
*************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.070 Side Force Inclination = 14.02 Degrees

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	328.1	2961.1	725.2	725.2	525.2
2	329.9	2960.2	767.0	767.0	541.5
3	330.0	2960.2	225.1	225.1	29.1
4	333.0	2958.7	422.2	422.2	54.6
5	339.0	2955.7	821.5	821.5	106.3
6	345.1	2952.7	1237.4	1237.4	160.1

7	351.3	2949.6	1668.4	1668.4	215.9
8	360.4	2945.1	2317.4	2317.4	299.9
9	373.6	2938.6	3370.9	3370.9	436.3
10	388.0	2931.4	4615.9	4615.9	597.4
11	402.3	2924.3	5860.8	5860.8	758.5
12	416.7	2917.1	7105.8	7105.8	919.6
13	431.0	2910.0	8350.7	8350.7	1080.8
14	445.4	2902.9	9595.6	9595.6	1241.9
15	452.8	2899.3	8306.1	8306.1	1075.0
16	461.6	2899.1	8578.3	8578.3	1110.2
17	478.7	2898.8	9104.4	9104.4	1178.3
18	495.8	2898.4	9630.5	9630.5	1246.4
19	512.9	2898.0	10156.5	10156.5	1314.5
20	530.0	2897.7	10682.6	10682.6	1382.6
21	547.1	2897.3	11208.7	11208.7	1450.7
22	564.2	2896.9	11734.8	11734.8	1518.7
23	581.3	2896.6	12260.9	12260.9	1586.8
24	598.4	2896.2	12787.0	12787.0	1654.9
25	607.0	2896.0	13066.9	13066.9	1691.2
26	614.8	2896.5	12805.9	12805.9	1657.4
27	630.3	2897.5	13172.8	13172.8	1704.9
28	645.7	2898.5	13539.8	13539.8	1752.3
29	661.2	2899.5	13906.6	13906.6	1799.8
30	669.0	2900.1	10243.8	10243.8	1325.8
31	675.2	2906.6	8699.6	8699.6	3283.0
32	687.6	2919.7	8252.4	8252.4	3114.2
33	700.0	2932.7	7805.3	7805.3	2945.5
34	712.4	2945.8	7358.1	7358.1	2776.7
35	724.8	2958.9	6910.9	6910.9	2608.0
36	737.2	2972.0	6463.7	6463.7	2439.2
37	749.6	2985.0	6016.5	6016.5	2270.5
38	762.0	2998.1	5569.4	5569.4	2101.7
39	774.4	3011.2	5122.2	5122.2	1933.0

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	786.8	3024.3	4674.9	4674.9	1764.2
41	799.1	3037.2	4128.7	4128.7	1558.0
42	811.3	3050.1	3483.2	3483.2	1314.4
43	823.6	3063.0	2837.7	2837.7	1070.8
44	835.8	3075.9	2192.1	2192.1	827.2
45	848.0	3088.8	1546.6	1546.6	583.6
46	858.9	3100.3	1011.6	1011.6	381.8
47	866.2	3107.9	696.5	696.5	262.8
48	870.2	3112.2	469.0	469.0	289.8

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .11   (=  .112E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .33   (=  .333E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        -50.47   (= -.505E+02)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .04   (=  .396E-01)
     SHOULD NOT EXCEED      .100E+03
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Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Static Stability Analysis
```

TABLE NO. 39

```
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.070 Side Force Inclination = 14.02 Degrees

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	329.9	3203.	2961.6	.477	979.2	1286.4
2	330.0	3292.	2961.6	.476	968.4	1295.0
3	330.0	3293.	2961.6	.477	971.1	1288.2
4	336.0	4922.	2961.9	.587	923.6	288.9
5	342.0	8130.	2960.7	.495	588.4	626.4
6	348.2	13066.	2958.9	.425	383.6	1009.0
7	354.5	19796.	2957.0	.382	240.9	1394.9
8	366.4	37670.	2953.6	.343	64.5	2112.7
9	380.8	68917.	2949.6	.319	-124.1	3050.2
10	395.1	111703.	2945.5	.305	-313.0	4061.2
11	409.5	166030.	2941.6	.298	-487.3	5092.6
12	423.9	231896.	2937.7	.294	-648.2	6130.1
13	438.2	309303.	2933.9	.292	-798.8	7169.3
14	452.6	398246.	2930.2	.290	-941.4	8208.5
15	453.0	398786.	2930.2	.290	-935.9	8202.2
16	470.1	421570.	2932.7	.299	-740.4	7992.1
17	487.2	445750.	2935.0	.306	-597.4	7858.8
18	504.3	471328.	2937.2	.311	-495.3	7787.0
19	521.4	498303.	2939.2	.314	-425.4	7765.2
20	538.6	526675.	2941.1	.316	-381.1	7784.1
21	555.7	556445.	2942.9	.317	-357.2	7836.7
22	572.8	587611.	2944.7	.318	-349.8	7917.5
23	589.9	620175.	2946.3	.318	-355.8	8021.7
24	607.0	654137.	2947.9	.317	-372.8	8146.0
25	607.0	654178.	2947.9	.317	-372.8	8146.1
26	622.5	667407.	2950.7	.320	-312.7	8036.0
27	638.0	681016.	2953.4	.322	-262.5	7942.5
28	653.5	695003.	2956.2	.324	-221.0	7864.1
29	669.0	709366.	2958.8	.325	-187.4	7799.3
30	669.0	709341.	2958.8	.325	-187.3	7799.1
31	681.4	634079.	2968.3	.321	-268.6	7419.2
32	693.8	562685.	2977.8	.316	-348.9	7034.9
33	706.2	495160.	2987.2	.310	-427.5	6644.7
34	718.6	431503.	2996.7	.304	-503.4	6247.0
35	731.0	371716.	3006.1	.297	-574.9	5839.0
36	743.4	315796.	3015.5	.289	-639.7	5417.5
37	755.8	263746.	3024.9	.279	-694.4	4977.3
38	768.2	215564.	3034.4	.269	-733.9	4511.4
39	780.6	171251.	3043.9	.257	-750.2	4009.0
40	793.0	130805.	3053.5	.244	-730.5	3453.6

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	805.2	95606.	3063.1	.242	-633.9	2936.6
42	817.4	65910.	3072.7	.238	-537.1	2420.0
43	829.7	41717.	3082.3	.233	-440.6	1904.9

44	841.9	23028.	3091.8	.223	-346.4	1394.3
45	854.1	9842.	3101.1	.195	-264.6	901.2
46	863.8	3019.	3107.9	.124	-184.0	476.9
47	868.6	671.	3111.0	.031	-78.7	165.4
48	871.8	0.	41530.4	ABOVE	-23.2	23.2

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .11  (=  .112E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .33  (=  .333E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        -50.47  (= -.505E+02)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .04  (=  .396E-01)
     SHOULD NOT EXCEED      .100E+03

END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Antelope Valley Public Landfill - Revised Short Section (9/7/00)
Seismic Stability Analysis

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	330.000	2960.000
4	453.000	2899.000
5	607.000	2896.000
6	1078.000	2904.000
7	1292.000	3002.000
8	1292.100	3005.000
9	1319.000	3005.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	329.900	2963.000
2	453.000	2902.000
3	607.000	2899.000
4	1078.000	2907.000

5	1292.100	3005.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse (0-5 feet)

Point	X	Y
1	329.900	2963.000
2	793.000	3124.000
3	894.000	3126.000
4	1292.100	3005.000

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse (5-10 feet)

Point	X	Y
1	335.980	2960.030
2	793.000	3119.000
3	894.000	3121.000
4	1285.290	3001.930

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse (10-15 feet)

Point	X	Y
1	342.030	2957.030
2	793.000	3114.000
3	894.000	3116.000
4	1278.460	2998.800

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse (15-20 feet)

Point	X	Y
1	348.210	2953.970
2	793.000	3109.000
3	894.000	3111.000
4	1271.520	2995.620

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse (20-30 feet)

Point	X	Y
1	354.460	2950.870
2	793.000	3104.000
3	894.000	3106.000
4	1264.420	2992.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse (below 30 feet)

Point	X	Y
1	366.410	2944.940
2	793.000	3094.000
3	894.000	3096.000
4	1251.040	2986.240

All new profile lines defined - No old lines retained
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TABLE NO. 3

```
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************
```

DATA FOR MATERIAL TYPE 1
Bedrock

Unit weight of material = 130.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 500.000
Friction angle - - - - - 39.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 2
Liner

Unit weight of material = 62.400

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - .000
Friction angle - - - - - 15.000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 3
Refuse (0-5 feet)

Unit weight of material = 60.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 4
Refuse (5-10 feet)

Unit weight of material = 62.000

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 5
Refuse (10-15 feet)

Unit weight of material = 63.500

CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
Cohesion - - - - - - - - - 600.000
Friction angle - - - - - .000 degrees

No (or zero) pore water pressures

DATA FOR MATERIAL TYPE 6
Refuse (15-20 feet)

Unit weight of material = 64.500

```
     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  7
Refuse (20-30 feet)

     Unit weight of material =   66.500

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  8
Refuse (below 30 feet)

     Unit weight of material =   80.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

All new material properties defined - No old data retained
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TABLE NO. 15
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Noncircular Shear Surface(s)

Computations Performed for Single Shear Surface


Shear Surface Coordinates -

     Point          X              Y

       1         326.390        2962.000
       2         452.580        2899.310
       3         607.020        2896.040
       4         668.980        2900.050
       5         871.790        3113.850

Seismic coefficient =  .254

----------------------------------------------------------------------
THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety =   3.000

Initial trial estimate for side force inclination =  15.000 degrees
(Applicable to Spencer's procedure only)
```

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	250.000	2963.000
2	329.900	2963.000
3	793.000	3124.000
4	894.000	3126.000
5	1292.100	3005.000
6	1319.000	3005.000

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TABLE NO. 26
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the Critical Shear Surface in the *
* Case of an Automatic Search.) *
****

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	326.4	2962.0					
1	328.1	2961.1	854.1	1	500.00	39.00	.0
	329.9	2960.3					
2	329.9	2960.2	24.8	1	500.00	39.00	.0
	330.0	2960.2					
3	330.0	2960.2	1.2	2	.00	15.00	.0
	330.0	2960.2					

4	333.0	2958.7	1967.9	2	.00	15.00	.0
	336.0	2957.2					
5	339.0	2955.7	3873.8	2	.00	15.00	.0
	342.0	2954.2					
6	345.1	2952.7	5960.0	2	.00	15.00	.0
	348.2	2951.2					
7	351.3	2949.6	8127.3	2	.00	15.00	.0
	354.5	2948.1					
8	360.4	2945.1	21583.7	2	.00	15.00	.0
	366.4	2942.1					
9	373.6	2938.6	37732.3	2	.00	15.00	.0
	380.8	2935.0					
10	388.0	2931.4	51667.5	2	.00	15.00	.0
	395.1	2927.8					
11	402.3	2924.3	65602.8	2	.00	15.00	.0
	409.5	2920.7					
12	416.7	2917.1	79538.0	2	.00	15.00	.0
	423.9	2913.6					
13	431.0	2910.0	93473.3	2	.00	15.00	.0
	438.2	2906.4					
14	445.4	2902.9	107408.3	2	.00	15.00	.0
	452.6	2899.3					
15	452.8	2899.3	3348.3	2	.00	15.00	.0
	453.0	2899.3					
16	461.6	2899.1	140864.2	2	.00	15.00	.0
	470.1	2898.9					
17	478.7	2898.8	149502.9	2	.00	15.00	.0
	487.2	2898.6					
18	495.8	2898.4	158142.0	2	.00	15.00	.0
	504.3	2898.2					
19	512.9	2898.0	166780.8	2	.00	15.00	.0
	521.4	2897.9					
20	530.0	2897.7	175419.3	2	.00	15.00	.0
	538.6	2897.5					

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	538.6	2897.5					
21	547.1	2897.3	184058.0	2	.00	15.00	.0
	555.7	2897.1					
22	564.2	2896.9	192697.0	2	.00	15.00	.0
	572.8	2896.8					
23	581.3	2896.6	201335.8	2	.00	15.00	.0
	589.9	2896.4					
24	598.4	2896.2	209976.1	2	.00	15.00	.0
	607.0	2896.0					
25	607.0	2896.0	250.7	2	.00	15.00	.0
	607.0	2896.0					
26	614.8	2896.5	196820.9	2	.00	15.00	.0
	622.5	2897.0					
27	630.3	2897.5	202460.5	2	.00	15.00	.0

	638.0	2898.0					
28	645.7	2898.5	208099.8	2	.00	15.00	.0
	653.5	2899.0					
29	661.2	2899.5	213739.2	2	.00	15.00	.0
	669.0	2900.1					
30	669.0	2900.1	35.8	2	.00	15.00	.0
	669.0	2900.1					
31	675.2	2906.6	169037.8	8	.00	38.00	.0
	681.4	2913.1					
32	687.6	2919.7	160348.9	8	.00	38.00	.0
	693.8	2926.2					
33	700.0	2932.7	151660.0	8	.00	38.00	.0
	706.2	2939.3					
34	712.4	2945.8	142971.1	8	.00	38.00	.0
	718.6	2952.3					
35	724.8	2958.9	134282.2	8	.00	38.00	.0
	731.0	2965.4					
36	737.2	2972.0	125593.3	8	.00	38.00	.0
	743.4	2978.5					
37	749.6	2985.0	116904.4	8	.00	38.00	.0
	755.8	2991.6					
38	762.0	2998.1	108215.6	8	.00	38.00	.0
	768.2	3004.6					
39	774.4	3011.2	99526.7	8	.00	38.00	.0
	780.6	3017.7					
40	786.8	3024.3	90838.5	8	.00	38.00	.0
	793.0	3030.8					

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	793.0	3030.8					
41	799.1	3037.2	79056.7	8	.00	38.00	.0
	805.2	3043.7					
42	811.3	3050.1	66696.4	8	.00	38.00	.0
	817.4	3056.6					
43	823.6	3063.0	54336.1	8	.00	38.00	.0
	829.7	3069.4					
44	835.8	3075.9	41975.8	8	.00	38.00	.0
	841.9	3082.3					
45	848.0	3088.8	29615.5	8	.00	38.00	.0
	854.1	3095.2					
46	858.9	3100.3	15323.1	7	.00	38.00	.0
	863.8	3105.4					
47	866.2	3107.9	5275.0	6	.00	38.00	.0
	868.6	3110.5					
48	870.2	3112.2	2625.7	5	600.00	.00	.0
	871.8	3113.9					

TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
1	328.1	217.	2962.1	0.	0.	.0	.0
2	329.9	6.	2961.4	0.	0.	.0	.0
3	330.0	0.	2961.6	0.	0.	.0	.0
4	333.0	500.	2961.4	0.	0.	.0	.0
5	339.0	984.	2960.9	0.	0.	.0	.0
6	345.1	1514.	2960.4	0.	0.	.0	.0
7	351.3	2064.	2959.9	0.	0.	.0	.0
8	360.4	5482.	2959.2	0.	0.	.0	.0
9	373.6	9584.	2957.7	0.	0.	.0	.0
10	388.0	13124.	2956.0	0.	0.	.0	.0
11	402.3	16663.	2954.6	0.	0.	.0	.0
12	416.7	20203.	2953.4	0.	0.	.0	.0
13	431.0	23742.	2952.2	0.	0.	.0	.0
14	445.4	27282.	2951.0	0.	0.	.0	.0
15	452.8	850.	2950.4	0.	0.	.0	.0
16	461.6	35780.	2951.8	0.	0.	.0	.0
17	478.7	37974.	2954.6	0.	0.	.0	.0
18	495.8	40168.	2957.3	0.	0.	.0	.0
19	512.9	42362.	2960.1	0.	0.	.0	.0
20	530.0	44557.	2962.9	0.	0.	.0	.0
21	547.1	46751.	2965.7	0.	0.	.0	.0
22	564.2	48945.	2968.4	0.	0.	.0	.0
23	581.3	51139.	2971.2	0.	0.	.0	.0
24	598.4	53334.	2974.0	0.	0.	.0	.0
25	607.0	64.	2975.4	0.	0.	.0	.0
26	614.8	49993.	2976.9	0.	0.	.0	.0
27	630.3	51425.	2980.0	0.	0.	.0	.0
28	645.7	52857.	2983.2	0.	0.	.0	.0
29	661.2	54290.	2986.3	0.	0.	.0	.0
30	669.0	9.	2987.8	0.	0.	.0	.0
31	675.2	42936.	2992.2	0.	0.	.0	.0
32	687.6	40729.	3000.9	0.	0.	.0	.0
33	700.0	38522.	3009.6	0.	0.	.0	.0
34	712.4	36315.	3018.3	0.	0.	.0	.0
35	724.8	34108.	3027.0	0.	0.	.0	.0
36	737.2	31901.	3035.8	0.	0.	.0	.0
37	749.6	29694.	3044.5	0.	0.	.0	.0
38	762.0	27487.	3053.2	0.	0.	.0	.0
39	774.4	25280.	3062.0	0.	0.	.0	.0

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TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
```

```
*  First Stage of Multi-Stage Computations.                    *
*  (Information is for the Critical Shear Surface in the       *
*  Case of an Automatic Search.)                               *
***************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
40	786.8	23073.	3070.7	0.	0.	.0	.0
41	799.1	20080.	3078.5	0.	0.	.0	.0
42	811.3	16941.	3085.2	0.	0.	.0	.0
43	823.6	13801.	3092.0	0.	0.	.0	.0
44	835.8	10662.	3098.9	0.	0.	.0	.0
45	848.0	7522.	3106.1	0.	0.	.0	.0
46	858.9	3892.	3112.6	0.	0.	.0	.0
47	866.2	1340.	3116.6	0.	0.	.0	.0
48	870.2	667.	3118.8	0.	0.	.0	.0

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TABLE NO. 29

```
*********************************************************************
*  Information Generated During Iterative Solution for the Factor   *
*  of Safety and Side Force Inclination by Spencer's Procedure      *
*********************************************************************
```

Iteration	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.1464E+07	-.3980E+10		
First-order corrections to F and THETA					-.638E+01	.158E+01
Values factored by .783E-01 - Deltas too large					-.500E+00	.124E+00
2	2.50000	15.1238	.1328E+07	-.3612E+10		
First-order corrections to F and THETA					-.411E+01	.172E+01
Values factored by .122E+00 - Deltas too large					-.500E+00	.208E+00
3	2.00000	15.3323	.1130E+07	-.3075E+10		
First-order corrections to F and THETA					-.230E+01	.195E+01
Values factored by .217E+00 - Deltas too large					-.500E+00	.424E+00
4	1.50000	15.7564	.8096E+06	-.2211E+10		
First-order corrections to F and THETA					-.952E+00	.251E+01
Values factored by .525E+00 - Deltas too large					-.500E+00	.132E+01
5	1.00000	17.0732	.1777E+06	-.5188E+09		
On iteration 5 the following slices produced low denominators in the equations for the factor of safety - 1 2						
First-order corrections to F and THETA					-.515E-01	.611E+01
Second-order correction - Iteration 1					-.337E-01	.611E+01
Second-order correction - Iteration 2					-.334E-01	.611E+01
Second-order correction - Iteration 3					-.334E-01	.611E+01
6	.96655	23.1871	-.2594E+06	.6500E+09		
On iteration 6 the following slices produced low denominators in the equations for the factor of safety - 1 2						
First-order corrections to F and THETA					.142E+00	.414E+01

```
Second-order correction - Iteration   1 ........   .160E+00  .414E+01
Second-order correction - Iteration   2 ........   .146E+00  .414E+01
Second-order correction - Iteration   3 ........   .200E+00  .414E+01
Second-order correction - Iteration   4 ........   .172E+00  .414E+01
Second-order correction - Iteration   5 ........   .157E+00  .414E+01
Second-order correction - Iteration   6 ........   .142E+00  .414E+01
Second-order correction - Iteration   7 ........   .160E+00  .414E+01
Second-order correction - Iteration   8 ........   .147E+00  .414E+01
Second-order correction - Iteration   9 ........   .214E+00  .414E+01
Second-order correction - Iteration  10 ........   .180E+00  .414E+01
SECOND-ORDER CORRECTIONS DID NOT CONVERGE
IN  10 ITERATIONS - FIRST-ORDER CORRECTIONS
USED

   7   1.10868    27.3277  -.9765E+06   .2449E+10
On iteration   7 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .825E-01  .198E+01
Second-order correction - Iteration   1 ........   .780E-01  .198E+01
Second-order correction - Iteration   2 ........   .812E-01  .198E+01
Second-order correction - Iteration   3 ........   .236E+00  .198E+01
Second-order correction - Iteration   4 ........   .158E+00  .198E+01
Second-order correction - Iteration   5 ........   .120E+00  .198E+01
Second-order correction - Iteration   6 ........   .100E+00  .198E+01
Second-order correction - Iteration   7 ........   .905E-01  .198E+01
Second-order correction - Iteration   8 ........   .854E-01  .198E+01
Second-order correction - Iteration   9 ........   .821E-01  .198E+01
Second-order correction - Iteration  10 ........   .756E-01  .198E+01
SECOND-ORDER CORRECTIONS DID NOT CONVERGE
IN  10 ITERATIONS - FIRST-ORDER CORRECTIONS
USED

   8   1.19123    29.3083  -.1205E+07   .2974E+10
On iteration   8 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .115E+00  .255E+01
Second-order correction - Iteration   1 ........   .125E+00  .255E+01
Second-order correction - Iteration   2 ........   .127E+00  .255E+01
Second-order correction - Iteration   3 ........   .128E+00  .255E+01
Second-order correction - Iteration   4 ........   .128E+00  .255E+01

   9   1.31887    31.8539  -.1576E+06   .4633E+09
On iteration   9 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.474E+00 -.939E+01
Values factored by  .916E+00 - Deltas too large   -.434E+00 -.859E+01

  10    .88466    23.2595  -.8813E+05   .1810E+09
On iteration  10 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .166E+00  .952E+01
Values factored by  .902E+00 - Deltas too large    .150E+00  .859E+01

  11   1.03424    31.8539  -.7394E+04   .3575E+08
On iteration  11 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.412E-01 -.270E+01
Second-order correction - Iteration   1 ........  -.373E-01 -.270E+01
Second-order correction - Iteration   2 ........  -.373E-01 -.270E+01

  12    .99696    29.1586   .1713E+04  -.3538E+07
On iteration  12 the following slices produced
```

```
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.149E-02 -.568E-01
Second-order correction - Iteration   1 ........  -.149E-02 -.568E-01

  13    .99547    29.1018   .1696E+00   .3628E+04
On iteration  13 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.853E-05 -.596E-03
Second-order correction - Iteration   1 ........  -.853E-05 -.596E-03

  14    .99547    29.1012  -.5438E-01   .2292E+03
On iteration  14 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.198E-06 -.155E-04
Second-order correction - Iteration   1 ........  -.198E-06 -.155E-04

  15    .99547    29.1012  -.6030E-01  -.1567E+03
On iteration  15 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .645E-06  .437E-04
Second-order correction - Iteration   1 ........   .645E-06  .437E-04

  16    .99547    29.1012   .9116E-01   .1983E+03
On iteration  16 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........  -.894E-06 -.604E-04
Second-order correction - Iteration   1 ........  -.894E-06 -.604E-04

  17    .99547    29.1012  -.3030E-01   .4442E+02
On iteration  17 the following slices produced
low denominators in the equations for the factor
of safety -    1   2
First-order corrections to F and THETA .........   .649E-07  .372E-05

Factor of Safety - - - - - - - -      .995
Side Force Inclination - - - - -     29.10
Number of Iterations - - - - - -    17

DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   2 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1     2
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TABLE NO. 38
*****************************************************************
*  Final Results for Stresses Along the Shear Surface           *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =    .995     Side Force Inclination =  29.10 Degrees

       -------- VALUES AT CENTER OF BASE OF SLICE---------

                                Total    Effective
Slice                           Normal    Normal       Shear
  No.   X-center  Y-center      Stress    Stress       Stress
```

1	328.1	2961.1	-5531.8	-5531.8	-3997.7
2	329.9	2960.2	-5577.0	-5577.0	-4034.4
3	330.0	2960.2	338.9	338.9	91.2
4	333.0	2958.7	642.2	642.2	172.9
5	339.0	2955.7	1249.7	1249.7	336.4
6	345.1	2952.7	1882.2	1882.2	506.6
7	351.3	2949.6	2538.0	2538.0	683.1
8	360.4	2945.1	3525.2	3525.2	948.9
9	373.6	2938.6	5127.7	5127.7	1380.2
10	388.0	2931.4	7021.5	7021.5	1890.0
11	402.3	2924.3	8915.3	8915.3	2399.7
12	416.7	2917.1	10809.1	10809.1	2909.5
13	431.0	2910.0	12702.8	12702.8	3419.2
14	445.4	2902.9	14596.1	14596.1	3928.8
15	452.8	2899.3	8218.1	8218.1	2212.1
16	461.6	2899.1	8488.7	8488.7	2284.9
17	478.7	2898.8	9009.2	9009.2	2425.0
18	495.8	2898.4	9529.8	9529.8	2565.1
19	512.9	2898.0	10050.4	10050.4	2705.3
20	530.0	2897.7	10571.0	10571.0	2845.4
21	547.1	2897.3	11091.6	11091.6	2985.5
22	564.2	2896.9	11612.2	11612.2	3125.7
23	581.3	2896.6	12132.8	12132.8	3265.8
24	598.4	2896.2	12653.4	12653.4	3405.9
25	607.0	2896.0	12955.3	12955.3	3487.2
26	614.8	2896.5	12073.6	12073.6	3249.8
27	630.3	2897.5	12419.5	12419.5	3343.0
28	645.7	2898.5	12765.5	12765.5	3436.1
29	661.2	2899.5	13111.2	13111.2	3529.1
30	669.0	2900.1	6998.2	6998.2	1883.7
31	675.2	2906.6	5918.8	5918.8	4645.3
32	687.6	2919.7	5614.5	5614.5	4406.5
33	700.0	2932.7	5310.3	5310.3	4167.8
34	712.4	2945.8	5006.0	5006.0	3929.0
35	724.8	2958.9	4701.8	4701.8	3690.2
36	737.2	2972.0	4397.6	4397.6	3451.4
37	749.6	2985.0	4093.3	4093.3	3212.6
38	762.0	2998.1	3789.1	3789.1	2973.9
39	774.4	3011.2	3484.9	3484.9	2735.1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	786.8	3024.3	3180.6	3180.6	2496.2
41	799.1	3037.2	2808.9	2808.9	2204.6
42	811.3	3050.1	2369.8	2369.8	1859.9
43	823.6	3063.0	1930.6	1930.6	1515.2
44	835.8	3075.9	1491.4	1491.4	1170.5
45	848.0	3088.8	1052.2	1052.2	825.8
46	858.9	3100.3	688.3	688.3	540.2
47	866.2	3107.9	473.9	473.9	371.9
48	870.2	3112.2	257.7	257.7	602.7

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .21  (=  .215E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .34  (=  .345E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -114.20  (= -.114E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .06  (=  .581E-01)
     SHOULD NOT EXCEED      .100E+03
```

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

///// WARNING ///// EFFECTIVE OR TOTAL NORMAL STRESS ON SHEAR SURFACE IS NEGATIVE AT POINTS ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE - SOLUTION MAY NOT BE A VALID SOLUTION.

///// WARNING ///// EFFECTIVE OR TOTAL NORMAL STRESS ON SHEAR SURFACE IS NEGATIVE AT POINTS ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE - SOLUTION MAY NOT BE A VALID SOLUTION.

///// WARNING ///// SHEAR STRESS AT SOME POINTS ALONG THE SHEAR SURFACE IS NEGATIVE - SOLUTION MAY NOT BE A VALID SOLUTION.

///// WARNING ///// SHEAR STRESS AT SOME POINTS ALONG THE SHEAR SURFACE IS NEGATIVE - SOLUTION MAY NOT BE A VALID SOLUTION.

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Seismic Stability Analysis

TABLE NO. 39

```
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = .995 Side Force Inclination = 29.10 Degrees

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	329.9	-27346.	2962.1	.677	-17952.6	534.7
2	330.0	-28079.	2962.1	.675	-17839.1	452.7
3	330.0	-28077.	2962.1	.677	-17863.1	513.7
4	336.0	-25283.	2966.1	ABOVE	-13255.0	7646.6
5	342.0	-19781.	2973.1	ABOVE	-8924.4	6262.6
6	348.2	-11317.	2994.2	ABOVE	-6622.6	5536.3
7	354.5	226.	519.5	BELOW	-5228.8	5245.6
8	366.4	30881.	2927.8	BELOW	-3657.2	5264.5
9	380.8	84469.	2937.6	.058	-2672.1	5901.9
10	395.1	157849.	2938.5	.185	-2127.6	6897.6
11	409.5	251020.	2937.4	.239	-1771.9	8042.4
12	423.9	363982.	2935.6	.268	-1513.4	9262.3
13	438.2	496736.	2933.4	.286	-1311.1	10524.9
14	452.6	649271.	2931.0	.298	-1144.1	11813.7
15	453.0	649443.	2931.1	.299	-1109.3	11766.2
16	470.1	656760.	2936.9	.337	106.3	10067.8
17	487.2	664525.	2942.3	.367	987.8	8761.2
18	504.3	672740.	2947.2	.391	1610.3	7762.6
19	521.4	681402.	2951.6	.408	2030.2	7008.6
20	538.6	690514.	2955.6	.421	2289.9	6451.0
21	555.7	700074.	2959.0	.429	2422.1	6052.4
22	572.8	710083.	2961.9	.433	2452.2	5783.4
23	589.9	720541.	2964.4	.433	2400.1	5620.9
24	607.0	731447.	2966.3	.430	2281.2	5546.4
25	607.0	731461.	2966.3	.430	2281.1	5546.4
26	622.5	718007.	2969.9	.435	2276.3	5206.4
27	638.0	704168.	2973.2	.437	2216.2	4935.3

28	653.5	689943.	2976.0	.436	2107.6	4725.4
29	669.0	675328.	2978.4	.433	1956.5	4569.7
30	669.0	675302.	2978.4	.433	1956.6	4569.4
31	681.4	603537.	2987.3	.431	1795.8	4333.7
32	693.8	535460.	2996.2	.428	1633.7	4096.2
33	706.2	471072.	3005.0	.425	1470.0	3856.6
34	718.6	410373.	3013.8	.422	1304.8	3614.4
35	731.0	353363.	3022.6	.417	1137.9	3368.8
36	743.4	300042.	3031.4	.412	969.1	3119.0
37	755.8	250410.	3040.1	.406	798.4	2863.6
38	768.2	204467.	3048.7	.398	625.9	2600.8
39	780.6	162213.	3057.2	.388	451.7	2328.1
40	793.0	123646.	3065.6	.373	276.6	2041.6

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	805.2	90082.	3073.7	.372	228.7	1725.1
42	817.4	61766.	3081.8	.372	184.5	1404.5
43	829.7	38698.	3090.1	.373	145.6	1077.7
44	841.9	20877.	3098.4	.378	114.2	741.4
45	854.1	8303.	3107.1	.396	91.1	392.6
46	863.8	1798.	3116.4	.548	101.2	55.8
47	868.6	-442.	3099.6	BELOW	164.1	-215.6
48	871.8	0.	1212.0	BELOW	5.3	-5.3

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION    =          .21  (=  .215E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION  =          .34  (=  .345E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -114.20  (= -.114E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM   =          .06  (=  .581E-01)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

***** CAUTION ***** FORCES BETWEEN SLICES ARE NEGATIVE AT POINTS
                    ALONG THE UPPER ONE-HALF OF THE SHEAR SURFACE -
                    A TENSION CRACK MAY BE NEEDED.

///// WARNING ///// FORCES BETWEEN SLICES ARE NEGATIVE AT POINTS
                    ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.
///// WARNING ///// FORCES BETWEEN SLICES ARE NEGATIVE AT POINTS
                    ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.

***** CAUTION ***** SOME OF THE FORCES BETWEEN SLICES ACT AT POINTS
                    ABOVE THE SURFACE OF THE SLOPE OR BELOW THE
                    SHEAR SURFACE - EITHER A TENSION CRACK MAY BE
                    NEEDED OR THE SOLUTION MAY NOT BE A VALID SOLUTION.


END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

"LONG" SECTION

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	460.000	2885.000
6	569.000	2883.000
7	1334.000	2896.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	307.000	2960.000
2	307.000	2963.000

3	460.000	2888.000
4	569.000	2886.000
5	1334.000	2896.000
6	1728.000	3097.000
7	1731.000	3097.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse 1

Point	X	Y
1	360.000	2937.020
2	950.000	3150.000
3	1173.000	3160.000
4	1431.000	3150.000
5	1685.000	3075.060

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse 2

Point	X	Y
1	342.000	2945.840
2	950.000	3160.000
3	1173.000	3170.000
4	1431.000	3160.000
5	1695.000	3080.160

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse 3

Point	X	Y
1	328.000	2952.710
2	950.000	3170.000
3	1173.000	3180.000
4	1431.000	3170.000
5	1705.000	3085.270

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse 4

Point	X	Y
1	322.000	2955.650
2	950.000	3175.000
3	1173.000	3185.000
4	1431.000	3170.000
5	1710.000	3087.820

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse 5

Point	X	Y
1	316.000	2958.590
2	950.000	3180.000
3	1173.000	3190.000
4	1431.000	3180.000
5	1715.000	3090.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse 6

Point	X	Y
1	307.000	2960.000

```
        2        950.000       3190.000
        3       1173.000       3200.000
        4       1431.000       3190.000
        5       1731.000       3097.000

All new profile lines defined - No old lines retained
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TABLE NO.  3
*********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
*********************************************************************

DATA FOR MATERIAL TYPE  1
Bedrock

     Unit weight of material =  130.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     500.000
     Friction angle - - - - -  39.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  2
Liner

     Unit weight of material =   62.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  15.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  3
Refuse 1

     Unit weight of material =   82.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  4
Refuse 2

     Unit weight of material =   69.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  5
Refuse 3

     Unit weight of material =   66.000
```

```
      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -          .000
      Friction angle - - - - -  33.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  6
 Refuse 4

      Unit weight of material =   64.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -          .000
      Friction angle - - - - -  33.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  7
 Refuse 5

      Unit weight of material =   63.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -     500.000
      Friction angle - - - - -    .000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  8
 Refuse 6

      Unit weight of material =   61.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -     500.000
      Friction angle - - - - -    .000 degrees

      No (or zero) pore water pressures

 All new material properties defined - No old data retained
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 Search for Static Critical Shear Surface Along Liner


 TABLE NO. 15
 *********************************
 * NEW ANALYSIS/COMPUTATION DATA *
 *********************************

 Noncircular Shear Surface(s)

 Automatic Search Performed


 Coordinates of points on shear surface which are to be shifted -

 Point          X              Y       Shift Angle

    1        308.000       2960.000   angle to be computed - moveable
    2        460.000       2886.000   angle to be computed - moveable
    3        569.000       2884.000   angle to be computed - moveable
    4        900.000       2887.000   angle to be computed - moveable
    5       1425.000       3180.000   angle to be computed - moveable
```

Initial distance for shifting points on shear surface = 2.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

Seismic coefficient = .000

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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Search for Static Critical Shear Surface Along Liner

TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	950.000	3190.000
6	1173.000	3200.000
7	1431.000	3190.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 22

```
*****************************************
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE          *
*****************************************
```

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
THE TOE OF THE SLOPE A DISTANCE = .36
SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
VERY LARGE

Crack depth computed to be - - - 10.23

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 3.083
Side Force Inclination - - - - - - - - - - 13.00
Number of Iterations - - - - - - - - - - - 12

TABLE NO. 23

```
****************************
* SEARCH TRIAL NUMBER    1 *
****************************
```

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.00	2960.00	3.114	12.66	7
1	309.88	2960.67	3.088	12.97	5
2	459.51	2884.06	3.455	11.59	17
2	460.49	2887.94	3.110	12.92	8
3	568.99	2882.00	See Message on Next Line(s)		

FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

3	569.01	2886.00	2.746	12.74	18
4	899.45	2888.92	2.161	10.68	12
4	900.55	2885.08	3.295	12.99	4
5	1423.00	3180.08	3.080	13.03	38
5	1427.00	3179.92	3.086	12.97	5

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.67	2960.24
2	460.21	2886.84
3	569.01	2886.00
4	899.45	2888.92
5	1423.00	3180.08

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

Incremental shift distance used to compute derivatives

was reduced to 1.400 as a result of the above
error and search was continued
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 2 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.60	2960.00	3.092	12.89	5
1	309.32	2960.47	3.087	12.98	20
2	459.66	2884.64	3.360	11.91	7
2	460.34	2887.36	3.086	13.00	12
3	568.99	2882.60	3.556	12.65	13
3	569.01	2885.40	2.816	12.84	5
4	899.62	2888.35	2.512	12.17	9
4	900.38	2885.65	3.252	13.00	14
5	1423.60	3180.05	3.081	13.02	21
5	1426.40	3179.95	3.085	12.98	4

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 1.400 at point 4

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.28	2960.10
2	460.17	2886.66
3	569.01	2885.40
4	899.62	2888.35
5	1423.60	3180.05

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.340
Side Force Inclination - - - - - - - - - - 11.59
Number of Iterations - - - - - - - - - - - 13
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 3 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

1-Stage

Point	X	Y	Factor of Safety	Side Force Inclination	Iterations
1	306.88	2960.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
1	309.59	2960.57	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	459.83	2885.31	2.338	11.58	5
2	460.50	2888.02	2.389	11.43	18
3	569.00	2884.00	2.512	12.19	8
3	569.01	2886.80	2.560	11.31	5
4	899.24	2889.69	2.165	10.74	9
4	900.00	2887.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1422.20	3180.11	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1425.00	3180.00	2.343	11.57	8

Maximum distance shifted for new estimate of shear surface is 1.400 at point 4

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.28	2960.10
2	459.83	2885.31
3	569.01	2885.31
4	899.24	2889.69
5	1423.60	3180.05

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.163
Side Force Inclination - - - - - - - - - - 10.74
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 4 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.88	2960.00	2.181	10.50	5
1	309.59	2960.57	2.166	10.73	16
2	459.50	2883.95	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.17	2886.66	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					

3	569.00	2886.71	2.613	11.21	22
3	569.02	2883.91	2.158	10.70	6
4	898.86	2891.04	2.673	12.41	9
4	899.62	2888.35	2.343	11.61	9
5	1422.20	3180.11	2.161	10.75	7
5	1425.00	3180.00	2.166	10.72	5

Maximum distance shifted for new estimate of shear
surface is 1.400 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.76	2960.27
2	459.83	2885.31
3	569.02	2883.91
4	899.33	2889.37
5	1422.20	3180.11

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.156
Side Force Inclination - - - - - - - - - - 10.72
Number of Iterations - - - - - - - - - - - 23
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 5 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	307.44	2959.80	2.153	10.72	18
1	310.08	2960.74	2.158	10.70	12
2	459.49	2883.95	2.548	9.78	5
2	460.18	2886.66	2.157	10.71	11
3	569.01	2885.31	2.161	10.75	8
3	569.02	2882.51	See Message on Next Line(s)		

FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

4	898.94	2890.72	2.332	11.57	8
4	899.71	2888.03	2.776	12.79	7
5	1420.80	3180.16	2.153	10.73	5
5	1423.60	3180.05	2.158	10.69	10

Maximum distance shifted for new estimate of shear
surface is 1.400 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.44	2959.80
2	460.00	2885.98
3	569.02	2883.91
4	899.22	2889.75

```
        5     1420.80     3180.16

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   2.151
Side Force Inclination - - - - - - - - -    10.75
Number of Iterations - - - - - - - - - -   7
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    6 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    1.40

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       306.06    2960.00   2.189      10.30           6
   1       308.76    2960.27   2.154      10.74           6
   2       459.66    2884.62   2.540       9.39          10
   2       460.34    2887.34 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.01    2882.51   2.570      10.96           4
   3       569.02    2885.31   2.157      10.78           6
   4       898.83    2891.09   2.437      11.98          12
   4       899.61    2888.40 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1419.40    3180.22   2.149      10.76           5
   5      1422.20    3180.11   2.154      10.73           5

Maximum distance shifted for new estimate of shear
surface is     1.400 at point   5

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      308.02     2960.01
        2      460.00     2885.98
        3      569.02     2884.60
        4      899.22     2889.75
        5     1419.40     3180.22

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   2.153
Side Force Inclination - - - - - - - - -    10.78
Number of Iterations - - - - - - - - - -   7
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    7 *
```

```
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =      .80

                                 1-Stage
                                 Factor
                                   of      Side Force
Point        X          Y       Safety    Inclination    Iterations

   1       306.67    2960.00    2.162       10.60            5
   1       308.20    2960.07 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       459.81    2885.20    2.151       10.74           10
   2       460.20    2886.75 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.02    2883.11    2.148       10.73           11
   3       569.02    2884.71    2.155       10.77            5
   4       899.00    2890.52    2.249       11.26            6
   4       899.44    2888.98    2.151       10.73            5
   5      1420.00    3180.19 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1421.60    3180.13    2.153       10.74           10

Computed shift distances for newly estimated shear surface
factored by  1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is       .800 at point   3

Coordinates For New Estimate of Shear Surface

     Point        X           Y

        1       307.44      2959.80
        2       459.81      2885.20
        3       569.02      2883.11
        4       899.44      2888.98
        5      1420.80      3180.16

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   2.147
Side Force Inclination - - - - - - - - -    10.71
Number of Iterations - - - - - - - - - -   5
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    8 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =      .80

                                 1-Stage
                                 Factor
                                   of      Side Force
Point        X          Y       Safety    Inclination    Iterations

   1       306.67    2960.00    2.266        9.74            7
   1       308.20    2960.07    2.149       10.71            8
```

```
   2       459.61    2884.43   2.685       9.44           5
   2       460.00    2885.98 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.01    2882.31   3.133      11.49           4
   3       569.02    2883.91 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       899.22    2889.75   2.147      10.72           9
   4       899.66    2888.21 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1420.00    3180.19   2.145      10.72          17
   5      1421.60    3180.13 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Maximum distance shifted for new estimate of shear
surface is      .800 at point   5

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      307.81     2959.93
        2      459.81     2885.20
        3      569.02     2883.11
        4      899.44     2888.98
        5     1420.00     3180.19

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to     .200 as a result of the above
error and search was continued
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    9 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =     .20

                                 1-Stage
                                 Factor
                                   of     Side Force
Point        X          Y       Safety   Inclination   Iterations

   1       307.25    2959.73   2.255       9.80           6
   1       307.63    2959.87 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       459.76    2885.01 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       459.86    2885.40   2.147      10.71           5
   3       569.02    2882.91   2.441      10.81           5
   3       569.02    2883.31   2.148      10.72          12
```

4	899.39	2889.17	2.147	10.72	11
4	899.50	2888.79	2.147	10.71	5
5	1420.60	3180.17	2.147	10.71	7
5	1421.00	3180.15	2.147	10.71	6

Maximum distance shifted for new estimate of shear
surface is .200 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.44	2959.80
2	459.81	2885.20
3	569.02	2883.21
4	899.50	2888.79
5	1420.60	3180.17

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - 2.147
Side Force Inclination - - - - - - - - - - 10.71
Number of Iterations - - - - - - - - - - - 10
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TABLE NO. 25
****
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER 9 TRIAL POSITIONS) *
****

X	Y
307.44	2959.80
459.81	2885.20
569.02	2883.21
899.50	2888.79
1420.60	3180.17

CAUTION - FACTOR OF SAFETY WAS NOT COMPUTED FOR SOME SHEAR
SURFACES NEAR CRITICAL SURFACE - CHECK PREVIOUS OUTPUT

1-Stage Factor of Safety = 2.147

Side Force Inclination = 10.71
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TABLE NO. 26
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the Critical Shear Surface in the *
* Case of an Automatic Search.) *
****

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure

	307.4	2959.8					
1	309.0	2959.0	315.3	8	500.00	.00	.0
	310.5	2958.3					
2	313.3	2956.9	1786.8	2	.00	15.00	.0
	316.0	2955.6					
3	319.0	2954.1	3770.4	2	.00	15.00	.0
	322.0	2952.7					
4	325.0	2951.2	5706.6	2	.00	15.00	.0
	328.0	2949.7					
5	335.0	2946.3	21068.5	2	.00	15.00	.0
	342.0	2942.9					
6	351.0	2938.5	43591.1	2	.00	15.00	.0
	360.0	2934.1					
7	376.6	2925.9	136506.7	2	.00	15.00	.0
	393.3	2917.8					
8	409.9	2909.6	213403.8	2	.00	15.00	.0
	426.5	2901.5					
9	443.2	2893.3	290300.6	2	.00	15.00	.0
	459.8	2885.2					
10	459.9	2885.2	1901.8	2	.00	15.00	.0
	460.0	2885.2					
11	478.2	2884.9	379644.6	2	.00	15.00	.0
	496.3	2884.5					
12	514.5	2884.2	420320.2	2	.00	15.00	.0
	532.7	2883.9					
13	550.8	2883.5	460994.8	2	.00	15.00	.0
	569.0	2883.2					
14	569.0	2883.2	202.1	2	.00	15.00	.0
	569.0	2883.2					
15	587.4	2883.5	505357.0	2	.00	15.00	.0
	605.7	2883.8					
16	624.1	2884.1	543121.2	2	.00	15.00	.0
	642.5	2884.5					
17	660.8	2884.8	580885.4	2	.00	15.00	.0
	679.2	2885.1					
18	697.5	2885.4	618649.5	2	.00	15.00	.0
	715.9	2885.7					
19	734.3	2886.0	656413.8	2	.00	15.00	.0
	752.6	2886.3					
20	771.0	2886.6	694177.9	2	.00	15.00	.0
	789.3	2886.9					

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	789.3	2886.9					
21	807.7	2887.2	731942.1	2	.00	15.00	.0
	826.1	2887.5					
22	844.4	2887.9	769706.1	2	.00	15.00	.0
	862.8	2888.2					
23	881.1	2888.5	807471.0	2	.00	15.00	.0

	899.5	2888.8					
24	900.9	2889.6	63214.5	2	.00	15.00	.0
	902.3	2890.4					
25	914.2	2897.0	531546.1	3	.00	33.00	.0
	926.2	2903.7					
26	938.1	2910.4	522141.8	3	.00	33.00	.0
	950.0	2917.0					
27	965.9	2925.9	669864.8	3	.00	33.00	.0
	981.9	2934.8					
28	997.8	2943.7	627062.5	3	.00	33.00	.0
	1013.7	2952.7					
29	1029.6	2961.6	584261.9	3	.00	33.00	.0
	1045.6	2970.5					
30	1061.5	2979.4	541459.6	3	.00	33.00	.0
	1077.4	2988.3					
31	1093.4	2997.2	498657.2	3	.00	33.00	.0
	1109.3	3006.1					
32	1125.2	3015.0	455855.5	3	.00	33.00	.0
	1141.1	3023.9					
33	1157.1	3032.8	413052.2	3	.00	33.00	.0
	1173.0	3041.7					
34	1189.1	3050.7	370439.2	3	.00	33.00	.0
	1205.2	3059.7					
35	1221.3	3068.7	319583.8	3	.00	33.00	.0
	1237.4	3077.7					
36	1253.5	3086.7	268727.0	3	.00	33.00	.0
	1269.6	3095.7					
37	1285.7	3104.7	217871.5	3	.00	33.00	.0
	1301.8	3113.7					
38	1317.9	3122.7	167016.1	3	.00	33.00	.0
	1334.0	3131.7					
39	1343.2	3136.9	72636.6	3	.00	33.00	.0
	1352.4	3142.0					
40	1361.6	3147.2	56013.7	3	.00	33.00	.0
	1370.8	3152.3					

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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	1370.8	3152.3					
41	1379.2	3157.0	37563.5	4	.00	33.00	.0
	1387.5	3161.7					
42	1395.9	3166.4	26268.8	5	.00	33.00	.0
	1404.3	3171.0					
43	1404.7	3171.3	1027.6	6	.00	33.00	.0
	1405.1	3171.5					
44	1412.9	3175.8	14202.8	7	500.00	.00	.0
	1420.6	3180.2					

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
1	309.0	0.	2959.9	0.	0.	.0	.0
2	313.3	0.	2959.6	0.	0.	.0	.0
3	319.0	0.	2959.2	0.	0.	.0	.0
4	325.0	0.	2958.8	0.	0.	.0	.0
5	335.0	0.	2958.0	0.	0.	.0	.0
6	351.0	0.	2956.8	0.	0.	.0	.0
7	376.6	0.	2954.1	0.	0.	.0	.0
8	409.9	0.	2951.0	0.	0.	.0	.0
9	443.2	0.	2948.4	0.	0.	.0	.0
10	459.9	0.	2947.2	0.	0.	.0	.0
11	478.2	0.	2950.2	0.	0.	.0	.0
12	514.5	0.	2956.3	0.	0.	.0	.0
13	550.8	0.	2962.3	0.	0.	.0	.0
14	569.0	0.	2965.4	0.	0.	.0	.0
15	587.4	0.	2968.8	0.	0.	.0	.0
16	624.1	0.	2975.6	0.	0.	.0	.0
17	660.8	0.	2982.4	0.	0.	.0	.0
18	697.5	0.	2989.2	0.	0.	.0	.0
19	734.3	0.	2996.1	0.	0.	.0	.0
20	771.0	0.	3002.9	0.	0.	.0	.0
21	807.7	0.	3009.7	0.	0.	.0	.0
22	844.4	0.	3016.5	0.	0.	.0	.0
23	881.1	0.	3023.4	0.	0.	.0	.0
24	900.9	0.	3027.3	0.	0.	.0	.0
25	914.2	0.	3033.4	0.	0.	.0	.0
26	938.1	0.	3044.3	0.	0.	.0	.0
27	965.9	0.	3054.6	0.	0.	.0	.0
28	997.8	0.	3064.2	0.	0.	.0	.0
29	1029.6	0.	3073.9	0.	0.	.0	.0
30	1061.5	0.	3083.6	0.	0.	.0	.0
31	1093.4	0.	3093.2	0.	0.	.0	.0
32	1125.2	0.	3102.9	0.	0.	.0	.0
33	1157.1	0.	3112.6	0.	0.	.0	.0
34	1189.1	0.	3121.7	0.	0.	.0	.0
35	1221.3	0.	3130.2	0.	0.	.0	.0
36	1253.5	0.	3138.8	0.	0.	.0	.0
37	1285.7	0.	3147.4	0.	0.	.0	.0
38	1317.9	0.	3156.2	0.	0.	.0	.0
39	1343.2	0.	3163.4	0.	0.	.0	.0

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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
```

```
*  First Stage of Multi-Stage Computations.                    *
*  (Information is for the Critical Shear Surface in the       *
*  Case of an Automatic Search.)                               *
***************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
40	1361.6	0.	3168.9	0.	0.	.0	.0
41	1379.2	0.	3174.1	0.	0.	.0	.0
42	1395.9	0.	3178.7	0.	0.	.0	.0
43	1404.7	0.	3181.1	0.	0.	.0	.0
44	1412.9	0.	3183.2	0.	0.	.0	.0

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Iteration	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.7639E+06	-.1940E+10		
First-order corrections to F and THETA					-.112E+01	-.158E+01
Values factored by .446E+00 - Deltas too large					-.500E+00	-.704E+00
2	2.50000	14.2955	.3553E+06	-.8890E+09		
First-order corrections to F and THETA					-.385E+00	-.199E+01
Second-order correction - Iteration 1					-.341E+00	-.199E+01
Second-order correction - Iteration 2					-.340E+00	-.199E+01
Second-order correction - Iteration 3					-.340E+00	-.199E+01
3	2.15968	12.3036	-.6577E+04	.3803E+08		
First-order corrections to F and THETA					-.132E-01	-.159E+01
Second-order correction - Iteration 1					-.128E-01	-.159E+01
Second-order correction - Iteration 2					-.128E-01	-.159E+01
4	2.14687	10.7143	.1888E+02	-.4329E+05		
First-order corrections to F and THETA					-.212E-04	-.652E-03
Second-order correction - Iteration 1					-.212E-04	-.652E-03
5	2.14685	10.7137	.1941E+00	-.9455E+03		
First-order corrections to F and THETA					.214E-06	.329E-04
Second-order correction - Iteration 1					.215E-06	.330E-04
6	2.14685	10.7137	.7813E-02	.3580E+03		
First-order corrections to F and THETA					-.334E-06	-.300E-04
Second-order correction - Iteration 1					-.333E-06	-.300E-04
7	2.14685	10.7137	.2410E+00	-.4413E+03		
First-order corrections to F and THETA					-.367E-06	-.171E-04
Second-order correction - Iteration 1					-.367E-06	-.171E-04
8	2.14685	10.7137	-.2983E+00	.1134E+04		
First-order corrections to F and THETA					-.534E-07	-.253E-04
Second-order correction - Iteration 1					-.530E-07	-.253E-04

```
   9   2.14685    10.7136   .8130E-01  -.1043E+04
First-order corrections to F and THETA .........   .650E-06  .651E-04
Second-order correction - Iteration   1 ........   .650E-06  .651E-04

  10   2.14685    10.7137   .8594E-01  -.7352E+02
First-order corrections to F and THETA .........  -.204E-06 -.127E-04

Factor of Safety - - - - - - - -     2.147
Side Force Inclination - - - - -     10.71
Number of Iterations - - - - - -    10
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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner
```

TABLE NO. 38

```
*****************************************************************
*  Final Results for Stresses Along the Shear Surface           *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.147 Side Force Inclination = 10.71 Degrees

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	309.0	2959.0	286.5	286.5	232.9
2	313.3	2956.9	397.7	397.7	49.6
3	319.0	2954.1	763.9	763.9	95.3
4	325.0	2951.2	1156.1	1156.1	144.3
5	335.0	2946.3	1829.3	1829.3	228.3
6	351.0	2938.5	2943.8	2943.8	367.4
7	376.6	2925.9	4987.7	4987.7	622.5
8	409.9	2909.6	7797.3	7797.3	973.2
9	443.2	2893.3	10607.0	10607.0	1323.9
10	459.9	2885.2	10182.6	10182.6	1270.9
11	478.2	2884.9	10764.7	10764.7	1343.5
12	514.5	2884.2	11918.0	11918.0	1487.5
13	550.8	2883.5	13071.4	13071.4	1631.4
14	569.0	2883.2	13638.5	13638.5	1702.2
15	587.4	2883.5	14019.2	14019.2	1749.7
16	624.1	2884.1	15066.8	15066.8	1880.5
17	660.8	2884.8	16114.4	16114.4	2011.3
18	697.5	2885.4	17162.1	17162.1	2142.0
19	734.3	2886.0	18209.7	18209.7	2272.8
20	771.0	2886.6	19257.3	19257.3	2403.5
21	807.7	2887.2	20304.9	20304.9	2534.3
22	844.4	2887.9	21352.5	21352.5	2665.0
23	881.1	2888.5	22400.1	22400.1	2795.8
24	900.9	2889.6	19528.1	19528.1	2437.3
25	914.2	2897.0	18305.3	18305.3	5537.2
26	938.1	2910.4	17981.4	17981.4	5439.3
27	965.9	2925.9	17267.8	17267.8	5223.4
28	997.8	2943.7	16164.5	16164.5	4889.6
29	1029.6	2961.6	15061.1	15061.1	4555.9
30	1061.5	2979.4	13957.8	13957.8	4222.1
31	1093.4	2997.2	12854.4	12854.4	3888.4
32	1125.2	3015.0	11751.1	11751.1	3554.6
33	1157.1	3032.8	10647.8	10647.8	3220.9
34	1189.1	3050.7	9447.5	9447.5	2857.8

35	1221.3	3068.7	8150.5	8150.5	2465.5
36	1253.5	3086.7	6853.5	6853.5	2073.1
37	1285.7	3104.7	5556.5	5556.5	1680.8
38	1317.9	3122.7	4259.5	4259.5	1288.5
39	1343.2	3136.9	3240.2	3240.2	980.1

1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	1361.6	3147.2	2498.7	2498.7	755.8
41	1379.2	3157.0	1844.5	1844.5	557.9
42	1395.9	3166.4	1289.9	1289.9	390.2
43	1404.7	3171.3	1005.6	1005.6	304.2
44	1412.9	3175.8	750.9	750.9	232.9

CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION = .28 (= .279E+00)
SHOULD NOT EXCEED .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION = .50 (= .504E+00)
SHOULD NOT EXCEED .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN = -9.04 (= -.904E+01)
SHOULD NOT EXCEED .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM = .09 (= .913E-01)
SHOULD NOT EXCEED .100E+03

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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner

TABLE NO. 39
****
* Final Results for Side Forces and Stresses Between Slices. *
* (Results for Critical Shear Surface in Case of a Search.) *
****

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.147 Side Force Inclination = 10.71 Degrees

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	310.5	1176.	2959.3	.352	44.6	730.6
2	316.0	2534.	2958.8	.421	171.7	482.8
3	322.0	5400.	2957.2	.354	52.1	784.0
4	328.0	9738.	2955.4	.318	-48.6	1125.1
5	342.0	25752.	2951.6	.293	-206.0	1913.4
6	360.0	58887.	2946.6	.280	-410.6	2988.5
7	393.3	162649.	2937.7	.273	-794.6	5168.3
8	426.5	324861.	2928.4	.266	-1275.6	7579.6
9	459.8	545524.	2919.3	.263	-1746.8	10027.8
10	460.0	545808.	2919.3	.263	-1746.1	10026.8
11	496.3	602741.	2922.6	.266	-1680.4	9952.5
12	532.7	665774.	2925.5	.265	-1702.4	10043.9
13	569.0	734909.	2928.1	.263	-1781.7	10251.9
14	569.0	734939.	2928.1	.263	-1781.8	10252.0
15	605.7	791496.	2931.6	.261	-1843.2	10341.5
16	642.5	852280.	2934.9	.258	-1932.9	10498.1

17	679.2	917289.	2938.1	.255	-2043.0	10707.0
18	715.9	986525.	2941.1	.251	-2168.4	10957.6
19	752.6	1059988.	2944.0	.247	-2305.1	11241.7
20	789.3	1137676.	2946.8	.244	-2450.3	11553.2
21	826.1	1219592.	2949.5	.240	-2602.1	11887.2
22	862.8	1305733.	2952.1	.236	-2758.8	12240.0
23	899.5	1396090.	2954.7	.233	-2919.4	12608.6
24	902.3	1371831.	2956.4	.234	-2849.2	12389.2
25	926.2	1257804.	2966.5	.226	-2860.3	11758.6
26	950.0	1145790.	2976.7	.219	-2835.0	11083.5
27	981.9	1002087.	2990.5	.217	-2681.1	10355.8
28	1013.7	867567.	3004.2	.215	-2525.4	9623.1
29	1045.6	742229.	3018.0	.212	-2367.0	8883.8
30	1077.4	626073.	3031.7	.209	-2204.7	8135.8
31	1109.3	519100.	3045.5	.206	-2036.5	7375.9
32	1141.1	421308.	3059.3	.203	-1859.3	6599.4
33	1173.0	332702.	3073.2	.199	-1668.2	5798.8
34	1205.2	253235.	3087.3	.198	-1452.2	5031.6
35	1237.4	184676.	3101.4	.197	-1235.8	4265.8
36	1269.6	127028.	3115.5	.197	-1019.3	3502.6
37	1301.8	80290.	3129.6	.195	-803.8	2745.3
38	1334.0	44461.	3143.7	.193	-594.3	2003.2
39	1352.4	28879.	3151.8	.191	-474.5	1587.1
40	1370.8	16863.	3159.8	.187	-364.7	1193.1

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	1387.5	8804.	3167.0	.176	-272.5	849.2
42	1404.3	3169.	3174.0	.148	-172.8	484.2
43	1405.1	2949.	3174.4	.147	-166.1	463.3
44	1420.6	0.	3170.7	BELOW	.2	-.3

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .28   (=  .279E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .50   (=  .504E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =        -9.04   (= -.904E+01)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .09   (=  .913E-01)
     SHOULD NOT EXCEED      .100E+03
```

END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Antelope Valley Landfill - Long Section
Search for Yield Acceleration Along Liner

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	460.000	2885.000
6	569.000	2883.000
7	1334.000	2896.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	307.000	2960.000
2	307.000	2963.000

3	460.000	2888.000
4	569.000	2886.000
5	1334.000	2896.000
6	1728.000	3097.000
7	1731.000	3097.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse 1

Point	X	Y
1	360.000	2937.020
2	950.000	3150.000
3	1173.000	3160.000
4	1431.000	3150.000
5	1685.000	3075.060

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse 2

Point	X	Y
1	342.000	2945.840
2	950.000	3160.000
3	1173.000	3170.000
4	1431.000	3160.000
5	1695.000	3080.160

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse 3

Point	X	Y
1	328.000	2952.710
2	950.000	3170.000
3	1173.000	3180.000
4	1431.000	3170.000
5	1705.000	3085.270

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse 4

Point	X	Y
1	322.000	2955.650
2	950.000	3175.000
3	1173.000	3185.000
4	1431.000	3170.000
5	1710.000	3087.820

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse 5

Point	X	Y
1	316.000	2958.590
2	950.000	3180.000
3	1173.000	3190.000
4	1431.000	3180.000
5	1715.000	3090.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse 6

Point	X	Y
1	307.000	2960.000

```
        2        950.000       3190.000
        3       1173.000       3200.000
        4       1431.000       3190.000
        5       1731.000       3097.000

All new profile lines defined - No old lines retained
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TABLE NO.  3
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

DATA FOR MATERIAL TYPE  1
Bedrock

     Unit weight of material =  130.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     500.000
     Friction angle - - - - -  39.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  2
Liner

     Unit weight of material =   62.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  15.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  3
Refuse 1

     Unit weight of material =   82.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  4
Refuse 2

     Unit weight of material =   69.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  33.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  5
Refuse 3

     Unit weight of material =   66.000
```

```
      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -          .000
      Friction angle - - - - -  33.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  6
 Refuse 4

      Unit weight of material =   64.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -          .000
      Friction angle - - - - -  33.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  7
 Refuse 5

      Unit weight of material =   63.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -     500.000
      Friction angle - - - - -    .000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  8
 Refuse 6

      Unit weight of material =   61.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -     500.000
      Friction angle - - - - -    .000 degrees

      No (or zero) pore water pressures

 All new material properties defined - No old data retained
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 TABLE NO. 15
 **********************************
 * NEW ANALYSIS/COMPUTATION DATA *
 **********************************

 Noncircular Shear Surface(s)

 Automatic Search Performed


 Coordinates of points on shear surface which are to be shifted -

 Point          X              Y       Shift Angle

    1        308.000        2960.000   angle to be computed - moveable
    2        460.000        2886.000   angle to be computed - moveable
    3        569.000        2884.000   angle to be computed - moveable
    4        900.000        2887.000   angle to be computed - moveable
    5       1425.000        3180.000   angle to be computed - moveable
```

Initial distance for shifting points on shear surface = 4.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

Seismic coefficient = .230

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	950.000	3190.000
6	1173.000	3200.000
7	1431.000	3190.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

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```
TABLE NO. 22
*****************************************
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE          *
*****************************************

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
          THE TOE OF THE SLOPE A DISTANCE =        .36
          SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
          VERY LARGE

Crack depth computed to be - - -     10.23

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -     1.593
Side Force Inclination - - - - - - - - -     33.36
Number of Iterations - - - - - - - - - -    10

TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    1 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    4.00

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       304.00    2960.00   1.664      26.49          14
   1       311.77    2961.35   1.602      31.76           8
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   5 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     5      9
   2       459.02    2882.12 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       460.98    2889.88 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       568.98    2880.00   1.854      28.30          16
   3       569.02    2888.00   1.482      30.58          11
   4       898.91    2890.85 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       901.09    2883.15 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1421.00    3180.16 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1429.00    3179.84 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Computed shift distances for newly estimated shear surface
factored by  1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is     4.000 at point   3

Coordinates For New Estimate of Shear Surface

     Point       X           Y
```

```
        1       309.47      2960.53
        2       460.00      2886.00
        3       569.02      2888.00
        4       900.00      2887.00
        5      1425.00      3180.00

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to    2.800 as a result of the above
error and search was continued
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    2 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    2.80

                                 1-Stage
                                 Factor
                                   of     Side Force
Point        X          Y       Safety   Inclination   Iterations

   1       305.20    2960.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   1       310.64    2960.94 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       459.31    2883.29   1.874      22.91          18
   2       460.69    2888.71 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       568.99    2881.20   1.844      28.64          11
   3       569.01    2886.80 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       899.24    2889.69   1.014      30.77          17
   4       900.76    2884.31 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1422.20    3180.11 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1427.80    3179.89   1.593      33.34           9

Computed shift distances for newly estimated shear surface
factored by  1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is     2.800 at point   4

Coordinates For New Estimate of Shear Surface

     Point       X           Y
```

1	308.00	2960.00
2	460.00	2886.00
3	569.00	2884.00
4	899.24	2889.69
5	1427.80	3179.89

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.015
Side Force Inclination - - - - - - - - - - 30.81
Number of Iterations - - - - - - - - - - - 14
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 3 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.80

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	305.20	2960.00	See Message on Next Line(s)		
VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF FROM -10.00 TO 80.00 DEGREES					
1	310.64	2960.94	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	459.31	2883.29	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.69	2888.71	See Message on Next Line(s)		
VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF FROM -10.00 TO 80.00 DEGREES					
3	569.00	2881.20	1.529	26.25	11
3	569.00	2886.80	1.289	28.12	14
4	898.47	2892.39	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
4	900.00	2887.00	1.593	33.34	10
5	1425.00	3180.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1430.60	3179.78	1.017	30.85	11

Maximum distance shifted for new estimate of shear surface is .426 at point 3

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.00	2960.00
2	460.00	2886.00
3	569.00	2884.43
4	899.24	2889.69
5	1427.80	3179.89

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY

```
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to    1.600 as a result of the above
error and search was continued
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    4 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    1.60

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       306.40    2960.00    .995      34.08          14
   1       309.51    2960.54   1.018      30.62          14
   2       459.61    2884.45 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       460.39    2887.55 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.00    2882.40   1.307      26.62           8
   3       569.00    2885.60 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       898.80    2891.23   1.228      33.26          10
   4       899.67    2888.15 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1426.20    3179.95 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1429.40    3179.83 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Maximum distance shifted for new estimate of shear
surface is     1.600 at point   1

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      306.40     2960.00
        2      460.00     2886.00
        3      569.00     2884.00
        4      899.24     2889.69
        5     1427.80     3179.89

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -    .995
Side Force Inclination - - - - - - - - -    34.08
Number of Iterations - - - - - - - - - - 14
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 5 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.60

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	304.80	2960.00	See Message on Next Line(s)		
VALUE OF SIDE FORCE INCLINATION BECAME OUTSIDE RANGE OF FROM -10.00 TO 80.00 DEGREES					
1	307.96	2960.34	1.016	30.76	9
2	459.61	2884.45	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.39	2887.55	1.004	32.35	15
The following applies to the above point - DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR 4 SLICES FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW - 1 4					
3	569.00	2882.40	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
3	569.00	2885.60	.997	34.16	20
4	898.80	2891.23	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
4	899.67	2888.15	1.390	29.45	13
The following applies to the above point - DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR 6 SLICES FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW - 1 6					
5	1426.20	3179.95	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1429.40	3179.83	.996	34.10	17

Maximum distance shifted for new estimate of shear surface is .000 at point 1

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	306.40	2960.00
2	460.00	2886.00
3	569.00	2884.00
4	899.24	2889.69
5	1427.80	3179.89

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - .995
Side Force Inclination - - - - - - - - - 34.08
Number of Iterations - - - - - - - - - - 14

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```
TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    6 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =      .40

                                 1-Stage
                                 Factor
                                   of     Side Force
Point        X          Y       Safety   Inclination   Iterations

   1       306.00    2960.00   1.108      23.05          12
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   7 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1      7
   1       306.80    2960.00   1.008      31.93          19
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   4 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1      4
   2       459.90    2885.61   1.114      22.82          13
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   7 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1      7
   2       460.10    2886.39 See Message on Next Line(s)
FATAL ERROR FOR SLICE   1 - DENOMINATOR IN EQUATIONS FOR F
BECAME SMALLER THAN ALLOWED - DENOMINATOR =     .10000E-04
   3       569.00    2883.60    .994      34.06          17
   3       569.00    2884.40 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       899.13    2890.08    .995      34.10          16
   4       899.35    2889.31 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1427.40    3179.91    .995      34.07          17
   5      1428.20    3179.88 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Maximum distance shifted for new estimate of shear
surface is      .400 at point   5

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      306.56     2960.00
        2      460.00     2886.00
        3      569.00     2883.60
        4      899.24     2889.69
        5     1427.40     3179.91

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -     .999
Side Force Inclination - - - - - - - - -    33.24
Number of Iterations - - - - - - - - - -  23
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   6 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1      6
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```

TABLE NO. 25

```
*****************************************************************
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER   6 TRIAL POSITIONS) *
*****************************************************************
```

X	Y
306.40	2960.00
460.00	2886.00
569.00	2884.00
899.24	2889.69
1427.80	3179.89

CAUTION - FACTOR OF SAFETY WAS NOT COMPUTED FOR SOME SHEAR SURFACES NEAR CRITICAL SURFACE - CHECK PREVIOUS OUTPUT

1-Stage Factor of Safety = .995

Side Force Inclination = 34.08

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	306.4	2960.0					
1	306.7	2959.9	11.3	1	500.00	39.00	.0
	307.0	2959.7					
2	308.8	2958.9	449.9	1	500.00	39.00	.0
	310.5	2958.0					
3	313.3	2956.7	1961.6	1	500.00	39.00	.0
	316.0	2955.4					
4	319.0	2953.9	3926.0	1	500.00	39.00	.0
	322.0	2952.5					
5	325.0	2951.0	5824.1	1	500.00	39.00	.0
	328.0	2949.6					
6	334.7	2946.4	19897.2	1	500.00	39.00	.0
	341.3	2943.2					
7	341.7	2943.0	1297.6	2	.00	15.00	.0
	342.0	2942.8					
8	351.0	2938.5	43548.0	2	.00	15.00	.0
	360.0	2934.2					
9	376.7	2926.1	136346.4	2	.00	15.00	.0
	393.3	2918.1					
10	410.0	2910.1	212997.6	2	.00	15.00	.0
	426.7	2902.1					
11	443.3	2894.0	289648.1	2	.00	15.00	.0
	460.0	2886.0					
12	478.2	2885.7	377834.6	2	.00	15.00	.0
	496.3	2885.3					
13	514.5	2885.0	418520.2	2	.00	15.00	.0
	532.7	2884.7					
14	550.8	2884.3	459205.9	2	.00	15.00	.0

	569.0	2884.0					
15	587.3	2884.3	503132.3	2	.00	15.00	.0
	605.7	2884.6					
16	624.0	2884.9	540808.4	2	.00	15.00	.0
	642.4	2885.3					
17	660.7	2885.6	578484.1	2	.00	15.00	.0
	679.1	2885.9					
18	697.4	2886.2	616160.8	2	.00	15.00	.0
	715.8	2886.5					
19	734.1	2886.8	653836.4	2	.00	15.00	.0
	752.5	2887.2					
20	770.8	2887.5	691513.2	2	.00	15.00	.0
	789.2	2887.8					

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Search for Yield Acceleration Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	789.2	2887.8					
21	807.5	2888.1	729188.8	2	.00	15.00	.0
	825.9	2888.4					
22	844.2	2888.7	766865.4	2	.00	15.00	.0
	862.5	2889.1					
23	880.9	2889.4	804545.9	2	.00	15.00	.0
	899.2	2889.7					
24	899.8	2890.0	26078.0	2	.00	15.00	.0
	900.4	2890.3					
25	912.8	2897.1	551544.3	3	.00	33.00	.0
	925.2	2903.9					
26	937.6	2910.8	541882.7	3	.00	33.00	.0
	950.0	2917.6					
27	965.9	2926.3	668876.3	3	.00	33.00	.0
	981.9	2935.1					
28	997.8	2943.8	626917.1	3	.00	33.00	.0
	1013.7	2952.5					
29	1029.6	2961.3	584959.6	3	.00	33.00	.0
	1045.6	2970.0					
30	1061.5	2978.8	543000.4	3	.00	33.00	.0
	1077.4	2987.5					
31	1093.4	2996.3	501041.2	3	.00	33.00	.0
	1109.3	3005.0					
32	1125.2	3013.8	459082.6	3	.00	33.00	.0
	1141.1	3022.5					
33	1157.1	3031.3	417122.3	3	.00	33.00	.0
	1173.0	3040.0					
34	1189.1	3048.8	375410.6	3	.00	33.00	.0
	1205.2	3057.7					
35	1221.3	3066.5	325416.3	3	.00	33.00	.0
	1237.4	3075.4					
36	1253.5	3084.2	275420.8	3	.00	33.00	.0
	1269.6	3093.0					
37	1285.7	3101.9	225426.6	3	.00	33.00	.0
	1301.8	3110.7					

38	1317.9	3119.6	175433.7	3	.00	33.00	.0
	1334.0	3128.4					
39	1344.8	3134.3	89582.7	3	.00	33.00	.0
	1355.6	3140.2					
40	1366.4	3146.2	67133.3	3	.00	33.00	.0
	1377.2	3152.1					

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Search for Yield Acceleration Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	1377.2	3152.1					
41	1385.7	3156.8	38208.7	4	.00	33.00	.0
	1394.2	3161.4					
42	1402.7	3166.1	26719.2	5	.00	33.00	.0
	1411.2	3170.8					
43	1411.5	3170.9	777.1	6	.00	33.00	.0
	1411.8	3171.1					
44	1419.8	3175.5	14715.7	7	500.00	.00	.0
	1427.8	3179.9					

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Antelope Valley Landfill - Long Section
Search for Yield Acceleration Along Liner

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

				FORCES DUE TO SURFACE PRESSURES			
Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
1	306.7	3.	2959.9	0.	0.	.0	.0
2	308.8	103.	2959.6	0.	0.	.0	.0
3	313.3	451.	2959.3	0.	0.	.0	.0
4	319.0	903.	2959.0	0.	0.	.0	.0
5	325.0	1340.	2958.6	0.	0.	.0	.0
6	334.7	4576.	2958.0	0.	0.	.0	.0
7	341.7	298.	2957.6	0.	0.	.0	.0
8	351.0	10016.	2956.8	0.	0.	.0	.0
9	376.7	31360.	2954.2	0.	0.	.0	.0
10	410.0	48989.	2951.2	0.	0.	.0	.0
11	443.3	66619.	2948.7	0.	0.	.0	.0
12	478.2	86902.	2950.5	0.	0.	.0	.0

13	514.5	96260.	2956.6	0.	0.	.0	.0
14	550.8	105617.	2962.7	0.	0.	.0	.0
15	587.3	115720.	2969.1	0.	0.	.0	.0
16	624.0	124386.	2975.9	0.	0.	.0	.0
17	660.7	133051.	2982.7	0.	0.	.0	.0
18	697.4	141717.	2989.5	0.	0.	.0	.0
19	734.1	150382.	2996.4	0.	0.	.0	.0
20	770.8	159048.	3003.2	0.	0.	.0	.0
21	807.5	167713.	3010.0	0.	0.	.0	.0
22	844.2	176379.	3016.8	0.	0.	.0	.0
23	880.9	185046.	3023.7	0.	0.	.0	.0
24	899.8	5998.	3027.3	0.	0.	.0	.0
25	912.8	126855.	3033.2	0.	0.	.0	.0
26	937.6	124633.	3044.4	0.	0.	.0	.0
27	965.9	153842.	3054.8	0.	0.	.0	.0
28	997.8	144191.	3064.3	0.	0.	.0	.0
29	1029.6	134541.	3073.8	0.	0.	.0	.0
30	1061.5	124890.	3083.3	0.	0.	.0	.0
31	1093.4	115239.	3092.8	0.	0.	.0	.0
32	1125.2	105589.	3102.3	0.	0.	.0	.0
33	1157.1	95938.	3111.8	0.	0.	.0	.0
34	1189.1	86344.	3120.7	0.	0.	.0	.0
35	1221.3	74846.	3129.1	0.	0.	.0	.0
36	1253.5	63347.	3137.5	0.	0.	.0	.0
37	1285.7	51848.	3145.9	0.	0.	.0	.0
38	1317.9	40350.	3154.5	0.	0.	.0	.0
39	1344.8	20604.	3161.9	0.	0.	.0	.0

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
40	1366.4	15441.	3168.2	0.	0.	.0	.0
41	1385.7	8788.	3173.8	0.	0.	.0	.0
42	1402.7	6145.	3178.4	0.	0.	.0	.0
43	1411.5	179.	3180.8	0.	0.	.0	.0
44	1419.8	3385.	3182.9	0.	0.	.0	.0

TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Trial Trial

```
       Factor   Side Force    Force      Moment                 Delta
Iter-    of    Inclination  Imbalance  Imbalance   Delta-F      Theta
ation  Safety   (degrees)     (lbs.)   (ft.-lbs.)              (degrees)

   1   3.00000    15.0000   .4104E+07  -.1099E+11
First-order corrections to F and THETA .........  -.609E+01  .200E+01
Values factored by  .821E-01 - Deltas too large   -.500E+00  .164E+00

   2   2.50000    15.1642   .3701E+07  -.9916E+10
First-order corrections to F and THETA .........  -.384E+01  .215E+01
Values factored by  .130E+00 - Deltas too large   -.500E+00  .281E+00

   3   2.00000    15.4448   .3100E+07  -.8317E+10
First-order corrections to F and THETA .........  -.207E+01  .243E+01
Values factored by  .242E+00 - Deltas too large   -.500E+00  .588E+00

   4   1.50000    16.0331   .2098E+07  -.5663E+10
First-order corrections to F and THETA .........  -.778E+00  .312E+01
Values factored by  .642E+00 - Deltas too large   -.500E+00  .200E+01

   5   1.00000    18.0347  -.6590E+05  -.8617E+07
On iteration   5 the following slices produced
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........   .839E-01  .942E+01
Values factored by  .912E+00 - Deltas too large    .765E-01  .859E+01

   6   1.07651    26.6291  -.2688E+07   .6726E+10
On iteration   6 the following slices produced
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........   .329E+00  .829E+01
Second-order correction - Iteration   1 ........   .735E+00  .829E+01
Second-order correction - Iteration   2 ........   .531E+00  .829E+01
Second-order correction - Iteration   3 ........   .426E+00  .829E+01
Second-order correction - Iteration   4 ........   .369E+00  .829E+01
Second-order correction - Iteration   5 ........   .326E+00  .829E+01
Second-order correction - Iteration   6 ........   .511E+00  .829E+01
Second-order correction - Iteration   7 ........   .416E+00  .829E+01
Second-order correction - Iteration   8 ........   .363E+00  .829E+01
Second-order correction - Iteration   9 ........   .318E+00  .829E+01
Second-order correction - Iteration  10 ........   .394E+00  .829E+01
SECOND-ORDER CORRECTIONS DID NOT CONVERGE
IN  10 ITERATIONS - FIRST-ORDER CORRECTIONS
USED

   7   1.40511    34.9200   .5178E+07  -.1090E+11
On iteration   7 the following slices produced
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........  -.174E+00 -.220E+01
Second-order correction - Iteration   1 ........  -.142E+00 -.220E+01
Second-order correction - Iteration   2 ........  -.280E+00 -.220E+01
Second-order correction - Iteration   3 ........  -.209E+00 -.220E+01
Second-order correction - Iteration   4 ........  -.169E+00 -.220E+01
Second-order correction - Iteration   5 ........  -.135E+00 -.220E+01
Second-order correction - Iteration   6 ........  -.189E+00 -.220E+01
Second-order correction - Iteration   7 ........  -.155E+00 -.220E+01
Second-order correction - Iteration   8 ........  -.960E-01 -.220E+01
Second-order correction - Iteration   9 ........  -.131E+00 -.220E+01
Second-order correction - Iteration  10 ........  -.174E+00 -.220E+01
SECOND-ORDER CORRECTIONS DID NOT CONVERGE
IN  10 ITERATIONS - FIRST-ORDER CORRECTIONS
USED

   8   1.23062    32.7223   .2408E+07  -.5174E+10
On iteration   8 the following slices produced
```

```
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........  -.181E+00 -.131E+01
Second-order correction - Iteration   1 ........  -.623E-01 -.131E+01
Second-order correction - Iteration   2 ........  -.170E+00 -.131E+01
Second-order correction - Iteration   3 ........  -.331E-01 -.131E+01
Second-order correction - Iteration   4 ........  -.133E+00 -.131E+01
SECOND-ORDER CORRECTIONS DIVERGED
FIRST-ORDER CORRECTIONS USED

   9   1.04916    31.4107   .7477E+06  -.1683E+10
On iteration   9 the following slices produced
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........  -.661E-01  .114E+01
Second-order correction - Iteration   1 ........  -.810E-01  .114E+01
Second-order correction - Iteration   2 ........  -.811E-01  .114E+01
Second-order correction - Iteration   3 ........  -.811E-01  .114E+01

  10    .96804    32.5494  -.8912E+05   .1308E+09
On iteration  10 the following slices produced
low denominators in the equations for the factor
of safety -    1   2   3   4   5   6
First-order corrections to F and THETA .........   .288E-01  .177E+01
Second-order correction - Iteration   1 ........   .293E-01  .177E+01
Second-order correction - Iteration   2 ........   .293E-01  .177E+01

  11    .99738    34.3199  -.8422E+03   .1042E+08
First-order corrections to F and THETA .........  -.261E-02 -.239E+00
Second-order correction - Iteration   1 ........  -.260E-02 -.239E+00
Second-order correction - Iteration   2 ........  -.260E-02 -.239E+00

  12    .99478    34.0807   .4594E+01   .3922E+05
First-order corrections to F and THETA .........  -.156E-04 -.134E-02
Second-order correction - Iteration   1 ........  -.156E-04 -.134E-02

  13    .99476    34.0794   .1371E+00  -.8648E+03
First-order corrections to F and THETA .........   .168E-06  .163E-04
Second-order correction - Iteration   1 ........   .168E-06  .163E-04

  14    .99476    34.0794  -.1136E+00  -.2513E+02
First-order corrections to F and THETA .........   .915E-07  .700E-05

Factor of Safety - - - - - - - -       .995
Side Force Inclination - - - - -      34.08
Number of Iterations - - - - - -     14
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Search for Yield Acceleration Along Liner


TABLE NO. 38
*****************************************************************
*  Final Results for Stresses Along the Shear Surface           *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =    .995     Side Force Inclination =  34.08 Degrees

       -------- VALUES AT CENTER OF BASE OF SLICE---------

                                Total    Effective
Slice                           Normal    Normal       Shear
  No.   X-center  Y-center      Stress    Stress       Stress
```

1	306.7	2959.9	-2224.6	-2224.6	-1308.3
2	308.8	2958.9	-2565.1	-2565.1	-1585.5
3	313.3	2956.7	-3293.4	-3293.4	-2178.4
4	319.0	2953.9	-4220.8	-4220.8	-2933.3
5	325.0	2951.0	-5214.4	-5214.4	-3742.1
6	334.7	2946.4	-6861.0	-6861.0	-5082.6
7	341.7	2943.0	4382.7	4382.7	1180.5
8	351.0	2938.5	5642.2	5642.2	1519.8
9	376.7	2926.1	9539.4	9539.4	2569.5
10	410.0	2910.1	14902.3	14902.3	4014.1
11	443.3	2894.0	20264.8	20264.8	5458.5
12	478.2	2885.7	10970.6	10970.6	2955.0
13	514.5	2885.0	12151.9	12151.9	3273.2
14	550.8	2884.3	13333.2	13333.2	3591.4
15	587.3	2884.3	13881.7	13881.7	3739.2
16	624.0	2884.9	14921.2	14921.2	4019.2
17	660.7	2885.6	15960.7	15960.7	4299.2
18	697.4	2886.2	17000.2	17000.2	4579.2
19	734.1	2886.8	18039.7	18039.7	4859.2
20	770.8	2887.5	19079.2	19079.2	5139.2
21	807.5	2888.1	20118.7	20118.7	5419.2
22	844.2	2888.7	21158.2	21158.2	5699.2
23	880.9	2889.4	22197.2	22197.2	5979.0
24	899.8	2890.0	14168.8	14168.8	3816.5
25	912.8	2897.1	14577.3	14577.3	9516.5
26	937.6	2910.8	14322.0	14322.0	9349.8
27	965.9	2926.3	13762.6	13762.6	8984.6
28	997.8	2943.8	12899.3	12899.3	8421.0
29	1029.6	2961.3	12036.0	12036.0	7857.4
30	1061.5	2978.8	11172.6	11172.6	7293.8
31	1093.4	2996.3	10309.3	10309.3	6730.2
32	1125.2	3013.8	9445.9	9445.9	6166.6
33	1157.1	3031.3	8582.8	8582.8	5603.1
34	1189.1	3048.8	7642.1	7642.1	4989.0
35	1221.3	3066.5	6624.4	6624.4	4324.6
36	1253.5	3084.2	5606.6	5606.6	3660.2
37	1285.7	3101.9	4588.9	4588.9	2995.8
38	1317.9	3119.6	3571.3	3571.3	2331.4
39	1344.8	3134.3	2721.4	2721.4	1776.6

1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	1366.4	3146.2	2039.4	2039.4	1331.4
41	1385.7	3156.8	1472.1	1472.1	961.0
42	1402.7	3166.1	1029.5	1029.5	672.1
43	1411.5	3170.9	805.4	805.4	525.8
44	1419.8	3175.5	613.6	613.6	502.6

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .36   (=   .365E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .45   (=   .452E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -746.35   (= -.746E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .16   (=   .160E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE
```

```
///// WARNING ///// EFFECTIVE OR TOTAL NORMAL STRESS ON SHEAR
                    SURFACE IS NEGATIVE AT POINTS ALONG THE
                    LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.
///// WARNING ///// EFFECTIVE OR TOTAL NORMAL STRESS ON SHEAR
                    SURFACE IS NEGATIVE AT POINTS ALONG THE
                    LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.

///// WARNING ///// SHEAR STRESS AT SOME POINTS ALONG THE SHEAR
                    SURFACE IS NEGATIVE - SOLUTION MAY NOT BE A
                    VALID SOLUTION.
///// WARNING ///// SHEAR STRESS AT SOME POINTS ALONG THE SHEAR
                    SURFACE IS NEGATIVE - SOLUTION MAY NOT BE A
                    VALID SOLUTION.
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        Search for Yield Acceleration Along Liner


        TABLE NO. 39
        ****************************************************************
        *  Final Results for Side Forces and Stresses Between Slices.  *
        *  (Results for Critical Shear Surface in Case of a Search.)   *
        ****************************************************************

        SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
        Factor of Safety =    .995     Side Force Inclination =  34.08 Degrees

              --------------- VALUES AT RIGHT SIDE OF SLICE ---------------
```

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	307.0	-1727.	2960.1	ABOVE	-25816.7	15918.1
2	310.5	-13905.	2960.4	.722	-8245.3	1178.4
3	316.0	-39277.	2960.5	.657	-8052.0	-242.4
4	322.0	-76347.	2960.5	.620	-8442.7	-1375.6
5	328.0	-123270.	2960.3	.596	-8967.9	-2428.7
6	341.3	-263583.	2959.7	.569	-10603.3	-4405.9
7	342.0	-261198.	2960.4	.591	-11253.1	-3329.7
8	360.0	-181188.	2986.1	ABOVE	-16617.2	9914.7
9	393.3	69320.	2735.9	BELOW	-13433.5	15011.6
10	426.7	460659.	2891.6	BELOW	-9939.4	17513.8
11	460.0	992811.	2905.0	.147	-7127.5	19903.4
12	496.3	1026350.	2921.9	.257	-2743.6	14683.8
13	532.7	1063501.	2936.9	.335	53.7	11235.4
14	569.0	1104259.	2950.1	.389	1810.1	8968.0
15	605.7	1119591.	2963.2	.431	2996.0	7182.5
16	642.4	1136072.	2974.7	.460	3658.5	6007.2
17	679.1	1153702.	2984.5	.476	3941.9	5281.9
18	715.8	1172479.	2992.5	.482	3947.0	4894.0
19	752.5	1192404.	2998.6	.480	3745.5	4762.0
20	789.2	1213478.	3003.0	.471	3389.2	4826.5
21	825.9	1235700.	3005.6	.455	2916.4	5043.4
22	862.5	1259070.	3006.3	.435	2355.2	5379.4
23	899.2	1283563.	3005.3	.410	1727.0	5809.0
24	900.4	1270760.	3006.5	.412	1760.5	5706.2
25	925.2	1162908.	3016.2	.405	1497.1	5452.8
26	950.0	1056945.	3025.4	.396	1205.5	5221.2
27	981.9	926146.	3036.7	.397	1134.4	4849.8
28	1013.7	803553.	3048.0	.397	1060.3	4478.8
29	1045.6	689165.	3059.2	.398	981.8	4109.1
30	1077.4	582982.	3070.3	.398	896.8	3742.0

31	1109.3	485004.	3081.3	.397	802.2	3379.5
32	1141.1	395231.	3092.1	.395	693.5	3025.1
33	1173.0	313671.	3102.6	.391	562.9	2684.6
34	1205.2	240259.	3112.9	.392	492.3	2328.8
35	1237.4	176624.	3123.3	.393	426.6	1968.8
36	1269.6	122766.	3133.9	.396	367.8	1602.4
37	1301.8	78684.	3144.6	.402	320.2	1226.1
38	1334.0	44381.	3155.8	.420	291.6	833.1
39	1355.6	26863.	3163.7	.444	281.4	563.3
40	1377.2	13736.	3172.0	.499	282.1	286.8

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	1394.2	6264.	3179.7	.609	285.6	60.3
42	1411.2	1039.	3200.6	ABOVE	298.6	-212.6
43	1411.8	887.	3203.7	ABOVE	298.2	-223.3
44	1427.8	0.	11756.0	ABOVE	-21.9	21.9

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .36   (=  .365E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .45   (=  .452E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -746.35   (= -.746E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .16   (=  .160E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

///// WARNING ///// FORCES BETWEEN SLICES ARE NEGATIVE AT POINTS
                    ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.
///// WARNING ///// FORCES BETWEEN SLICES ARE NEGATIVE AT POINTS
                    ALONG THE LOWER ONE-HALF OF THE SHEAR SURFACE -
                    SOLUTION MAY NOT BE A VALID SOLUTION.

***** CAUTION ***** SOME OF THE FORCES BETWEEN SLICES ACT AT POINTS
                    ABOVE THE SURFACE OF THE SLOPE OR BELOW THE
                    SHEAR SURFACE - EITHER A TENSION CRACK MAY BE
                    NEEDED OR THE SOLUTION MAY NOT BE A VALID SOLUTION.

END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	460.000	2885.000
6	569.000	2883.000
7	1334.000	2896.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	307.000	2960.000
2	307.000	2963.000

3	460.000	2888.000
4	569.000	2886.000
5	1334.000	2896.000
6	1728.000	3097.000
7	1731.000	3097.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse 1

Point	X	Y
1	360.000	2937.020
2	950.000	3150.000
3	1173.000	3160.000
4	1431.000	3150.000
5	1685.000	3075.060

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse 2

Point	X	Y
1	342.000	2945.840
2	950.000	3160.000
3	1173.000	3170.000
4	1431.000	3160.000
5	1695.000	3080.160

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse 3

Point	X	Y
1	328.000	2952.710
2	950.000	3170.000
3	1173.000	3180.000
4	1431.000	3170.000
5	1705.000	3085.270

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse 4

Point	X	Y
1	322.000	2955.650
2	950.000	3175.000
3	1173.000	3185.000
4	1431.000	3170.000
5	1710.000	3087.820

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse 5

Point	X	Y
1	316.000	2958.590
2	950.000	3180.000
3	1173.000	3190.000
4	1431.000	3180.000
5	1715.000	3090.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse 6

Point	X	Y
1	307.000	2960.000

```
        2        950.000      3190.000
        3       1173.000      3200.000
        4       1431.000      3190.000
        5       1731.000      3097.000

All new profile lines defined - No old lines retained
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TABLE NO.  3
**********************************************************************
* NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
**********************************************************************

DATA FOR MATERIAL TYPE  1
Bedrock

     Unit weight of material =  130.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     500.000
     Friction angle - - - - -  39.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  2
Liner

     Unit weight of material =   62.400

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  15.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  3
Refuse 1

     Unit weight of material =   82.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  4
Refuse 2

     Unit weight of material =   69.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -        .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  5
Refuse 3

     Unit weight of material =   66.000
```

```
     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  6
Refuse 4

     Unit weight of material =   64.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  7
Refuse 5

     Unit weight of material =   63.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -      600.000
     Friction angle - - - - -     .000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  8
Refuse 6

     Unit weight of material =   61.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -      600.000
     Friction angle - - - - -     .000 degrees

     No (or zero) pore water pressures

All new material properties defined - No old data retained
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TABLE NO. 15
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Noncircular Shear Surface(s)

Automatic Search Performed


Coordinates of points on shear surface which are to be shifted -

Point          X              Y       Shift Angle

   1        308.000        2960.000   angle to be computed - moveable
   2        460.000        2886.000   angle to be computed - moveable
   3        569.000        2884.000   angle to be computed - moveable
   4        950.000        2889.000   angle to be computed - moveable
   5       1425.000        3180.000   angle to be computed - moveable
```

Initial distance for shifting points on shear surface = 2.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

Seismic coefficient = .000

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	950.000	3190.000
6	1173.000	3200.000
7	1431.000	3190.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

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TABLE NO. 22

```
*****************************************
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE          *
*****************************************
```

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
THE TOE OF THE SLOPE A DISTANCE = .36
SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
VERY LARGE

Crack depth computed to be - - - 10.23

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 3.035
Side Force Inclination - - - - - - - - - - 12.49
Number of Iterations - - - - - - - - - - - 22

TABLE NO. 23

```
****************************
* SEARCH TRIAL NUMBER    1 *
****************************
```

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.00	2960.00	3.066	12.12	10
1	309.88	2960.67	3.040	12.46	5
2	459.51	2884.06	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.49	2887.94	3.072	12.36	5
3	568.99	2882.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
3	569.01	2886.00	2.706	11.70	12
4	949.40	2890.91	2.411	10.48	14
4	950.60	2887.09	3.648	12.83	7
5	1423.00	3180.08	3.032	12.51	9
5	1427.00	3179.92	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.68	2960.24
2	460.00	2886.00
3	569.01	2886.00
4	949.40	2890.91
5	1423.00	3180.08

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.418
Side Force Inclination - - - - - - - - - - 10.55
Number of Iterations - - - - - - - - - - - 11

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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 2 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.69	2960.00	2.424	10.46	5
1	310.56	2960.92	2.422	10.53	9
2	459.52	2884.06	2.721	9.65	11
2	460.48	2887.94	2.465	10.43	7
3	568.99	2888.00	3.892	12.18	22
3	569.02	2884.00	2.408	10.49	24
4	948.81	2892.82	3.789	12.47	11
4	950.00	2889.00	2.703	11.72	12
5	1421.00	3180.15	See Message on Next Line(s)		

FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

5	1425.00	3180.00	2.423	10.53	8

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 3

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.84	2960.30
2	460.17	2886.71
3	569.02	2884.00
4	949.60	2890.28
5	1423.00	3180.08

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.409
Side Force Inclination - - - - - - - - - - 10.47
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 3 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

1-Stage
Factor

Point	X	Y	of Safety	Side Force Inclination	Iterations
1	306.86	2960.00	2.407	10.48	6
1	310.72	2960.97	2.413	10.46	5
2	459.68	2884.77 See Message on Next Line(s)			
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.67	2888.65	2.614	9.88	14
3	569.01	2882.00	3.252	11.00	6
3	569.03	2886.00	2.419	10.53	6
4	949.00	2892.19	3.046	12.47	6
4	950.20	2888.38	3.373	12.83	10
5	1421.00	3180.15	2.404	10.49	8
5	1425.00	3180.00 See Message on Next Line(s)			
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					

Maximum distance shifted for new estimate of shear surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	306.86	2960.00
2	460.17	2886.71
3	569.02	2884.98
4	949.54	2890.48
5	1421.00	3180.15

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.407
Side Force Inclination - - - - - - - - - - 10.53
Number of Iterations - - - - - - - - - - - 11
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 4 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	304.86	2960.00	2.451	10.08	5
1	308.76	2960.63	2.410	10.53	5
2	459.69	2884.77 See Message on Next Line(s)			
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.65	2888.65	2.608	10.06	5
3	569.02	2882.98	2.429	10.47	6
3	569.02	2886.98	3.358	11.25	8
4	948.94	2892.39	3.325	12.76	5
4	950.14	2888.57	3.029	12.56	6
5	1419.00	3180.23	2.403	10.55	8
5	1423.00	3180.08	2.412	10.51	12

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.70	2960.25
2	460.17	2886.71
3	569.02	2884.02
4	949.59	2890.29
5	1419.00	3180.23

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.398
Side Force Inclination - - - - - - - - - - 10.52
Number of Iterations - - - - - - - - - - - 13
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 5 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 2.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	305.72	2960.00	2.421	10.25	8
1	309.58	2960.92	2.402	10.51	5
2	459.68	2884.77	2.641	9.82	13
2	460.67	2888.65	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
3	569.01	2882.02	3.228	11.03	13
3	569.03	2886.02	2.441	10.57	9
4	948.99	2892.20	3.043	12.55	4
4	950.20	2888.39	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1417.01	3180.31	2.394	10.55	5
5	1421.00	3180.15	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					

Maximum distance shifted for new estimate of shear
surface is 2.000 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.36	2960.49
2	460.17	2886.71
3	569.03	2884.92
4	949.59	2890.29

5 1417.01 3180.31

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.400
Side Force Inclination - - - - - - - - - - 10.57
Number of Iterations - - - - - - - - - - - 5
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 6 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 1.40

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.32	2960.00	2.407	10.40	9
1	309.02	2960.72	2.401	10.51	9
2	459.83	2885.35	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	460.52	2888.07	2.469	10.33	6
3	569.02	2882.62	2.843	10.66	7
3	569.03	2885.42	2.406	10.56	8
4	949.17	2891.63	2.839	12.17	5
4	950.02	2888.96	3.051	12.60	7
5	1417.61	3180.29	2.395	10.55	16
5	1420.40	3180.18	2.401	10.51	5

Maximum distance shifted for new estimate of shear
surface is 1.400 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.05	2960.38
2	460.17	2886.71
3	569.02	2884.70
4	949.55	2890.42
5	1417.61	3180.29

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.400
Side Force Inclination - - - - - - - - - - 10.56
Number of Iterations - - - - - - - - - - - 9
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 7 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .80

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.94	2960.00	2.397	10.53	5
1	308.45	2960.52	2.400	10.52	8
2	459.98	2885.94	2.397	10.53	13
2	460.37	2887.49	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
3	569.02	2883.22	2.394	10.50	11
3	569.02	2884.82	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
4	949.35	2891.06	2.477	10.92	8
4	949.84	2889.53	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1418.20	3180.26	2.397	10.53	8
5	1419.80	3180.20	2.400	10.51	12

Computed shift distances for newly estimated shear surface factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear surface is .800 at point 3

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	306.94	2960.00
2	459.98	2885.94
3	569.02	2883.22
4	949.59	2890.29
5	1418.20	3180.26

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.390
Side Force Inclination - - - - - - - - - - 10.51
Number of Iterations - - - - - - - - - - - 8
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 8 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .80

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.14	2960.00	2.424	10.14	8
1	307.70	2960.25	2.391	10.52	5
2	459.78	2885.16	2.432	10.07	8
2	460.18	2886.71	See Message on Next Line(s)		

FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

3	569.02	2882.42	3.034	10.78	5
3	569.02	2884.02	2.394	10.53	10
4	949.35	2891.06	2.447	10.80	7
4	949.84	2889.53	2.390	10.49	6
5	1417.41	3180.29	2.389	10.53	6
5	1419.00	3180.23	2.392	10.50	6

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .800 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.30	2960.11
2	459.98	2885.94
3	569.02	2883.61
4	949.84	2889.53
5	1417.41	3180.29

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.390
Side Force Inclination - - - - - - - - - - 10.53
Number of Iterations - - - - - - - - - - - 7
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TABLE NO. 23
****
* SEARCH TRIAL NUMBER 9 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .80

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	306.51	2960.00	2.407	10.32	10
1	308.06	2960.38	See Message on Next Line(s)		

FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

2	459.78	2885.16	2.389	10.53	9
2	460.17	2886.71	2.391	10.52	7
3	569.02	2882.81	3.516	11.65	14
3	569.02	2884.41	2.394	10.55	7
4	949.59	2890.29	2.391	10.54	10
4	950.08	2888.77	3.366	12.92	8
5	1416.61	3180.33	2.388	10.54	7
5	1418.20	3180.26	2.392	10.52	6

Computed shift distances for newly estimated shear surface
factored by 1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is .800 at point 5

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.30	2960.11
2	459.78	2885.16
3	569.02	2884.01
4	949.72	2889.91
5	1416.61	3180.33

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to .200 as a result of the above
error and search was continued
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Search for Static Critical Shear Surface Along Liner

TABLE NO. 23
****
* SEARCH TRIAL NUMBER 10 *
****

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = .20

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	307.11	2960.04	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
1	307.49	2960.18	2.391	10.52	6
2	459.93	2885.74	2.390	10.53	6
2	460.03	2886.13	2.390	10.53	5
3	569.02	2883.41	2.389	10.52	15
3	569.02	2883.81	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
4	949.78	2889.72	2.390	10.53	7
4	949.90	2889.34	2.746	11.96	12
5	1417.21	3180.30	2.390	10.53	12
5	1417.61	3180.29	2.391	10.53	15

Maximum distance shifted for new estimate of shear
surface is .200 at point 2

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	307.30	2960.11
2	459.93	2885.74
3	569.02	2883.41
4	949.81	2889.63
5	1417.21	3180.30

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 2.388

Side Force Inclination - - - - - - - - - - 10.52
Number of Iterations - - - - - - - - - - - 7
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Search for Static Critical Shear Surface Along Liner

TABLE NO. 25
****
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER 10 TRIAL POSITIONS) *
****

X	Y
307.30	2960.11
459.93	2885.74
569.02	2883.41
949.81	2889.63
1417.21	3180.30

CAUTION - FACTOR OF SAFETY WAS NOT COMPUTED FOR SOME SHEAR SURFACES NEAR CRITICAL SURFACE - CHECK PREVIOUS OUTPUT

1-Stage Factor of Safety = 2.388

Side Force Inclination = 10.52
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Search for Static Critical Shear Surface Along Liner

TABLE NO. 26
****
* Coordinate, Weight, Strength and Pore Water Pressure *
* Information for Individual Slices for Conventional *
* Computations or First Stage of Multi-Stage Computations. *
* (Information is for the Critical Shear Surface in the *
* Case of an Automatic Search.) *
****

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	307.3	2960.1					
1	308.9	2959.3	269.7	8	600.00	.00	.0
	310.5	2958.5					
2	313.3	2957.2	1700.3	2	.00	15.00	.0
	316.0	2955.9					
3	319.0	2954.4	3670.3	2	.00	15.00	.0
	322.0	2952.9					
4	325.0	2951.5	5601.2	2	.00	15.00	.0
	328.0	2950.0					
5	335.0	2946.6	20801.9	2	.00	15.00	.0
	342.0	2943.2					
6	351.0	2938.8	43206.4	2	.00	15.00	.0
	360.0	2934.4					
7	372.5	2928.3	94699.7	2	.00	15.00	.0
	385.0	2922.3					
8	397.5	2916.2	137968.1	2	.00	15.00	.0
	410.0	2910.1					
9	422.5	2904.0	181235.8	2	.00	15.00	.0
	434.9	2897.9					

10	447.4	2891.8	224503.8	2	.00	15.00	.0
	459.9	2885.7					
11	460.0	2885.7	703.1	2	.00	15.00	.0
	460.0	2885.7					
12	478.2	2885.4	378545.9	2	.00	15.00	.0
	496.3	2885.0					
13	514.5	2884.6	419477.2	2	.00	15.00	.0
	532.7	2884.2					
14	550.8	2883.8	460408.7	2	.00	15.00	.0
	569.0	2883.4					
15	569.0	2883.4	249.6	2	.00	15.00	.0
	569.0	2883.4					
16	586.3	2883.7	474981.2	2	.00	15.00	.0
	603.6	2884.0					
17	620.9	2884.3	508583.6	2	.00	15.00	.0
	638.3	2884.5					
18	655.6	2884.8	542186.2	2	.00	15.00	.0
	672.9	2885.1					
19	690.2	2885.4	575788.8	2	.00	15.00	.0
	707.5	2885.7					
20	724.8	2886.0	609391.4	2	.00	15.00	.0
	742.1	2886.2					

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	742.1	2886.2					
21	759.4	2886.5	642993.8	2	.00	15.00	.0
	776.7	2886.8					
22	794.0	2887.1	676596.7	2	.00	15.00	.0
	811.3	2887.4					
23	828.6	2887.7	710199.6	2	.00	15.00	.0
	846.0	2887.9					
24	863.3	2888.2	743801.7	2	.00	15.00	.0
	880.6	2888.5					
25	897.9	2888.8	777404.7	2	.00	15.00	.0
	915.2	2889.1					
26	932.5	2889.3	811010.9	2	.00	15.00	.0
	949.8	2889.6					
27	949.9	2889.7	4622.2	2	.00	15.00	.0
	950.0	2889.7					
28	951.0	2890.4	48324.1	2	.00	15.00	.0
	952.0	2891.0					
29	965.8	2899.6	640454.7	3	.00	38.00	.0
	979.6	2908.2					
30	993.5	2916.8	604351.2	3	.00	38.00	.0
	1007.3	2925.4					
31	1021.1	2934.0	568249.3	3	.00	38.00	.0
	1034.9	2942.5					
32	1048.7	2951.1	532144.7	3	.00	38.00	.0
	1062.5	2959.7					
33	1076.3	2968.3	496042.9	3	.00	38.00	.0

	1090.1	2976.9					
34	1103.9	2985.5	459939.5	3	.00	38.00	.0
	1117.8	2994.1					
35	1131.6	3002.7	423837.8	3	.00	38.00	.0
	1145.4	3011.3					
36	1159.2	3019.8	387737.8	3	.00	38.00	.0
	1173.0	3028.4					
37	1186.4	3036.8	339618.1	3	.00	38.00	.0
	1199.8	3045.1					
38	1213.3	3053.5	300597.6	3	.00	38.00	.0
	1226.7	3061.8					
39	1240.1	3070.1	261577.1	3	.00	38.00	.0
	1253.5	3078.5					
40	1266.9	3086.8	222556.6	3	.00	38.00	.0
	1280.3	3095.2					

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	1280.3	3095.2					
41	1293.8	3103.5	183536.1	3	.00	38.00	.0
	1307.2	3111.9					
42	1320.6	3120.2	144513.7	3	.00	38.00	.0
	1334.0	3128.6					
43	1343.5	3134.5	78999.4	3	.00	38.00	.0
	1353.1	3140.4					
44	1362.6	3146.4	59282.1	3	.00	38.00	.0
	1372.1	3152.3					
45	1379.7	3157.0	33996.4	4	.00	38.00	.0
	1387.3	3161.7					
46	1394.9	3166.4	23775.1	5	.00	38.00	.0
	1402.4	3171.1					
47	1402.8	3171.4	996.3	6	.00	38.00	.0
	1403.2	3171.6					
48	1410.2	3176.0	12787.8	7	600.00	.00	.0
	1417.2	3180.3					

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TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

FORCES DUE TO SURFACE PRESSURES

Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
1	308.9	0.	2960.0	0.	0.	.0	.0
2	313.3	0.	2959.7	0.	0.	.0	.0
3	319.0	0.	2959.3	0.	0.	.0	.0
4	325.0	0.	2958.9	0.	0.	.0	.0
5	335.0	0.	2958.2	0.	0.	.0	.0
6	351.0	0.	2957.0	0.	0.	.0	.0
7	372.5	0.	2954.7	0.	0.	.0	.0
8	397.5	0.	2952.2	0.	0.	.0	.0
9	422.5	0.	2950.2	0.	0.	.0	.0
10	447.4	0.	2948.3	0.	0.	.0	.0
11	460.0	0.	2947.4	0.	0.	.0	.0
12	478.2	0.	2950.4	0.	0.	.0	.0
13	514.5	0.	2956.4	0.	0.	.0	.0
14	550.8	0.	2962.4	0.	0.	.0	.0
15	569.0	0.	2965.5	0.	0.	.0	.0
16	586.3	0.	2968.7	0.	0.	.0	.0
17	620.9	0.	2975.1	0.	0.	.0	.0
18	655.6	0.	2981.5	0.	0.	.0	.0
19	690.2	0.	2987.9	0.	0.	.0	.0
20	724.8	0.	2994.3	0.	0.	.0	.0
21	759.4	0.	3000.8	0.	0.	.0	.0
22	794.0	0.	3007.2	0.	0.	.0	.0
23	828.6	0.	3013.6	0.	0.	.0	.0
24	863.3	0.	3020.1	0.	0.	.0	.0
25	897.9	0.	3026.5	0.	0.	.0	.0
26	932.5	0.	3032.9	0.	0.	.0	.0
27	949.9	0.	3036.2	0.	0.	.0	.0
28	951.0	0.	3036.5	0.	0.	.0	.0
29	965.8	0.	3041.4	0.	0.	.0	.0
30	993.5	0.	3050.6	0.	0.	.0	.0
31	1021.1	0.	3059.9	0.	0.	.0	.0
32	1048.7	0.	3069.1	0.	0.	.0	.0
33	1076.3	0.	3078.3	0.	0.	.0	.0
34	1103.9	0.	3087.6	0.	0.	.0	.0
35	1131.6	0.	3096.8	0.	0.	.0	.0
36	1159.2	0.	3106.1	0.	0.	.0	.0
37	1186.4	0.	3114.7	0.	0.	.0	.0
38	1213.3	0.	3122.6	0.	0.	.0	.0
39	1240.1	0.	3130.6	0.	0.	.0	.0

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Search for Static Critical Shear Surface Along Liner

TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

FORCES DUE TO SURFACE PRESSURES

Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
40	1266.9	0.	3138.6	0.	0.	.0	.0
41	1293.8	0.	3146.6	0.	0.	.0	.0

42	1320.6	0.	3154.8	0.	0.	.0	.0
43	1343.5	0.	3162.0	0.	0.	.0	.0
44	1362.6	0.	3168.4	0.	0.	.0	.0
45	1379.7	0.	3174.1	0.	0.	.0	.0
46	1394.9	0.	3178.7	0.	0.	.0	.0
47	1402.8	0.	3181.1	0.	0.	.0	.0
48	1410.2	0.	3183.3	0.	0.	.0	.0

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TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Iter-ation	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.5155E+06	-.1283E+10		
First-order corrections to F and THETA					-.714E+00	-.207E+01
Values factored by .700E+00 - Deltas too large					-.500E+00	-.145E+01
2	2.50000	13.5512	.8129E+05	-.1753E+09		
First-order corrections to F and THETA					-.110E+00	-.253E+01
Second-order correction - Iteration 1					-.106E+00	-.253E+01
Second-order correction - Iteration 2					-.106E+00	-.253E+01
3	2.39446	11.0261	-.1720E+03	.6933E+07		
First-order corrections to F and THETA					-.606E-02	-.499E+00
Second-order correction - Iteration 1					-.602E-02	-.499E+00
Second-order correction - Iteration 2					-.602E-02	-.499E+00
4	2.38845	10.5268	.9438E+00	.2184E+05		
First-order corrections to F and THETA					-.241E-04	-.190E-02
Second-order correction - Iteration 1					-.241E-04	-.190E-02
5	2.38842	10.5249	-.2546E+00	-.1259E+03		
First-order corrections to F and THETA					.998E-06	.638E-04
Second-order correction - Iteration 1					.998E-06	.639E-04
6	2.38842	10.5250	-.1497E+00	.7182E+03		
First-order corrections to F and THETA					-.169E-06	-.241E-04
Second-order correction - Iteration 1					-.168E-06	-.241E-04
7	2.38842	10.5250	-.1047E+00	.2504E+02		
First-order corrections to F and THETA					.337E-06	.203E-04

Factor of Safety - - - - - - - - 2.388
Side Force Inclination - - - - - 10.52
Number of Iterations - - - - - - 7

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Antelope Valley Landfill - Long Section
Search for Static Critical Shear Surface Along Liner

TABLE NO. 38

```
*****************************************************************
*  Final Results for Stresses Along the Shear Surface           *
```

* (Results for Critical Shear Surface in Case of a Search.) *
****

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.388 Side Force Inclination = 10.52 Degrees

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	308.9	2959.3	277.6	277.6	251.2
2	313.3	2957.2	373.3	373.3	41.9
3	319.0	2954.4	733.5	733.5	82.3
4	325.0	2951.5	1119.4	1119.4	125.6
5	335.0	2946.6	1781.7	1781.7	199.9
6	351.0	2938.8	2878.2	2878.2	322.9
7	372.5	2928.3	4545.4	4545.4	509.9
8	397.5	2916.2	6622.2	6622.2	742.9
9	422.5	2904.0	8698.9	8698.9	975.9
10	447.4	2891.8	10775.7	10775.7	1208.9
11	460.0	2885.7	10127.0	10127.0	1136.1
12	478.2	2885.4	10710.0	10710.0	1201.5
13	514.5	2884.6	11868.0	11868.0	1331.4
14	550.8	2883.8	13026.1	13026.1	1461.4
15	569.0	2883.4	13624.4	13624.4	1528.5
16	586.3	2883.7	13943.8	13943.8	1564.3
17	620.9	2884.3	14930.3	14930.3	1675.0
18	655.6	2884.8	15916.7	15916.7	1785.6
19	690.2	2885.4	16903.2	16903.2	1896.3
20	724.8	2886.0	17889.7	17889.7	2007.0
21	759.4	2886.5	18876.1	18876.1	2117.6
22	794.0	2887.1	19862.6	19862.6	2228.3
23	828.6	2887.7	20849.1	20849.1	2339.0
24	863.3	2888.2	21835.5	21835.5	2449.7
25	897.9	2888.8	22822.0	22822.0	2560.3
26	932.5	2889.3	23808.7	23808.7	2671.0
27	949.9	2889.7	20537.7	20537.7	2304.0
28	951.0	2890.4	20503.3	20503.3	2300.2
29	965.8	2899.6	18428.3	18428.3	6028.1
30	993.5	2916.8	17389.4	17389.4	5688.3
31	1021.1	2934.0	16350.6	16350.6	5348.5
32	1048.7	2951.1	15311.8	15311.8	5008.7
33	1076.3	2968.3	14273.0	14273.0	4668.9
34	1103.9	2985.5	13234.2	13234.2	4329.1
35	1131.6	3002.7	12195.4	12195.4	3989.3
36	1159.2	3019.8	11156.5	11156.5	3649.4
37	1186.4	3036.8	10059.3	10059.3	3290.5
38	1213.3	3053.5	8903.5	8903.5	2912.5
39	1240.1	3070.1	7747.8	7747.8	2534.4

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	1266.9	3086.8	6592.0	6592.0	2156.3
41	1293.8	3103.5	5436.2	5436.2	1778.3
42	1320.6	3120.2	4280.4	4280.4	1400.2
43	1343.5	3134.5	3291.8	3291.8	1076.8
44	1362.6	3146.4	2470.2	2470.2	808.0
45	1379.7	3157.0	1785.1	1785.1	583.9
46	1394.9	3166.4	1248.4	1248.4	408.4
47	1402.8	3171.4	972.2	972.2	318.0

48	1410.2	3176.0	722.4	722.4	251.2

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .27  (=  .271E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .57  (=  .575E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -404.06  (= -.404E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .12  (=  .115E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE
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Search for Static Critical Shear Surface Along Liner
```

TABLE NO. 39

```
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 2.388 Side Force Inclination = 10.52 Degrees

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	310.5	1272.	2959.6	.398	178.3	736.4
2	316.0	2515.	2959.2	.452	238.6	434.3
3	322.0	5198.	2957.5	.371	91.8	731.2
4	328.0	9293.	2955.7	.327	-19.2	1064.1
5	342.0	24501.	2951.9	.296	-185.6	1828.9
6	360.0	56088.	2946.9	.281	-392.5	2869.5
7	385.0	125321.	2940.0	.271	-706.8	4461.3
8	410.0	226186.	2933.0	.264	-1065.7	6193.0
9	434.9	358684.	2926.1	.261	-1418.5	7958.0
10	459.9	522811.	2919.2	.260	-1761.3	9733.0
11	460.0	522909.	2919.2	.260	-1761.0	9732.5
12	496.3	575752.	2922.6	.263	-1663.7	9594.1
13	532.7	634309.	2925.5	.264	-1659.6	9627.9
14	569.0	698584.	2928.1	.262	-1716.3	9782.4
15	569.0	698620.	2928.1	.262	-1716.4	9782.5
16	603.6	745686.	2931.5	.261	-1745.0	9795.9
17	638.3	796082.	2934.8	.259	-1801.2	9872.5
18	672.9	849808.	2937.8	.256	-1877.9	9999.1
19	707.5	906863.	2940.8	.253	-1970.2	10165.9
20	742.1	967248.	2943.6	.250	-2074.2	10365.3
21	776.7	1030963.	2946.3	.247	-2187.4	10591.7
22	811.3	1098008.	2948.9	.243	-2307.7	10840.5
23	846.0	1168382.	2951.5	.240	-2433.5	11108.0
24	880.6	1242086.	2953.9	.237	-2563.7	11391.5
25	915.2	1319120.	2956.4	.233	-2697.3	11688.6
26	949.8	1399514.	2958.8	.230	-2833.7	11997.6
27	950.0	1397458.	2958.9	.230	-2827.4	11979.3
28	952.0	1375942.	2960.4	.232	-2752.9	11799.1
29	979.6	1223323.	2973.4	.230	-2625.7	11121.3
30	1007.3	1079308.	2986.4	.229	-2497.4	10439.9
31	1034.9	943895.	2999.5	.227	-2367.3	9754.0

32	1062.5	817086.	3012.5	.224	-2234.9	9062.3
33	1090.1	698879.	3025.5	.222	-2099.0	8363.0
34	1117.8	589276.	3038.6	.219	-1958.0	7653.4
35	1145.4	488276.	3051.7	.216	-1809.5	6929.9
36	1173.0	395875.	3064.8	.212	-1649.6	6186.7
37	1199.8	314946.	3077.7	.212	-1470.9	5496.4
38	1226.7	243314.	3090.5	.211	-1291.6	4806.6
39	1253.5	180981.	3103.4	.210	-1111.8	4117.8
40	1280.3	127946.	3116.2	.209	-931.6	3431.0

1

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	1307.2	84210.	3129.1	.208	-751.7	2748.4
42	1334.0	49771.	3142.0	.206	-574.7	2075.7
43	1353.1	30945.	3151.1	.204	-449.4	1606.1
44	1372.1	16818.	3160.2	.198	-335.8	1162.6
45	1387.3	8717.	3167.3	.187	-251.0	822.4
46	1402.4	3051.	3174.4	.164	-152.1	452.1
47	1403.2	2814.	3174.8	.164	-144.3	428.6
48	1417.2	0.	5662.8	ABOVE	23.5	-23.5

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .27  (=  .271E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .57  (=  .575E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =      -404.06  (= -.404E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .12  (=  .115E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

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TABLE NO. 1

```
****************************************
* COMPUTER PROGRAM DESIGNATION - UTEXAS3 *
* Originally Coded By Stephen G. Wright  *
* Version No. 1.209                      *
* Last Revision Date  2/28/98            *
* (C) Copyright 1985-1998 S. G. Wright   *
* All Rights Reserved                    *
****************************************
```

```
*************************************************************
*                                                           *
*      RESULTS OF COMPUTATIONS PERFORMED USING THIS COMPUTER *
* PROGRAM SHOULD NOT BE USED FOR DESIGN PURPOSES UNLESS THEY *
* HAVE BEEN VERIFIED BY INDEPENDENT ANALYSES, EXPERIMENTAL   *
* DATA OR FIELD EXPERIENCE. THE USER SHOULD UNDERSTAND THE   *
* ALGORITHMS AND ANALYTICAL PROCEDURES USED IN THE COMPUTER  *
* PROGRAM AND MUST HAVE READ ALL DOCUMENTATION FOR THIS      *
* PROGRAM BEFORE ATTEMPTING ITS USE.                         *
*                                                           *
*      NEITHER SHINOAK SOFTWARE NOR STEPHEN G. WRIGHT        *
* MAKE OR ASSUME LIABILITY FOR ANY WARRANTIES, EXPRESSED OR  *
* IMPLIED, CONCERNING THE ACCURACY, RELIABILITY, USEFULNESS  *
* OR ADAPTABILITY OF THIS COMPUTER PROGRAM.                  *
*                                                           *
*************************************************************
```

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Antelope Valley Landfill - Long Section
Search for Yield Acceleration - Along Liner

TABLE NO. 2

```
*************************
* NEW PROFILE LINE DATA *
*************************
```

PROFILE LINE 1 - MATERIAL TYPE = 1
Bedrock

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	460.000	2885.000
6	569.000	2883.000
7	1334.000	2896.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

PROFILE LINE 2 - MATERIAL TYPE = 2
Liner

Point	X	Y
1	307.000	2960.000
2	307.000	2963.000

3	460.000	2888.000
4	569.000	2886.000
5	1334.000	2896.000
6	1728.000	3097.000
7	1731.000	3097.000

PROFILE LINE 3 - MATERIAL TYPE = 3
Refuse 1

Point	X	Y
1	360.000	2937.020
2	950.000	3150.000
3	1173.000	3160.000
4	1431.000	3150.000
5	1685.000	3075.060

PROFILE LINE 4 - MATERIAL TYPE = 4
Refuse 2

Point	X	Y
1	342.000	2945.840
2	950.000	3160.000
3	1173.000	3170.000
4	1431.000	3160.000
5	1695.000	3080.160

PROFILE LINE 5 - MATERIAL TYPE = 5
Refuse 3

Point	X	Y
1	328.000	2952.710
2	950.000	3170.000
3	1173.000	3180.000
4	1431.000	3170.000
5	1705.000	3085.270

PROFILE LINE 6 - MATERIAL TYPE = 6
Refuse 4

Point	X	Y
1	322.000	2955.650
2	950.000	3175.000
3	1173.000	3185.000
4	1431.000	3170.000
5	1710.000	3087.820

PROFILE LINE 7 - MATERIAL TYPE = 7
Refuse 5

Point	X	Y
1	316.000	2958.590
2	950.000	3180.000
3	1173.000	3190.000
4	1431.000	3180.000
5	1715.000	3090.370

PROFILE LINE 8 - MATERIAL TYPE = 8
Refuse 6

Point	X	Y
1	307.000	2960.000

```
        2        950.000       3190.000
        3       1173.000       3200.000
        4       1431.000       3190.000
        5       1731.000       3097.000

 All new profile lines defined - No old lines retained
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 Antelope Valley Landfill - Long Section
 Search for Yield Acceleration - Along Liner


 TABLE NO.  3
 ***********************************************************************
 * NEW MATERIAL PROPERTY DATA - CONVENTIONAL/FIRST-STAGE COMPUTATIONS *
 ***********************************************************************

 DATA FOR MATERIAL TYPE  1
 Bedrock

      Unit weight of material =  130.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -     500.000
      Friction angle - - - - -  39.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  2
 Liner

      Unit weight of material =   62.400

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -        .000
      Friction angle - - - - -  15.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  3
 Refuse 1

      Unit weight of material =   82.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -        .000
      Friction angle - - - - -  38.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  4
 Refuse 2

      Unit weight of material =   69.000

      CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
      Cohesion - - - - - - - -        .000
      Friction angle - - - - -  38.000 degrees

      No (or zero) pore water pressures

 DATA FOR MATERIAL TYPE  5
 Refuse 3

      Unit weight of material =   66.000
```

```
     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  6
Refuse 4

     Unit weight of material =   64.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -          .000
     Friction angle - - - - -  38.000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  7
Refuse 5

     Unit weight of material =   63.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     600.000
     Friction angle - - - - -    .000 degrees

     No (or zero) pore water pressures

DATA FOR MATERIAL TYPE  8
Refuse 6

     Unit weight of material =   61.000

     CONVENTIONAL (ISOTROPIC) SHEAR STRENGTHS
     Cohesion - - - - - - - -     600.000
     Friction angle - - - - -    .000 degrees

     No (or zero) pore water pressures

All new material properties defined - No old data retained
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TABLE NO. 15
*********************************
* NEW ANALYSIS/COMPUTATION DATA *
*********************************

Noncircular Shear Surface(s)

Automatic Search Performed


Coordinates of points on shear surface which are to be shifted -

Point          X              Y      Shift Angle

   1        308.000        2960.000   angle to be computed - moveable
   2        460.000        2886.000   angle to be computed - moveable
   3        569.000        2884.000   angle to be computed - moveable
   4        950.000        2889.000   angle to be computed - moveable
   5       1425.000        3180.000   angle to be computed - moveable
```

Initial distance for shifting points on shear surface = 8.000
Maximum steepness permitted for toe of shear surface = 50.00 degrees

Seismic coefficient = .235

THE FOLLOWING REPRESENT EITHER DEFAULT OR PREVIOUSLY DEFINED VALUES:

Initial trial estimate for the factor of safety = 3.000

Initial trial estimate for side force inclination = 15.000 degrees
(Applicable to Spencer's procedure only)

Maximum number of iterations allowed for
calculating the factor of safety = 40

Allowed force imbalance for convergence = 100.000

Allowed moment imbalance for convergence = 100.000

Initial trial values for factor of safety (and side force inclination
for Spencer's procedure) will be kept constant during search

Number of increments for slice subdivision = 30

Depth of water in crack = .000

Unit weight of water in crack = 62.400

Conventional (single-stage) computations to be performed

Procedure used to compute the factor of safety: SPENCER
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Search for Yield Acceleration - Along Liner

TABLE NO. 16
****
* NEW SLOPE GEOMETRY DATA *
****

NOTE - NO DATA WERE INPUT, SLOPE GEOMETRY DATA
WERE GENERATED BY THE PROGRAM

Slope Coordinates -

Point	X	Y
1	.000	2878.000
2	110.000	2884.000
3	257.000	2960.000
4	307.000	2960.000
5	950.000	3190.000
6	1173.000	3200.000
7	1431.000	3190.000
8	1731.000	3097.000
9	1756.000	3097.000
10	1830.000	3170.000
11	1960.000	3198.000

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Search for Yield Acceleration - Along Liner

TABLE NO. 22

```
*****************************************
* INITIAL COMPUTED INFORMATION FOR SEARCH *
* WITH NONCIRCULAR SHEAR SURFACE          *
*****************************************
```

CAUTION - INITIAL TRIAL SHEAR SURFACE IS BELOW SLOPE NEAR
THE TOE OF THE SLOPE A DISTANCE = .36
SOLUTION WILL BE ERRONEOUS IF THIS DISTANCE IS
VERY LARGE

Crack depth computed to be - - - 10.23

FOR INITIAL TRIAL NONCIRCULAR SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - - - 1.508
Side Force Inclination - - - - - - - - - - 37.35
Number of Iterations - - - - - - - - - - - 14

TABLE NO. 23

```
****************************
* SEARCH TRIAL NUMBER    1 *
****************************
```

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES = 8.00

Point	X	Y	1-Stage Factor of Safety	Side Force Inclination	Iterations
1	300.00	2960.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
1	315.53	2962.69	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
2	458.04	2878.24	1.862	22.17	17
2	461.96	2893.76	1.709	25.70	10
3	568.98	2876.00	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
3	569.02	2892.00	1.772	29.19	9
4	947.61	2896.64	1.694	34.93	13
4	952.39	2881.36	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1417.01	3180.31	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					
5	1432.96	3179.16	See Message on Next Line(s)		
FATAL ERROR IN CALCULATING FACTOR OF SAFETY					
SOLUTION DID NOT CONVERGE WITHIN 40 ITERATIONS					

Maximum distance shifted for new estimate of shear
surface is 1.101 at point 2

Coordinates For New Estimate of Shear Surface

Point	X	Y
1	308.00	2960.00
2	460.27	2887.07
3	569.00	2884.00
4	950.00	2889.00
5	1425.00	3180.00

```
FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   1.508
Side Force Inclination - - - - - - - - -    37.58
Number of Iterations - - - - - - - - - - - 10
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    2 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    8.00

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       300.00    2960.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   1       315.53    2962.69 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       458.30    2879.31 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       462.24    2894.82 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       568.94    2876.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.06    2892.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       947.61    2896.64   1.694      35.08          10
   4       952.39    2881.36 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1417.01    3180.31 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1432.96    3179.16 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Maximum distance shifted for new estimate of shear
surface is       .000 at point   1

Coordinates For New Estimate of Shear Surface

     Point        X           Y

       1       308.00      2960.00
       2       460.27      2887.07
       3       569.00      2884.00
       4       950.00      2889.00
       5      1425.00      3180.00

FOR NEW ESTIMATE OF SHEAR SURFACE
```

```
1-Stage Factor of Safety - - - - - - - - -   1.508
Side Force Inclination - - - - - - - - - -    37.58
Number of Iterations - - - - - - - - - - -  10
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    3 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    5.60

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       302.40    2960.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   1       313.27    2961.89   1.606      26.72          12
   2       458.89    2881.64 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       461.65    2892.50   1.706      25.76          13
   3       568.96    2878.40   2.000      30.04           7
   3       569.04    2889.60   1.700      28.72           8
   4       948.33    2894.34   1.651      35.98          10
   4       951.67    2883.66 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1419.40    3180.22   1.508      37.60          11
   5      1430.60    3179.78 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Maximum distance shifted for new estimate of shear
surface is     5.600 at point   5

Coordinates For New Estimate of Shear Surface

     Point       X           Y

       1      308.00     2960.00
       2      460.27     2887.07
       3      569.01     2885.23
       4      950.00     2889.00
       5     1419.40     3180.22

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to    3.200 as a result of the above
error and search was continued
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```

```
TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    4 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    3.20

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations

   1       304.80    2960.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   1       311.01    2961.08   1.510      36.99          13
   2       459.48    2883.97   1.768      23.75          11
   2       461.06    2890.17   1.686      26.42           8
   3       568.98    2880.80   1.984      30.74           7
   3       569.02    2887.20   1.520      29.53          15
   4       949.04    2892.05 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       950.96    2885.95   1.858      34.75          12
   5      1421.80    3180.12 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1428.20    3179.88   1.508      37.57          16

Maximum distance shifted for new estimate of shear
surface is     1.523 at point   3

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      308.00     2960.00
        2      460.34     2887.36
        3      569.01     2885.52
        4      950.00     2889.00
        5     1425.00     3180.00

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   1.327
Side Force Inclination - - - - - - - - -    36.85
Number of Iterations - - - - - - - - - -  16
1       UTEXAS3 - VER. 1.209 -  2/28/98 - (C) 1985-2000 S. G. WRIGHT
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    5 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    3.20

                                1-Stage
                                Factor
                                  of     Side Force
Point        X          Y      Safety   Inclination   Iterations
```

```
   1       304.80    2960.00 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   1       311.01    2961.08   1.329      36.44          13
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   1 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     5      5
   2       459.58    2884.25 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       461.11    2890.47 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.00    2882.32 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.02    2888.72 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       949.05    2892.06 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       950.95    2885.94 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1421.80    3180.12   1.326      36.84          12
   5      1428.20    3179.88   1.328      36.86          12

Computed shift distances for newly estimated shear surface
factored by  1.000 to prevent over-shift

Maximum distance shifted for new estimate of shear
surface is     3.200 at point   5

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      308.00     2960.00
        2      460.34     2887.36
        3      569.01     2885.52
        4      950.00     2889.00
        5     1421.80     3180.12

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   1.326
Side Force Inclination - - - - - - - - -    36.84
Number of Iterations - - - - - - - - - -  12
1       UTEXAS3 - VER. 1.209 -  2/28/98 - (C) 1985-2000 S. G. WRIGHT
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TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    6 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =    3.20

                                  1-Stage
                                  Factor
                                    of     Side Force
Point        X          Y        Safety   Inclination   Iterations
```

```
   1       304.80    2960.00   1.356      29.20          11
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   7 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -     1      7
   1       311.01    2961.08 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       459.58    2884.25 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       461.11    2890.47 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.00    2882.32   1.955      31.78          10
   3       569.02    2888.72   1.659      28.57          11
   4       949.04    2892.05   1.710      35.60          16
   4       950.96    2885.95 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1418.60    3180.25 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1425.00    3180.00   1.327      36.85          16

Maximum distance shifted for new estimate of shear
surface is      .493 at point   3

Coordinates For New Estimate of Shear Surface

     Point        X           Y

        1      308.00      2960.00
        2      460.34      2887.36
        3      569.01      2886.02
        4      950.00      2889.00
        5     1421.80      3180.12

ERROR FOR NEW ESTIMATE OF SHEAR SURFACE
ERROR IN COMPUTING FACTOR OF SAFETY
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS

Incremental shift distance used to compute derivatives
was reduced to      .800 as a result of the above
error and search was continued
1       UTEXAS3 - VER. 1.209 -  2/28/98 - (C) 1985-2000 S. G. WRIGHT
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Search for Yield Acceleration - Along Liner


TABLE NO. 23
****************************
* SEARCH TRIAL NUMBER    7 *
****************************

INCREMENTAL SHIFT DISTANCE USED TO COMPUTE DERIVATIVES =      .80

                                 1-Stage
                                 Factor
                                   of     Side Force
Point        X          Y       Safety   Inclination   Iterations

   1       307.25    2959.73 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
```

```
   1       308.75    2960.27 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       460.15    2886.58 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   2       460.54    2888.14   1.439      28.90          11
The following applies to the above point -
DENOMINATOR IN EQUATIONS FOR F WAS SMALL FOR   2 SLICES
FIRST AND LAST SLICES WHERE DENOMINATOR WAS LOW -    10    11
   3       569.01    2884.72 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   3       569.01    2886.32 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   4       949.76    2889.76   1.071      33.01          13
   4       950.24    2888.24 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1421.00    3180.16 See Message on Next Line(s)
FATAL ERROR IN CALCULATING FACTOR OF SAFETY
SOLUTION DID NOT CONVERGE WITHIN  40 ITERATIONS
   5      1422.60    3180.09   1.326      36.84          10

Maximum distance shifted for new estimate of shear
surface is      .800 at point   4

Coordinates For New Estimate of Shear Surface

     Point       X           Y

        1      308.00     2960.00
        2      460.34     2887.36
        3      569.01     2885.52
        4      949.76     2889.76
        5     1421.80     3180.12

FOR NEW ESTIMATE OF SHEAR SURFACE
1-Stage Factor of Safety - - - - - - - -   1.071
Side Force Inclination - - - - - - - - -    33.01
Number of Iterations - - - - - - - - - -  13
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TABLE NO. 25
*****************************************************************
* FINAL CRITICAL SHEAR SURFACE (FOUND AFTER   7 TRIAL POSITIONS) *
*****************************************************************

      X          Y

    308.00    2960.00
    460.34    2887.36
    569.01    2885.52
    949.76    2889.76
   1421.80    3180.12

CAUTION - FACTOR OF SAFETY WAS NOT COMPUTED FOR SOME SHEAR
SURFACES NEAR CRITICAL SURFACE - CHECK PREVIOUS OUTPUT

1-Stage Factor of Safety =   1.071
```

Side Force Inclination = 33.01

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TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	308.0	2960.0					
1	309.3	2959.4	219.4	8	600.00	.00	.0
	310.5	2958.8					
2	313.3	2957.5	1602.7	2	.00	15.00	.0
	316.0	2956.2					
3	319.0	2954.8	3540.8	2	.00	15.00	.0
	322.0	2953.3					
4	325.0	2951.9	5448.2	2	.00	15.00	.0
	328.0	2950.5					
5	335.0	2947.1	20354.0	2	.00	15.00	.0
	342.0	2943.8					
6	351.0	2939.5	42443.2	2	.00	15.00	.0
	360.0	2935.2					
7	376.7	2927.3	134035.9	2	.00	15.00	.0
	393.3	2919.3					
8	410.0	2911.4	210343.8	2	.00	15.00	.0
	426.7	2903.4					
9	443.3	2895.5	286651.0	2	.00	15.00	.0
	460.0	2887.5					
10	460.2	2887.4	3352.2	2	.00	15.00	.0
	460.3	2887.4					
11	478.5	2887.1	373816.1	2	.00	15.00	.0
	496.6	2886.7					
12	514.7	2886.4	414127.5	2	.00	15.00	.0
	532.8	2886.1					
13	550.9	2885.8	454437.7	2	.00	15.00	.0
	569.0	2885.5					
14	569.0	2885.5	150.4	2	.00	15.00	.0
	569.0	2885.5					
15	586.3	2885.7	470563.1	2	.00	15.00	.0
	603.6	2885.9					
16	620.9	2886.1	504547.0	2	.00	15.00	.0
	638.2	2886.3					
17	655.5	2886.5	538529.6	2	.00	15.00	.0
	672.9	2886.7					
18	690.2	2886.9	572513.8	2	.00	15.00	.0
	707.5	2887.1					
19	724.8	2887.3	606496.4	2	.00	15.00	.0
	742.1	2887.5					
20	759.4	2887.6	640480.4	2	.00	15.00	.0
	776.7	2887.8					

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Search for Yield Acceleration - Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	776.7	2887.8					
21	794.0	2888.0	674462.9	2	.00	15.00	.0
	811.3	2888.2					
22	828.6	2888.4	708447.2	2	.00	15.00	.0
	845.9	2888.6					
23	863.2	2888.8	742429.6	2	.00	15.00	.0
	880.5	2889.0					
24	897.8	2889.2	776413.8	2	.00	15.00	.0
	915.1	2889.4					
25	932.5	2889.6	810398.9	2	.00	15.00	.0
	949.8	2889.8					
26	949.9	2889.8	5713.0	2	.00	15.00	.0
	950.0	2889.9					
27	950.9	2890.5	42421.4	2	.00	15.00	.0
	951.8	2891.0					
28	967.6	2900.7	730045.3	3	.00	38.00	.0
	983.4	2910.4					
29	999.2	2920.2	683341.3	3	.00	38.00	.0
	1015.0	2929.9					
30	1030.8	2939.6	636634.1	3	.00	38.00	.0
	1046.6	2949.3					
31	1062.4	2959.0	589931.3	3	.00	38.00	.0
	1078.2	2968.8					
32	1094.0	2978.5	543226.1	3	.00	38.00	.0
	1109.8	2988.2					
33	1125.6	2997.9	496522.1	3	.00	38.00	.0
	1141.4	3007.6					
34	1157.2	3017.4	449816.8	3	.00	38.00	.0
	1173.0	3027.1					
35	1186.4	3035.3	342787.5	3	.00	38.00	.0
	1199.8	3043.6					
36	1213.3	3051.8	304167.8	3	.00	38.00	.0
	1226.7	3060.1					
37	1240.1	3068.3	265546.9	3	.00	38.00	.0
	1253.5	3076.6					
38	1266.9	3084.9	226927.2	3	.00	38.00	.0
	1280.3	3093.1					
39	1293.8	3101.4	188306.3	3	.00	38.00	.0
	1307.2	3109.6					
40	1320.6	3117.9	149685.2	3	.00	38.00	.0
	1334.0	3126.1					

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Search for Yield Acceleration - Along Liner

TABLE NO. 26

```
*************************************************************
*  Coordinate, Weight, Strength and Pore Water Pressure     *
*  Information for Individual Slices for Conventional       *
*  Computations or First Stage of Multi-Stage Computations. *
```

```
*  (Information is for the Critical Shear Surface in the      *
*  Case of an Automatic Search.)                              *
*************************************************************
```

Slice No.	X	Y	Slice Weight	Matl. Type	Cohesion	Friction Angle	Pore Pressure
	1334.0	3126.1					
41	1344.6	3132.6	90724.3	3	.00	38.00	.0
	1355.1	3139.1					
42	1365.7	3145.6	66755.9	3	.00	38.00	.0
	1376.3	3152.1					
43	1383.9	3156.8	34347.5	4	.00	38.00	.0
	1391.6	3161.5					
44	1399.2	3166.2	24020.1	5	.00	38.00	.0
	1406.9	3170.9					
45	1407.2	3171.1	851.7	6	.00	38.00	.0
	1407.6	3171.4					
46	1414.7	3175.7	13075.5	7	600.00	.00	.0
	1421.8	3180.1					

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TABLE NO. 27

```
*************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional Computations or the   *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
*************************************************************
```

Slice No.	X	Seismic Force	Y for Seismic Force	FORCES DUE TO SURFACE PRESSURES Normal Force	Shear Force	X	Y
1	309.3	52.	2960.1	0.	0.	.0	.0
2	313.3	377.	2959.9	0.	0.	.0	.0
3	319.0	832.	2959.5	0.	0.	.0	.0
4	325.0	1280.	2959.1	0.	0.	.0	.0
5	335.0	4783.	2958.4	0.	0.	.0	.0
6	351.0	9974.	2957.3	0.	0.	.0	.0
7	376.7	31498.	2954.6	0.	0.	.0	.0
8	410.0	49431.	2951.7	0.	0.	.0	.0
9	443.3	67363.	2949.2	0.	0.	.0	.0
10	460.2	788.	2948.1	0.	0.	.0	.0
11	478.5	87847.	2951.1	0.	0.	.0	.0
12	514.7	97320.	2957.2	0.	0.	.0	.0
13	550.9	106793.	2963.2	0.	0.	.0	.0
14	569.0	35.	2966.3	0.	0.	.0	.0
15	586.3	110582.	2969.5	0.	0.	.0	.0
16	620.9	118569.	2975.8	0.	0.	.0	.0
17	655.5	126554.	2982.1	0.	0.	.0	.0
18	690.2	134541.	2988.5	0.	0.	.0	.0
19	724.8	142527.	2994.8	0.	0.	.0	.0
20	759.4	150513.	3001.2	0.	0.	.0	.0
21	794.0	158499.	3007.6	0.	0.	.0	.0
22	828.6	166485.	3013.9	0.	0.	.0	.0
23	863.2	174471.	3020.3	0.	0.	.0	.0
24	897.8	182457.	3026.7	0.	0.	.0	.0
25	932.5	190444.	3033.0	0.	0.	.0	.0
26	949.9	1343.	3036.3	0.	0.	.0	.0

27	950.9	9969.	3036.5	0.	0.	.0	.0
28	967.6	171561.	3042.0	0.	0.	.0	.0
29	999.2	160585.	3052.4	0.	0.	.0	.0
30	1030.8	149609.	3062.9	0.	0.	.0	.0
31	1062.4	138634.	3073.4	0.	0.	.0	.0
32	1094.0	127658.	3083.8	0.	0.	.0	.0
33	1125.6	116683.	3094.3	0.	0.	.0	.0
34	1157.2	105707.	3104.8	0.	0.	.0	.0
35	1186.4	80555.	3114.0	0.	0.	.0	.0
36	1213.3	71479.	3121.8	0.	0.	.0	.0
37	1240.1	62404.	3129.6	0.	0.	.0	.0
38	1266.9	53328.	3137.5	0.	0.	.0	.0
39	1293.8	44252.	3145.5	0.	0.	.0	.0

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Search for Yield Acceleration - Along Liner

TABLE NO. 27

```
************************************************************
*  Seismic Forces and Forces Due to Surface Pressures for   *
*  Individual Slices for Conventional  Computations or the  *
*  First Stage of Multi-Stage Computations.                 *
*  (Information is for the Critical Shear Surface in the    *
*  Case of an Automatic Search.)                            *
************************************************************
```

				FORCES DUE TO SURFACE PRESSURES			
Slice No.	X	Seismic Force	Y for Seismic Force	Normal Force	Shear Force	X	Y
40	1320.6	35176.	3153.6	0.	0.	.0	.0
41	1344.6	21320.	3161.0	0.	0.	.0	.0
42	1365.7	15688.	3167.9	0.	0.	.0	.0
43	1383.9	8072.	3173.9	0.	0.	.0	.0
44	1399.2	5645.	3178.5	0.	0.	.0	.0
45	1407.2	200.	3181.0	0.	0.	.0	.0
46	1414.7	3073.	3183.1	0.	0.	.0	.0

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Search for Yield Acceleration - Along Liner

TABLE NO. 29

```
*******************************************************************
*  Information Generated During Iterative Solution for the Factor  *
*  of Safety and Side Force Inclination by Spencer's Procedure     *
*******************************************************************
```

Iter-ation	Trial Factor of Safety	Trial Side Force Inclination (degrees)	Force Imbalance (lbs.)	Moment Imbalance (ft.-lbs.)	Delta-F	Delta Theta (degrees)
1	3.00000	15.0000	.4080E+07	-.1093E+11		
First-order corrections to F and THETA					-.567E+01	.235E+01
Values factored by .883E-01 - Deltas too large					-.500E+00	.208E+00
2	2.50000	15.2075	.3651E+07	-.9785E+10		
First-order corrections to F and THETA					-.357E+01	.257E+01
Values factored by .140E+00 - Deltas too large					-.500E+00	.360E+00

```
   3   2.00000    15.5675   .3016E+07  -.8101E+10
First-order corrections to F and THETA .........  -.192E+01  .298E+01
Values factored by  .260E+00 - Deltas too large   -.500E+00  .776E+00

   4   1.50000    16.3439   .1978E+07  -.5360E+10
First-order corrections to F and THETA .........  -.722E+00  .409E+01
Values factored by  .693E+00 - Deltas too large   -.500E+00  .283E+01

   5   1.00000    19.1746  -.9737E+05  -.4697E+07
First-order corrections to F and THETA .........   .858E-01  .273E+02
Values factored by  .315E+00 - Deltas too large    .270E-01  .859E+01

   6   1.02699    27.7690  -.1095E+06   .1227E+09
First-order corrections to F and THETA .........   .513E-01  .793E+01
Second-order correction - Iteration   1 ........   .601E-01  .793E+01
Second-order correction - Iteration   2 ........   .602E-01  .793E+01
Second-order correction - Iteration   3 ........   .602E-01  .793E+01

   7   1.08721    35.7033  -.3409E+05   .1461E+09
First-order corrections to F and THETA .........  -.174E-01 -.250E+01
Second-order correction - Iteration   1 ........  -.140E-01 -.250E+01
Second-order correction - Iteration   2 ........  -.140E-01 -.250E+01

   8   1.07318    33.2030   .3653E+04  -.2143E+07
First-order corrections to F and THETA .........  -.179E-02 -.187E+00
Second-order correction - Iteration   1 ........  -.178E-02 -.187E+00
Second-order correction - Iteration   2 ........  -.178E-02 -.187E+00

   9   1.07139    33.0161   .1165E+01   .6044E+05
First-order corrections to F and THETA .........  -.156E-04 -.232E-02
Second-order correction - Iteration   1 ........  -.156E-04 -.232E-02

  10   1.07138    33.0138  -.5263E-01   .4608E+03
First-order corrections to F and THETA .........  -.799E-07 -.131E-04
Second-order correction - Iteration   1 ........  -.799E-07 -.131E-04

  11   1.07138    33.0137  -.1040E+00   .5354E+03
First-order corrections to F and THETA .........  -.655E-07 -.121E-04
Second-order correction - Iteration   1 ........  -.655E-07 -.121E-04

  12   1.07138    33.0137  -.6545E+00   .6957E+03
First-order corrections to F and THETA .........   .246E-06  .228E-04
Second-order correction - Iteration   1 ........   .246E-06  .228E-04

  13   1.07138    33.0137   .1788E+00   .7145E+02
First-order corrections to F and THETA .........  -.132E-06 -.159E-04

Factor of Safety - - - - - - - -     1.071
Side Force Inclination - - - - -     33.01
Number of Iterations - - - - - -    13
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Search for Yield Acceleration - Along Liner


TABLE NO. 38
*************************************************************
*  Final Results for Stresses Along the Shear Surface       *
*  (Results for Critical Shear Surface in Case of a Search.) *
*************************************************************

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety =  1.071     Side Force Inclination =  33.01 Degrees

        -------- VALUES AT CENTER OF BASE OF SLICE---------
```

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
1	309.3	2959.4	1020.1	1020.1	560.0
2	313.3	2957.5	608.8	608.8	152.3
3	319.0	2954.8	1224.3	1224.3	306.2
4	325.0	2951.9	1883.7	1883.7	471.1
5	335.0	2947.1	3016.1	3016.1	754.3
6	351.0	2939.5	4891.7	4891.7	1223.4
7	376.7	2927.3	8341.9	8341.9	2086.3
8	410.0	2911.4	13091.0	13091.0	3274.0
9	443.3	2895.5	17840.0	17840.0	4461.8
10	460.2	2887.4	20229.9	20229.9	5059.5
11	478.5	2887.1	10635.0	10635.0	2659.8
12	514.7	2886.4	11781.8	11781.8	2946.6
13	550.9	2885.8	12928.7	12928.7	3233.4
14	569.0	2885.5	13567.3	13567.3	3393.2
15	586.3	2885.7	13591.3	13591.3	3399.2
16	620.9	2886.1	14572.9	14572.9	3644.7
17	655.5	2886.5	15554.4	15554.4	3890.1
18	690.2	2886.9	16536.0	16536.0	4135.6
19	724.8	2887.3	17517.5	17517.5	4381.1
20	759.4	2887.6	18499.1	18499.1	4626.6
21	794.0	2888.0	19480.6	19480.6	4872.1
22	828.6	2888.4	20462.2	20462.2	5117.6
23	863.2	2888.8	21443.7	21443.7	5363.0
24	897.8	2889.2	22425.3	22425.3	5608.5
25	932.5	2889.6	23407.2	23407.2	5854.1
26	949.9	2889.8	14561.7	14561.7	3641.8
27	950.9	2890.5	14539.6	14539.6	3636.3
28	967.6	2900.7	14241.0	14241.0	10385.0
29	999.2	2920.2	13330.0	13330.0	9720.7
30	1030.8	2939.6	12418.9	12418.9	9056.3
31	1062.4	2959.0	11507.8	11507.8	8391.9
32	1094.0	2978.5	10596.7	10596.7	7727.5
33	1125.6	2997.9	9685.7	9685.7	7063.1
34	1157.2	3017.4	8774.6	8774.6	6398.7
35	1186.4	3035.3	7875.4	7875.4	5743.0
36	1213.3	3051.8	6988.1	6988.1	5096.0
37	1240.1	3068.3	6100.8	6100.8	4448.9
38	1266.9	3084.9	5213.6	5213.6	3801.9
39	1293.8	3101.4	4326.3	4326.3	3154.9

1

-------- VALUES AT CENTER OF BASE OF SLICE---------

Slice No.	X-center	Y-center	Total Normal Stress	Effective Normal Stress	Shear Stress
40	1320.6	3117.9	3439.0	3439.0	2507.8
41	1344.6	3132.6	2645.8	2645.8	1929.4
42	1365.7	3145.6	1946.8	1946.8	1419.7
43	1383.9	3156.8	1384.6	1384.6	1009.7
44	1399.2	3166.2	968.3	968.3	706.1
45	1407.2	3171.1	755.9	755.9	551.2
46	1414.7	3175.7	569.6	569.6	560.0

CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION = .57 (= .565E+00)
SHOULD NOT EXCEED .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION = .60 (= .605E+00)
SHOULD NOT EXCEED .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN = 363.37 (= .363E+03)

```
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .12   (=   .124E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE
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Search for Yield Acceleration - Along Liner
```

TABLE NO. 39

```
*****************************************************************
*  Final Results for Side Forces and Stresses Between Slices.   *
*  (Results for Critical Shear Surface in Case of a Search.)    *
*****************************************************************
```

SPENCER'S PROCEDURE USED TO COMPUTE FACTOR OF SAFETY
Factor of Safety = 1.071 Side Force Inclination = 33.01 Degrees

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
1	310.5	3106.	2960.2	.572	1505.4	598.6
2	316.0	5539.	2961.6	.768	1723.3	-402.6
3	322.0	10915.	2960.7	.615	1285.0	235.3
4	328.0	19186.	2959.4	.524	1082.3	805.1
5	342.0	50086.	2956.8	.454	1058.2	1865.4
6	360.0	114521.	2953.6	.421	1157.4	3232.2
7	393.3	318006.	2948.3	.404	1587.8	5863.9
8	426.7	637336.	2942.3	.391	1858.6	8895.9
9	460.0	1072513.	2936.5	.385	2199.2	11940.9
10	460.3	1077599.	2936.5	.385	2201.9	11973.3
11	496.6	1095480.	2952.9	.469	5291.1	7733.4
12	532.8	1115289.	2967.7	.527	7035.1	5061.3
13	569.0	1137031.	2980.7	.566	7914.7	3422.8
14	569.0	1137040.	2980.7	.566	7914.9	3422.4
15	603.6	1139229.	2993.3	.596	8358.5	2244.5
16	638.2	1141576.	3004.5	.615	8412.9	1548.7
17	672.9	1144081.	3014.1	.624	8188.5	1208.4
18	707.5	1146744.	3022.0	.624	7762.4	1133.8
19	742.1	1149566.	3028.2	.617	7189.4	1259.8
20	776.7	1152545.	3032.6	.603	6509.0	1539.1
21	811.3	1155683.	3035.2	.583	5749.9	1936.2
22	845.9	1158978.	3035.7	.557	4933.3	2424.6
23	880.5	1162432.	3034.2	.526	4075.2	2984.1
24	915.1	1166044.	3030.5	.490	3187.3	3599.1
25	949.8	1169831.	3024.7	.450	2278.5	4257.9
26	950.0	1166716.	3025.0	.450	2285.6	4234.7
27	951.8	1143578.	3027.4	.456	2359.3	4053.3
28	983.4	1000233.	3038.6	.456	2198.4	3770.1
29	1015.0	866058.	3049.9	.456	2034.5	3487.5
30	1046.6	741054.	3061.0	.456	1866.3	3206.2
31	1078.2	625221.	3072.1	.455	1692.2	2927.2
32	1109.8	518558.	3083.1	.454	1509.5	2652.3
33	1141.4	421066.	3093.9	.452	1313.8	2384.5
34	1173.0	332744.	3104.3	.447	1098.5	2128.6
35	1199.8	265438.	3113.0	.447	976.2	1888.9
36	1226.7	205715.	3121.8	.447	857.1	1646.1
37	1253.5	153575.	3130.6	.449	742.3	1399.0
38	1280.3	109018.	3139.5	.452	633.8	1145.9
39	1307.2	72044.	3148.7	.459	534.8	883.5
40	1334.0	42652.	3158.3	.476	451.1	606.3

---------- VALUES AT RIGHT SIDE OF SLICE ----------

Slice No.	X-Right	Side Force	Y-Coord. of Side Force Location	Fraction of Height	Sigma at Top	Sigma at Bottom
41	1355.1	24839.	3166.3	.505	398.2	375.7
42	1376.3	11731.	3175.3	.579	362.1	129.7
43	1391.6	4986.	3183.9	.745	344.6	-65.9
44	1406.9	270.	3282.2	ABOVE	355.5	-332.9
45	1407.6	103.	3440.6	ABOVE	356.3	-347.5
46	1421.8	0.	-1389.3	BELOW	32.3	-32.3

```
CHECK SUMS - (ALL SHOULD BE SMALL)
SUM OF FORCES IN VERTICAL DIRECTION     =          .57  (=  .565E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF FORCES IN HORIZONTAL DIRECTION   =          .60  (=  .605E+00)
     SHOULD NOT EXCEED      .100E+03
SUM OF MOMENTS ABOUT COORDINATE ORIGIN =       363.37  (=  .363E+03)
     SHOULD NOT EXCEED      .100E+03
SHEAR STRENGTH/SHEAR FORCE CHECK-SUM    =          .12  (=  .124E+00)
     SHOULD NOT EXCEED      .100E+03

***** WARNING ***** ONE OF CHECK SUMS IS TOO LARGE

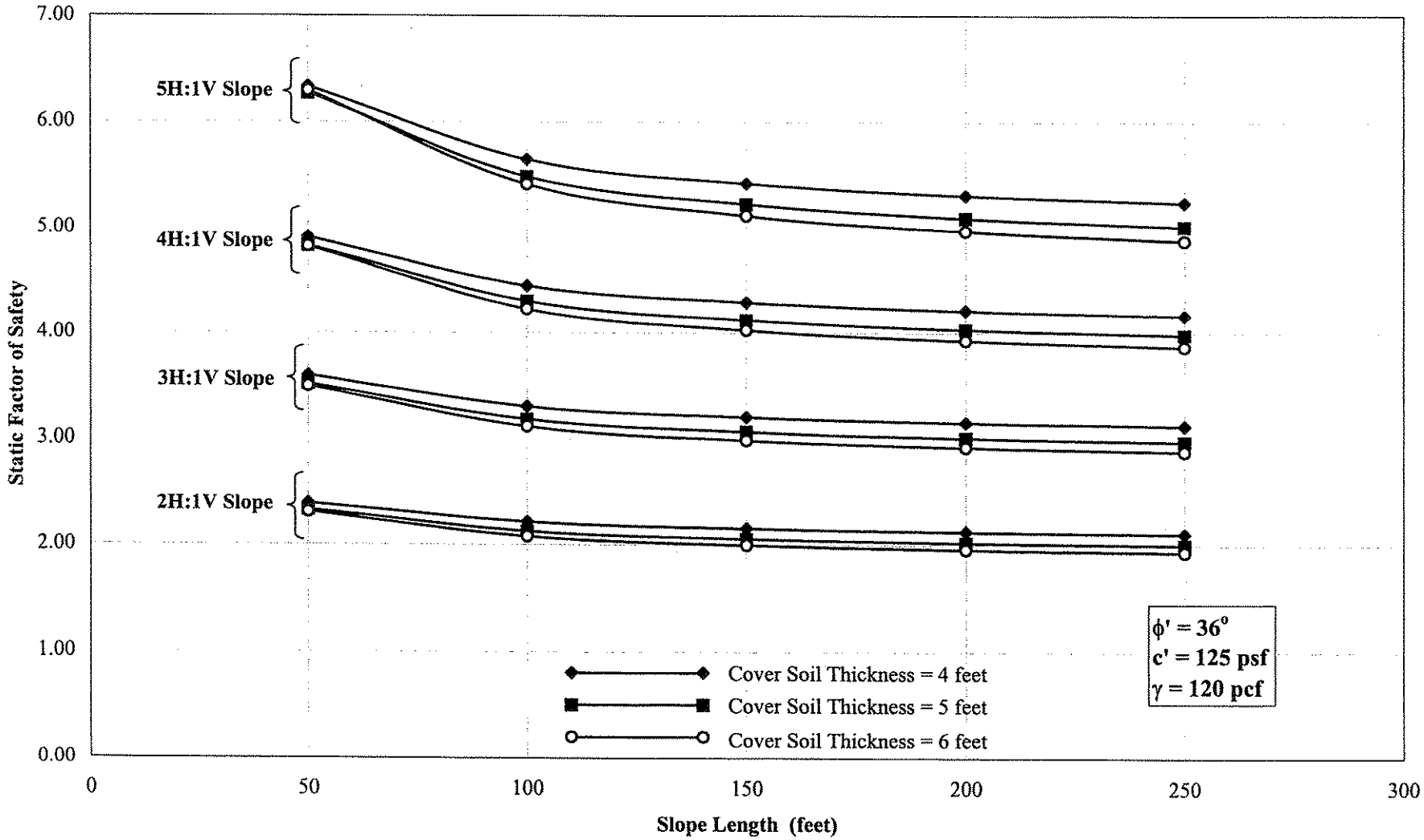
***** CAUTION ***** SOME OF THE FORCES BETWEEN SLICES ACT AT POINTS
                    ABOVE THE SURFACE OF THE SLOPE OR BELOW THE
                    SHEAR SURFACE - EITHER A TENSION CRACK MAY BE
                    NEEDED OR THE SOLUTION MAY NOT BE A VALID SOLUTION.


END-OF-FILE ENCOUNTERED WHILE READING COMMAND
WORDS - END OF PROBLEM(S) ASSUMED
```

MONOLITHIC SOIL COVER

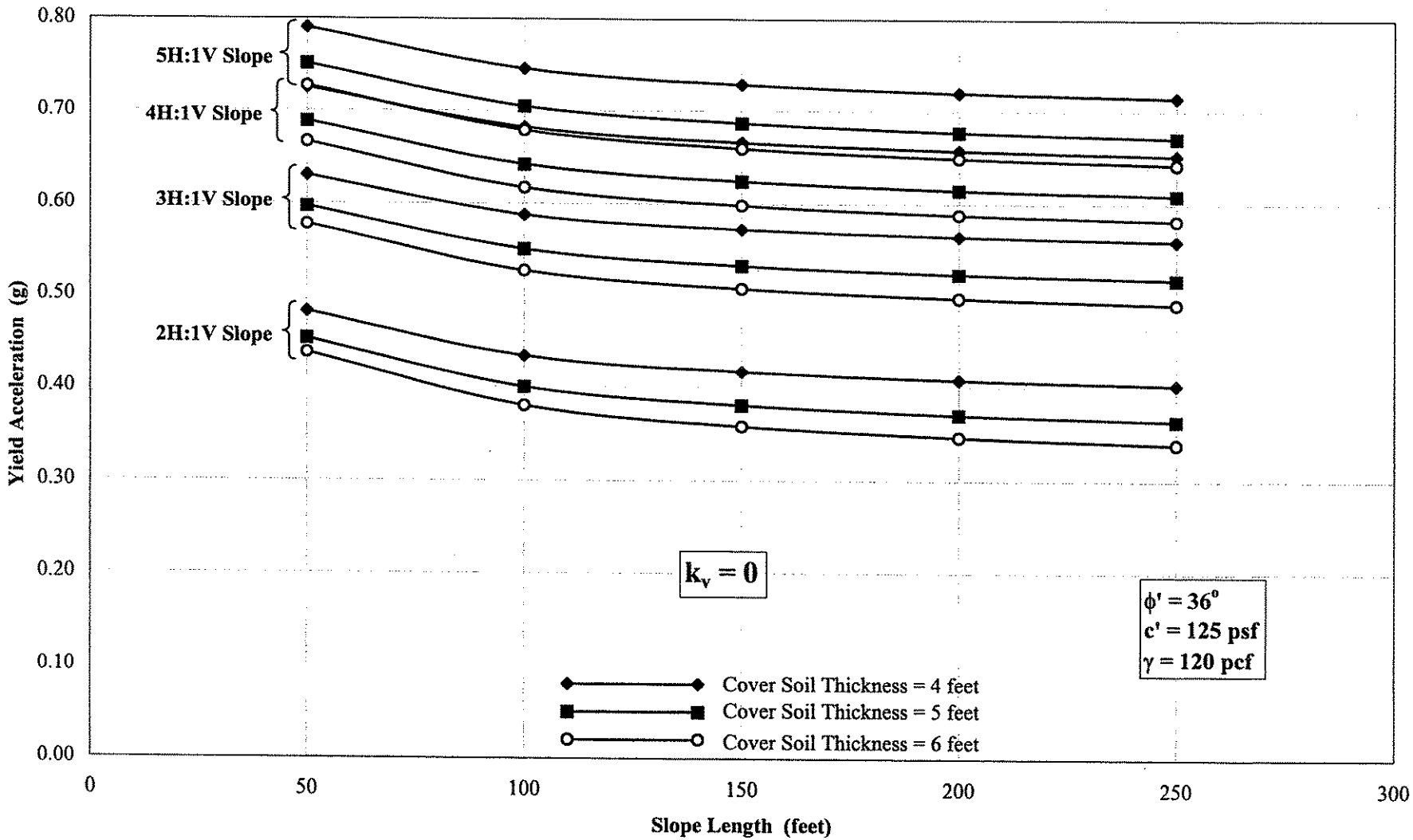
LANDFILL COVER SOIL - STATIC FACTORS OF SAFETY

Koerner and Hwu (1991) Method



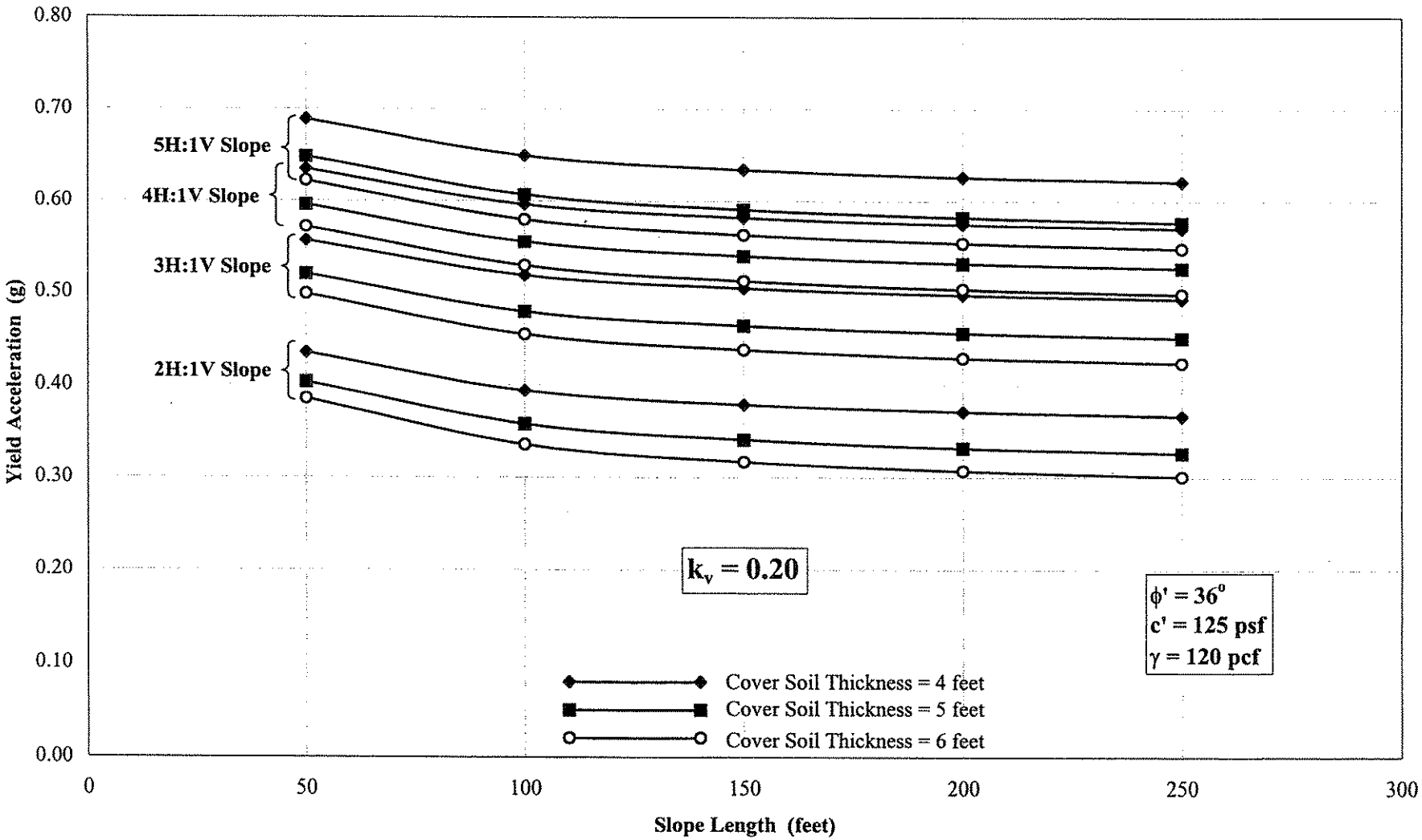
LANDFILL COVER SOIL - YIELD ACCELERATIONS

Ling and Leshchinsky (1997) Method



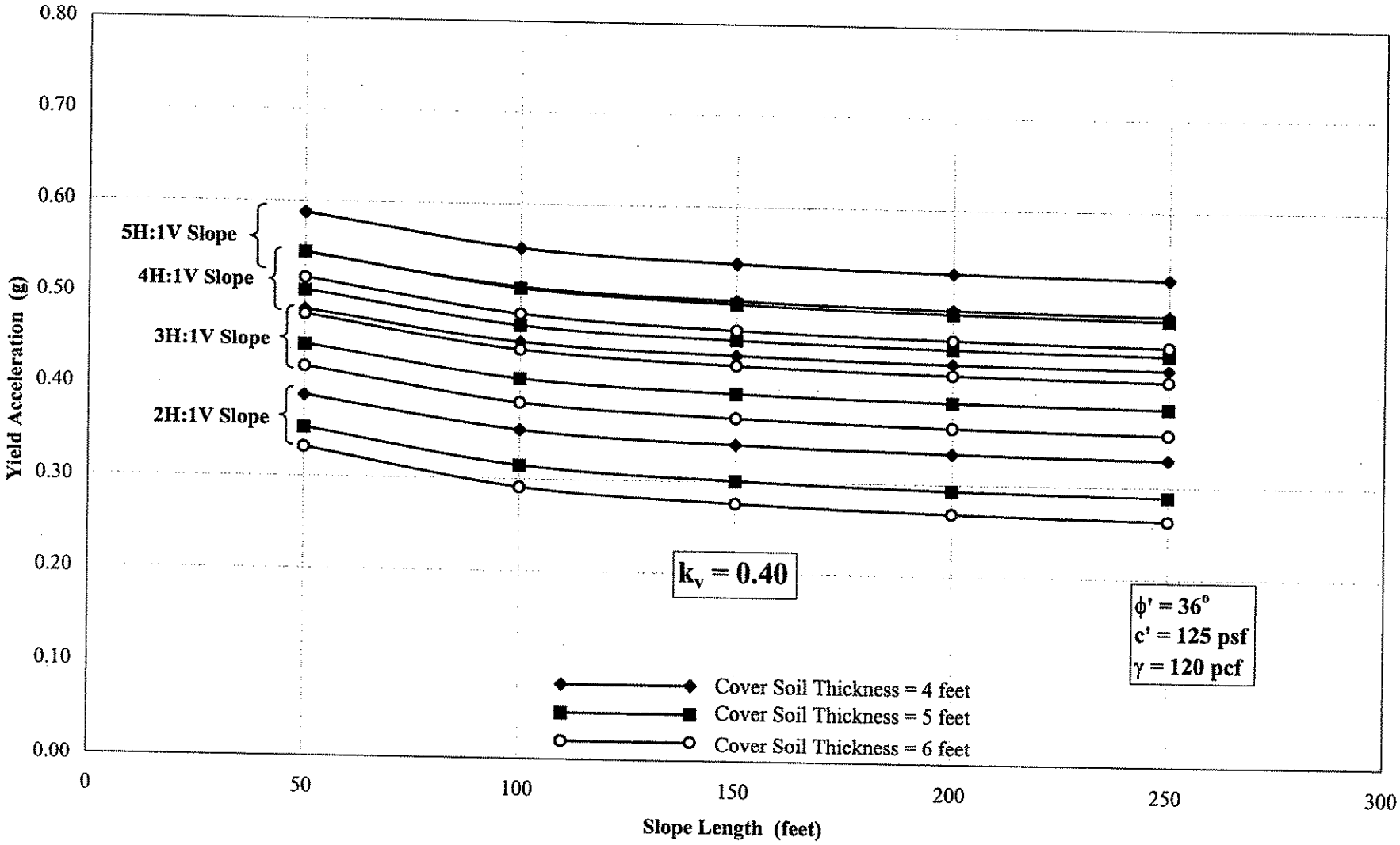
LANDFILL COVER SOIL - YIELD ACCELERATIONS

Ling and Leshchinsky (1997) Method



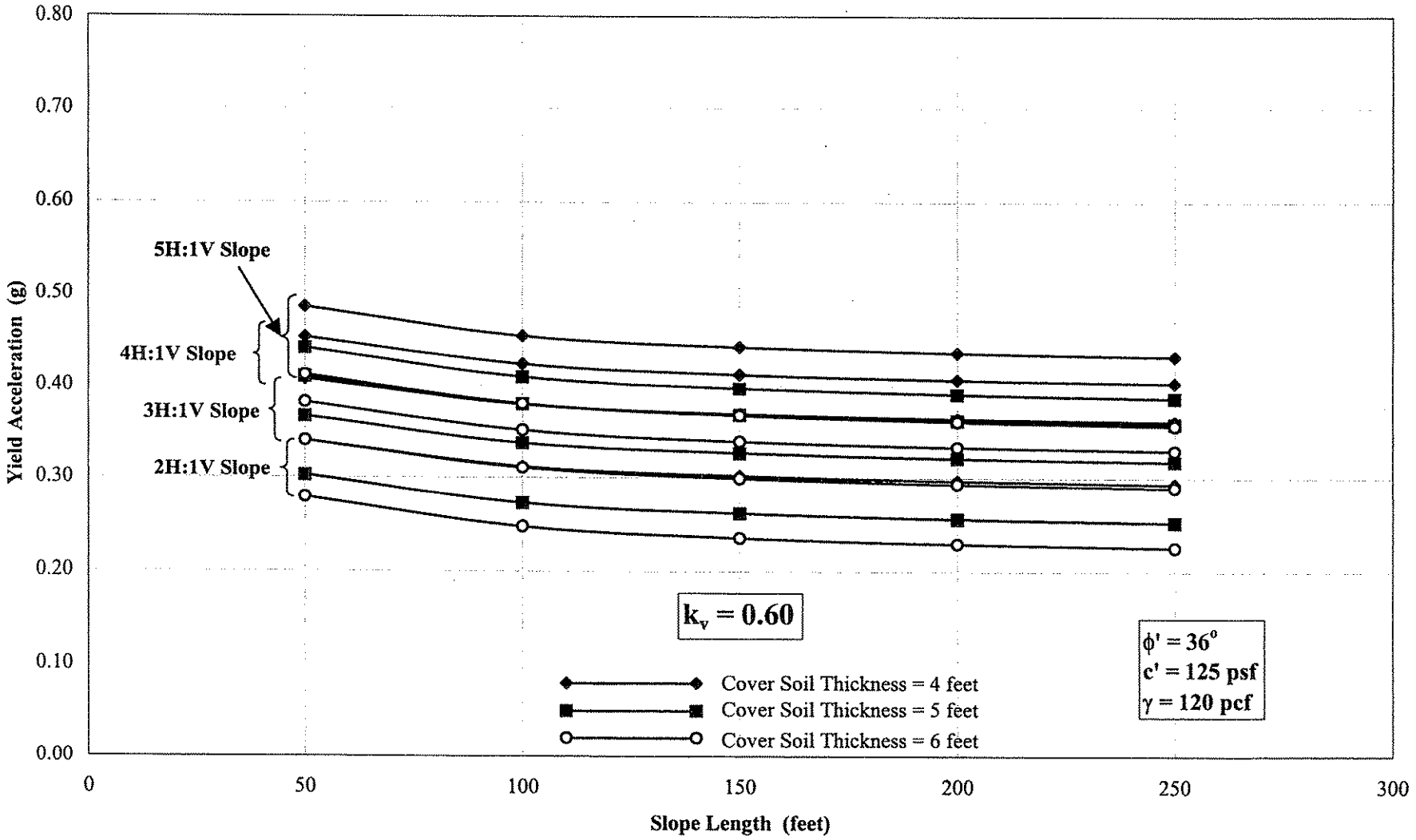
LANDFILL COVER SOIL - YIELD ACCELERATIONS

Ling and Leshchinsky (1997) Method



LANDFILL COVER SOIL - YIELD ACCELERATIONS

Ling and Leshchinsky (1997) Method



Appendix B-2

Report of Geological Findings for the San Andreas Fault Zone Potential Impact on the Proposed Expansion Area, GCE, August 30, 1999

August 30, 1999

Mr. Hugh Walker
District Landfill Manager
Waste Management, Inc.
Palmdale Disposal Company
1200 West City Ranch Road
Post Office Box 4040
Palmdale, California 93350

RE: Report of Geological Findings for the San Andreas Fault Zone Potential Impact on the Proposed Expansion Area Antelope Valley Public Landfill, Number 2 Palmdale, California

Dear Mr. Walker:

GCE, Inc. (GCE) has completed the background literature and aerial photographic review for the proposed expansion area Landfill Number 2 for the Class III, Antelope Valley Public Landfill, located in Palmdale, California. The purpose of the work was to determine whether the faults in the area of Landfill # 2 would have any effects on the design of the proposed Landfill.

Previous mapping of the area by Barrows and others in 1985, and later by Buena Engineers (1985) identified only four faults in the expansion area, Landfill 2. These include the northern splay of San Andreas fault, the Little Rock fault, Fault "A", and Fault "B". Subsequent investigations of these faults which included published literature review and field checking of the mapped faults, drainage patterns and geomorphologic features study and evaluation, and extensive trenching and mapping by Kleinfelder's geologists Brian Villalobos, CEG, Steve Joseph, RG, and Richard Frizzell in 1989, and background literature review and aerial photographs review and field mapping by GCE geologists Steve Joseph, RG, and Richard Frizzell, RG in 1999 found that the Little Rock fault and Fault "A" were inactive and should not affect the design of the proposed landfill, and that what was designated as Fault "B" is actually an igneous contact, and therefore, was re-classified as a geologic contact. However, mapping and field checking of the surface expression of the northern splay of the San Andreas fault zone indicated that this fault has historical movement. Based on these findings and per the Code of Federal Regulations Subtitle "D" requirements, GCE recommends that the footprint for refuse be set back a minimum of 200 feet north of the mapped surface expression of the northern splay of the San Andreas fault zone.

The following report details our findings including a description of the regional lithologies in this area, a discussion of the structures found and the potential impact these structures may have on development of Landfill Number 2.

1230 North Jefferson, Suite J, Anaheim, California 92807
(714) 632-9969 Fax: (714) 632-9968 California Contractor's License #709413

It has been a pleasure working with you on this project. If you have any questions or need assistance in any other area, please feel free to contact us at (714) 632-9969.

Sincerely
GCE, INC.

Farideh V. Kia, RG, CHG, REA
Project Manager

REPORT OF GEOLOGICAL FINDINGS FOR THE SAN ANDREAS FAULT ZONE POTENTIAL IMPACT ON THE PROPOSED EXPANSION AREA ANTELOPE VALLEY PUBLIC LANDFILL NO. 2 PALMDALE, CALIFORNIA

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FOR THE SAN ANDREAS FAULT ZONE
POTENTIAL IMPACT ON THE PROPOSED EXPANSION AREA
ANTELOPE VALLEY PUBLIC LANDFILL NO. 2
PALMDALE, CA

Report Prepared For:

Mr. Hugh Walker
District Landfill Manager
Waste Management, Inc.
Palmdale Disposal Company
1200 West City Ranch Road
Post Office Box 4040
Palmdale, California 93350

Report Prepared By:

Gas Control Engineering Inc.
1230 North Jefferson Street, Suite J
Anaheim, California 92807
(714) 632-9969

Project 1124-3-1

Stephen E. Joseph, RG
Senior Geologist

Richard J. Frizzell, RG
Project Geologist

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1.0 INTRODUCTION

The Antelope Valley Landfill (Landfill) is located in the Anaverde Valley approximately two miles southwest of the City of Palmdale, Los Angeles County, California. The Landfill is located in the northeast ¼ of Section 22, Township 6 North, Range 12 West, San Bernardino Baseline and Principal Meridian.

The proposed expansion area for the Class III, Antelope Valley Public Landfill Number 2 lies in the northern portion of the Anaverde Creek Valley, a linear topographic expression of the San Andreas fault zone. Previous mapping by California Division of Mines and Geology (Barrows 1985) and different consulting geologists identified only four faults in the area of Landfill 2. These include; the northern splay of San Andreas fault zone, the Little Rock fault, Fault "A", and Fault "B".

GCE was retained by Waste Management, Inc., to perform a fault hazard study for the proposed expansion area for the Class III, Antelope Valley Public Landfill Number 2. The purpose of the work was to determine whether the mapped faults in the area of the Landfill would have any effects on the design of the proposed expansion area.

The scope of work for this project consisted of a review of historical information regarding the historic movement and surface disruption along the portion of the San Andreas fault zone immediately south of the proposed expansion area, a review of historical aerial photographs in this area to note any previous escarpments that have been subsequently disrupted by development of the landfill, a field check of previous mapping and aerial photographs, and developing a recommended course of action that would best suit the conditions found.

Review work was completed by Richard Frizzell, a Registered Geologist, during October 1998 and Stephen Joseph, a Registered Geologist, during August 1999. The field checking of aerial photographs and previous mapping was completed in August 1999 by all the geologists involved in the project.

The following sections provide information on the site geologic condition, the mapped faults in the area of the Landfill, our evaluation of the effects these faults may have on the design of the Landfill, and our recommendation.

2.0 REGIONAL AND LOCAL GEOLOGICAL CONDITIONS

This section briefly discusses the regional and local geological conditions found at the Landfill including a discussion of the local structural conditions in the area of the Landfill.

2.1 REGIONAL GEOLOGIC CONDITIONS

The Landfill is located near the northern base of the Sierra Pelona Mountains which are a part of the Transverse Ranges that extend in a roughly east-west direction in southern California. Areas south of the San Andreas fault zone are typically underlain by granitic and metamorphic lithologies associated with the Transverse Ranges (Dibblee, 1982) including the Mesozoic-age (?) Pelona Schist, a gray to green, biotite and chlorite schist. This distinctive rock type is a common clast in the Recent- to late Quaternary-age alluvial deposits (Dibblee, 1967; Evans, 1982).

North of the San Andreas fault zone the lithologies include; Pre-Cambrian-age granites and gneisses; Paleozoic and Mesozoic-age cratonic rocks; and Cenozoic volcanic, fluvial and lacustrine deposits (Dibblee, 1967).

2.2 LOCAL GEOLOGICAL CONDITIONS

The section that discusses the geological units found in the Landfill, from the oldest to the youngest in age is found in **Appendix A - Local Geological Units**.

2.3 REVIEW OF PUBLISHED REPORTS AND MAPS

Results of extensive previous fault investigations and mapping by California Division of Mines and Geology (Barrows 1985), Buena Engineers (1985), Kleinfelder (1989) identified four faults in the area of Landfill 2. The previously mapped features are shown on **Figure 1 - Enlarged Landfill II Property Boundary and Refuse Limits Showing Fault Locations**. The investigations included review of published and unpublished geologic, geomorphic seismic and soil data, review of aerial photographs, field geologic and geomorphic mapping of the site and adjacent areas, and extensive trench explorations. The following section provides a brief summary of the published information for these faults.

2.3.1 San Andreas Fault Zone

The San Andreas fault zone is an active fault zone that is located south of the Landfill property line. The surface disruption from the 1857 Fort Tejon earthquake is visible along its trace; the epicenter for this earthquake was 47 miles northwest of the Landfill. The magnitude of this event was estimated at 8.3 M_s and had an estimated intensity at the site of VIII on the Modified Mercalli Scale (Sieh, 1985). This fault has been designated as active by the State of California and has been assigned an Alquist-Priolo Special Studies Zone (State of California, Department of Mines and Geology (CDMG), 1979; CDMG, 1981).

Barrows and others (1985) have mapped the surface features of the San Andreas fault zone. They noted that the surfical features of the fault zone near the eastern portion of the Landfill were less notable than those observed in the western portion of the landfill consisting primarily of closed depressions and offset gullies. Further west, near City Ranch Road in the area of Landfill 2, the San Andreas fault zone is present as two to three parallel to subparallel strands in a zone up to 100 feet wide (Buena Engineers, 1985). Surfical features are more common in the western portion of the property and consist of trenches or troughs, ponded alluvium, offset gullies and channels, linear ridges, deflected drainages, benches, aligned vegetation, swales, and beheaded channels. No other geologic features were noted other than the main trace of the San Andreas fault zone.

2.3.2 Little Rock Fault

The Little Rock fault crosses the northern portion of the Landfill and represents the primary boundary between the two distinctly different tectonic blocks. The Little Rock fault trends roughly north 60° west, dipping to the south at 82 degrees. The fault zone in the area of Phase IV, Landfill Number 1 is characterized by a single 1 to 3 foot wide gouge in an area of fractured gneiss and quartz monzonite. Offset on the Little Rock fault in the area of the landfill is not known. In the area of the Landfill the Little Rock fault has not moved since at least Holocene time. Barrows (1975) and Barrows and others (1985) indicate that the Little Rock fault zone may have approximately 13 miles of right-lateral offset along its trace in an area approximately 40 miles to the southeast of the landfill. Barrows and others (1985) state that the Little Rock fault may have been the main ancestral trace of the San Andreas fault zone system until the beginning of the Pleistocene epoch. At this time, the Little Rock fault took on more of a dip-slip motion. Several portions of the fault trace have not moved with this dip-slip motion during the Quaternary. The Little Rock fault in the area of the landfill appears to be one of these portions.

Barrows and others (1985) mapped surfical features of the Little Rock fault. The Little Rock fault did not demonstrate offset within the Landfill. Topographic expressions of the Little Rock fault include soil and rock contrasts and linear gullies. Kleinfelder (1989a & 1989b) indicated a few gullies appeared to have offset stream channels; however, this is due to resistant lithologies south of the Little Rock fault that deflect the streams rather then motion along the fault line.

Within the Phase IV expansion area of Landfill Number 1, the Little Rock fault does not have recent movement along its trace. This was shown in an outcrop along the western portion of the Phase IV pit where the fault trace does not offset the five to eight feet thick overlying debris flows and alluvial deposits associated with the older terrace deposits (Joseph, 1998). Kleinfelder (1989b) showed that these terrace deposits in the area of the landfill are not typically younger than 25,000 years before present and are probably older than 250,000 years before present (for further discussion of the lithologies, please refer to Appendix A); therefore, this outcrop clearly showed that the Little Rock fault zone does not have recent (Holocene) movement along this portion of its trace.

2.3.3 Fault "A"

Fault "A" was initially mapped by Barrows and others (1985). Barrows reported Fault "A" to be concealed beneath Quarternary alluvial deposits with no surfical features that identify this fault as active. Fault "A" was subsequently mapped in the Landfill by Buena (1985) as a contact between the red and gray arkosic sandstone members of the Anaverde Formation. Buena (1985) stated that this fault had demonstrated Recent-age movement along its trace. To evaluate Buena's assessment, in 1989 Kleinfelder conducted an extensive evaluation of Fault "A" that included review of published and unpublished geologic, geomorphic seismic and soil data, review of aerial photographs, field geologic and geomorphic mapping of the site and adjacent areas, and extensive trench explorations. A total of 6 trenches were excavated along the Fault "A" to lengths ranging between approximately 45 feet and 200 feet, and depths of approximately 10 feet and 35 feet. Results of the mapping showed no evidence of movement along the trace of Fault "A." One outcrop near the westernmost portion of the Landfill had the red and gray arkosic sandstone members of the Anaverde Formation in fault contact. The fault observed in this area was noted as a single, 12-inch wide gray-green gouge zone. Overlying the fault trace and the Anaverde Formation was a terrace deposit (Qt) whose age had been estimated at between 25,000 to 250,000 year bp (see Appendix A for further discussion regarding the ages of the terrace deposits.) The trace of Fault "A" clearly had not disrupted the overlying terrace deposits; and, therefore, Fault "A" was reclassified as an inactive fault.

2.3.4 Geologic Igneous Contact (Fault "B")

An unnamed fault (later designated as Fault "B") was mapped by Barrows and others (1985), and later by Buena (1985) during the initial mapping for the development of Landfill Number 2. In 1998, during the excavation in the northwest portion of the Landfill 1, it was found that the rock that had been previously mapped as Anaverde Formation south of the Fault in contact with granitic rocks north of the Fault was actually deeply weathered granodiorite. Further excavation found that the contact between the granodiorite and quartz monzonite was an igneous contact and not structural, and the Anaverde Formation is in depositional contact with the underlying granitic rocks (for further discussion, see **Appendix A**). Based on more detailed subsurface information, what was mapped as a fault, was reclassified as a geologic igneous contact.

3.0 AERIAL PHOTOGRAPH REVIEW

3.1 INTRODUCTION

The following section discusses the findings of the aerial photographic review conducted by GCE. Photographs were reviewed at the United States Department of Agriculture, Soil Conservation Service field office located in Lancaster, California.

GCE obtained photographs that pre-dated the construction and use of the property as a landfill. Photographs were sought that provided adequate coverage of the property at a scale that allowed for interpretation of surface topographic expressions of the various fault zones. GCE found three sets of aerial photographs that met these criteria; the photographs reviewed were dated 1953, 1959 and 1968.

For the purpose of discussion of our findings, GCE has designated various topographical features present in the landfill that consist of alternating east-west trending ridges and hills and north-south trending side drainages associated with Anaverde Creek. These hills and valleys are numbered from east to west away from Landfill Number 1. Two hills are mentioned in the aerial photograph discussion; they are numbered 1 and 2 beginning with the hill nearest the existing landfill and trending west. The intervening drainages are numbered similarly; Drainage 1 is between the existing landfill and Hill 1; Drainage 2 is between Hills 1 and 2; and, Drainage 3 is between Hills 2 and the western property boundary (please refer to Figure 1).

3.2 1953 AERIAL PHOTOGRAPH

The photographs reviewed were AXJ-10K-32/33 (stereo pair), dated April 9, 1953. Stereoscopic effect was good with these photographs. The photograph was taken in the spring; the vegetation of the region appears to be good. This photograph shows the area prior to the start of the Landfill as a gently sloping alluvial fan. The Southern California Edison Substation adjoining the Landfill can be seen it this photograph and subsequent photographs. The northern trace of the San Andreas Fault can be seen in the photographs as a linear feature with offsets drainages, trenches or troughs, offset gullies and channels, linear ridges, deflected drainages, benches, aligned vegetation, swales, and offset rock types. The northern trace of the San Andreas Fault Zone can be clearly located relative to City Ranch Road and the Southern California Edison Substation adjoining the future landfill.

3.3 1959 AERIAL PHOTOGRAPH

The photographs reviewed were AXJ-3W-092/093 (stereo pair), dated July 24, 1959. Stereoscopic effect was good with these photographs. The photograph was taken in late summer; the vegetation in the region appears distressed due to heat stress and summer drought. The

Landfill has the beginnings of an excavation in native soil and rock with some filling of areas. The area of Landfill Number 1 appears as a small pit in the area of Phase I. Some of the office buildings are also visible on the photograph with City Ranch Road appearing as a dirt road. Most of the same linear fault features are visible in these photographs as in the 1953 series. The San Andreas fault trace is still clearly visible with little alteration by man.

3.4 1968 AERIAL PHOTOGRAPH

The photographs reviewed were 5-115/115 (stereo pair), dated April 4, 1968. Stereoscopic effect is excellent with these photographs (the best of the three sets reviewed). The photographs were taken in late spring; the vegetation appears good. The Landfill is clearly visible and the footprint area of Landfill Number 1 has significantly increased. It appears Phase I is filling and the landfill operator has begun preparing Phase II of Landfill Number 1. The landfill buildings that were visible on the 1959 photograph are still present and several new structures have been added including the truck repair facility. City Ranch Road is still visible as a dirt road. The trace of the San Andreas fault is still clearly visible even though some alteration has taken place due to man's activities in the area such as the beginning of construction of the California Aqueduct. The same linear features and scarps that mark the San Andreas fault zone are still clearly visible.

3.5 DISCUSSION OF AERIAL PHOTOGRAPHS

The discussion in this section follows the same format as the Previously Mapped Geological Structures portion of Section 2.0.

3.5.1 San Andreas Fault Zone

The San Andreas fault zone will be discussed in four portions relative to the existing landfill, Hill 1 and Hill 2.

Existing Landfill Area (Landfill Number 1): The San Andreas fault zone in the easternmost portion of the landfill facility consists of a deep linear channel that contains the Anaverde Creek and passes 200 to 300 feet south of City Ranch Road and the structures associated with the landfill. South of this linear channel is a shudder ridge whose northern flank is nearly vertical and which forms the southern bank of the channel. A major drainage entering Anaverde Creek from the south is deflected approximately 50 feet east by the San Andreas fault in this area. The stream deflection is in line with a shallow scarp that truncates a shutter ridge located approximately 200 feet west of the creek. The linear channel continues westward south of Hill 1 until it is lost in another shutter ridge. The vegetation in the area of the Anaverde Creek appears to have ready access to shallow groundwater, especially the vegetation south of the fault, where groundwater is close to the ground surface.

Juniper trees grow in the areas which are not too wet or too dry to support the growth. In this area Juniper trees only grow in areas underlain by bedrock or faults, because the alluvial areas are too well drained to support the growth of the trees, and areas along the south trace of the San Andreas Fault Zone are too wet for the growth of the trees. Therefore, Juniper trees south of the Hill 2, along City Ranch Road, represent the northern trace of the San Andreas Fault Zone.

Hill 1: Approximately 500 feet northeast of the linear channel, another escarpment is visible; this escarpment offsets Drainage 1 southwest of the existing landfill. The escarpment becomes progressively more pronounced to the west. The spring set of photographs (1968) show an additional linear trace of vegetation east of Drainage 1. City Ranch Road roughly parallels this scarp throughout much of this section. In this area, City Ranch Road is south of the scarp, which denotes the northern boundary of the fault zone. South of the scarp, a long shutter ridge is present along this portion of the fault that marks the southern boundary of the fault zone.

As the main scarp of the San Andreas fault zone continues westward, it crosses Drainage 2. The stream is deflected to the right by the fault approximately 20 feet. The vegetation north of the fault was lush and did not appear to be distressed by the summer conditions. The wash south of the fault was void of vegetation indicating that the fault was offsetting different types of soils in this area. The fault also appears to have truncated several of the ridges on the southern portion of Hill 2 west of Drainage 2. The northern boundary of the San Andreas fault zone is marked by linear vegetation along its trace. South of the main scarp is a smaller linear feature, primarily represented by a break in slope from a shutter ridge along the southern portion of the fault zone.

Hill 2: The southern slope of Hill 2 north of the San Andreas fault zone is cross-cut by several sub-parallel linear features. It appears that several of the sub-parallel linear features begin near where the main trace of the San Andreas fault zone crosses Drainage 2 and trend northward roughly parallel to the northern splay of the San Andreas fault zone. GCE has mapped folded claystone with sandstone interbeds in the southern face of Hill 2. These linear features appear to be either bedding planes or fractures related to the intense folding found within this lithological unit.

4.0 FIELD MAPPING

4.1 SAN ANDREAS FAULT

In August 1999, GCE geologists field checked the aerial photographs and previous mapping by Barrows and others (1985). GCE was able to easily confirm on the ground features seen on the aerial photographs and features described and mapped by Barrows and others. Scarps and linear features marking the northern boundary of the San Andreas fault zone can clearly be seen in the field. GCE geologists marked the northern boundary of the San Andreas fault zone by placing red flags along the trace.

4.2 LITTLE ROCK FAULT

The Little Rock fault in the vicinity of the landfill has been mapped and looked at in detail for the past 15 years by consulting geologists. The fault consists of a single 1 to 3 feet wide gouge zone in fractured gneiss and quartz monzonite. The fault is overlain by 5 to 8 feet of unbroken terrace deposits of older alluvium. These terrace deposits are believed to be close to 250,000 years old which indicate lack of recent movement on the Little Rock fault. The unbroken terrace deposit outcrop was photographed and documented during excavation of the Phase IV pit and during previous investigations. Copies of the photographs are provided in Appendix B.

4.3 FAULT "A"

Fault "A" was mapped by Kleinfelder in 1989 during an extensive fault investigation which involved numerous excavations into the fault zone. This fault forms a single, 12-inch wide gray-green gouge zone in the Anaverde Formation. Overlying the fault trace is a terrace deposit of between 25,000 and 250,000 years old. In all of the excavations, Fault "A" did not disrupt any of the overlying deposit and thus has not moved in at least the last 25,000 years. Because of this relationship between the overlying terrace deposits and the fault, Fault "A" is inactive and has not moved in Holocene time. Additional detailed discussions of this relationship are included in Appendix A.

4.4 GEOLOGIC IGNEOUS CONTACT (FAULT "B")

What was previously mapped and designated as Fault "B" was investigated during the excavation and liner installation for Phase IV and in subsequent subsurface excavations near Phase IV. It was found that what had previously been mapped as Anaverde Formation was actually a deeply weathered granodiorite (Joseph, 1998). Detailed mapping of the excavations showed that the contact between the granodiorite and quartz monzonite is an igneous and not a structural contact and that the Anaverde Formation is in depositional contact with the underlying granitic rocks. Based on this new information, Fault "B" was reclassified as an igneous contact.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Based on the review of available literature, historical aerial photographs, and field mapping and observation, GCE concludes the following regarding the faults mapped in the expansion area:

- The northern boundary of the San Andreas fault zone is narrowed to a single strand along the Anaverde Creek channel in the area of Landfill 1 (south of the landfill offices). All recent movement on this portion of the San Andreas fault zone appears to be confined to this single fault line.
- Southwest of Landfill 1, in the vicinity of Drainage 1 and Hill 1, the San Andreas fault zone is marked by offsets in drainage channels entering the Anaverde Creek. This portion of the fault is also marked by small scarps and by a single line of vegetation primarily Juniper trees, which extends west to the area near Drainage 2.
- Drainage 2 appears to be offset by this single strand. The fault zone was also delineated by pronounced scarps as well as the line of Juniper trees in the area of Hill 2.
- West of Drainage 2, additional splays of the San Andreas fault zone are visible. These splays are visible south of the main strand located near City Ranch Road and most are visible as topographically subdued escarpments.
- The northern boundary of the San Andreas Fault Zone can be clearly seen and identified on aerial photographs and on the ground in the vicinity of the Landfill 2.
- The Little Rock fault and Fault "A" in the vicinity of the landfill have not moved in the past 25,000 to 250,000 years. These faults are inactive and should not be a concern for the proposed Landfill
- That Fault "B" is not a fault but is an igneous contact between a granodiorite and a quartz monzonite.
- With the exception of the San Andrea, Little Rock, and Fault "A", no other faults have been mapped in the expansion Landfill 2.

Based on these observed conditions at the subject property, GCE believes that the trace of the San Andreas fault zone has sufficient topological features to warrant its classification as an active fault line. The northern boundary of the San Andreas Fault Zone can be delineated in the vicinity of the southern boundary of Landfill 2.

Based on aerial photograph interpretation and field mapping, the known trace of the San Andreas fault zone, as discussed and mapped in Dibblee (1967), Barrows (1975) and Barrows and others (1985), appear to be very accurate in the vicinity of the Landfill. Barrows and others mapping plots the northern boundary of the San Andreas Fault Zone with high degree of certainty; and based on our field checking of their mapping, we also believe they have plotted the northern boundary accurately.

5.2 RECOMMENDATIONS

Based on the findings of the extensive fault investigations and mapping by Barrows (1985), Buena (1985), Kleinfelder (1989), and GCE (1998, 1999), with the exception of San Andreas Fault, there is no evidence of other active faults in the vicinity of the expansion area. Therefore, no additional fault investigation is recommended in the expansion. However, GCE recommends that the footprint for the refuse for the proposed landfill be placed a minimum of 200 feet north of the northern splay of the San Andreas fault zone in compliance with the requirements of Subtitle "D".

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APPENDIX A - LOCAL GEOLOGIC UNITS

APPENDIX A - LOCAL GEOLOGICAL UNITS

This section is a summarization of the geological units found at the subject property. The information presented in this appendix is a compilation of previous studies completed for the area of Landfill Number 2. There are three major lithological types in the area of the Landfill: basement complex, Anaverde Formation and the alluvial deposits.

Mesozoic (?)-age Basement Complex

The basement complex rock lithologies observed in the Landfill are roughly grouped together into the tectonic block north and south of the Little Rock fault zone. The northern block consists of the light and dark gneisses with associated quartz monzonite dikes; the southern block consists of quartz monzonite and granodiorite with minor amounts of augen gneiss and schist.

The contact between the quartz monzonite and granodiorite appears to be igneous. Several areas previously mapped as red arkosic sandstone member of the Anaverde Formation (Barrows and others, 1985; Buena, 1985; Kleinfelder (1989a & 1989b)) are actually deeply weathered areas of granodiorite. The relative ages between the units in the basement complex are not known; however, Barrows and others (1985) indicate that most of the basement lithologies appear to be similar to other lithologies of Mesozoic-age found near the western fringes of the Mojave Desert.

Late Pliocene-age Anaverde Formation

One regional unit that was mapped in the Landfill is the late Pliocene-age Anaverde Formation that is only found in the westernmost portion of the Antelope Valley and in deep groundwater wells in the Lancaster Basin. This formation has three mapped members, a lower red arkosic sandstone member (Tar), a middle gray arkosic sandstone member (Tag), and an upper gypsiferous claystone member (Tac).

Red arkosic sandstone (Tar): is a red, moderately to poorly indurated silty, pebbly, fine- to coarse-grained arkosic sandstone with occasional coarse- to fine-pebble to cobble conglomerate lenses, commonly forming scour-and-fill structures. The red arkosic sandstone is present in the intervening valley between the hills adjacent to the San Andreas fault zone to the south and the higher ridges adjacent to the Little Rock fault zone to the north. During liner installation of Phase IV of Landfill Number 1, GCE found red arkosic sandstone is in depositional contact with the underlying quartz monzonite in the area. The lower 10 feet outcrop are gruessy monolithic sandstone with abundant potassium feldspar crystal in the deposit. Introduction of additional clasts in the red arkosic sandstone commenced in this area of the Landfill Number 1 approximately 10 to 20 feet above the contact with the underlying quartz monzonite. This indicates only local sources were contributing to the sediment load for a short time at the initiation of sedimentation.

Gray arkosic sandstone (Tag): is a gray to tan, well indurated, pebbly, fine- to coarse-grained arkosic sandstone with thin interbeds of fine sandy shale and fine-pebble to cobble conglomerate. The gray arkosic sandstone is characterized by bold, rounded, cliff- and ridge-forming outcrops in the hills north of the San Andreas fault zone.

Gypsiferous Claystone (Tac): is composed of black, thinly bedded claystone and shale with occasional thin to thick interbeds of gray, pebbly, fine- to coarse-grained arkosic sandstone. The claystone is highly expansive, extensively folded, severely sheared and tectonically distorted due to its short distance from the San Andreas fault zone and the high plasticity the claystone has exhibited during previous drilling activities at the site (Buena, 1985). The claystone contains abundant interbeds of evaporites including gypsum, anhydrite, halite and other salts. The claystone typically outcrops along the southern flanks of the hills just north of the San Andreas fault zone.

Quaternary-age Alluvial Deposits

Terrace deposits (Qt): are typically present along the flanks of the ridges and represent deeply dissected and uplifted deposits that are primarily composed of sand and gravel. Soil types that comprise most of the terrace deposits are Castaic-Balcolm silty clayey loam, 30 to 50 percent slopes, eroded (Woodruff and others, 1970). The sand intervals are brown, coarse to fine sand with some silt, and pebble to cobble gravel. The gravel portions of this unit are fine to coarse gravel with some medium to coarse sand, and some boulders. The boulders of the unit are subangular to angular indicating a deposit proximal to the source terrace.

Clasts present in the younger terrace deposits are monolithic with greater than 85% of the clasts composed of underlying gneiss similar to that found throughout the Landfill indicating a local source with some minor amounts of granite and schist from exotic terraces. Older terrace deposits are a mixture of gneiss, granite and schist indicating multiple terrane sources for the detritus. Much of the granite and schist does not have a local source.

Both the older and younger terrace deposits are poorly interbedded. The poor distribution and layering in these deposits indicate sheet flow, debris flow, or other high volume depositional events throughout depositional histories. Many of these deposits typically have a slight layered appearance and appear to have the beginnings of a "B" soil horizon developing, which is consistent with other terrace deposits observed in the area of the Landfill. This horizon creates a marker horizon within the terrace deposit that can be used for the purpose of evaluating disruptions caused by fault movements.

Exposures of the terrace deposit along the eastern portion of the Landfill show this unit to be approximately 5 to 10 feet thick. A trench excavated near Phase IV of Landfill Number 1 showed the lower terrace deposit to be from 10 to 15 feet thick (Joseph, 1998). However, previous studies by Kleinfelder (1989a and 1989b) show that these deposits can be more than 50 feet thick in places.

The exact age of these units are not known; however, a study completed by Kleinfelder (1989b) on deposits similar in the western portions of the Landfill indicate that these deposits may range in age from 25,000 to 250,000 years before present (bp) assigning them as mid- to late-Pleistocene in age, based on uplift characteristics and similar soil types throughout the Antelope Valley (Ponti, 1985). This age was assigned units based on an assessment of the position on the hillsides, the suggested and calculated uplift from activity along the current trace of the San Andreas fault zone located approximately 40 miles south of the expansion area (Seih, 1985), the type of clasts contained in the deposit, and the extent of erosion observed in this unit.

Mid to Late Quaternary-age older alluvium (Qoa): is generally a dark yellowish brown gravelly sand. Soil types include Ayar clay loam, 5 to 15 percent slopes; Sorrento loam, 2 to 5 percent slopes and Hanford gravelly sandy loam, 2 to 9 percent slopes (Woodruff and others, 1970). Most of these deposits are deeply dissected alluvial fans commonly associated with the major drainages in the area of the Landfill. The sand is fine to coarse-grained with coarser to finer gravel, and traces of silt, cobbles and boulders. The clasts are subrounded to subangular. The thickness ranges from 5 to greater than 50 feet thick in places. Some alluvial deposits have been dissected by younger alluvial deposits indicating the age of some of the alluvial deposits range in age from Recent to late Pleistocene-age. Ponti (1985) estimates the ages for most of these older alluvial units are 11,000 to 25,000 years bp; based on the extent of erosional dissection and position relative to younger alluvial deposits.

Recent to late Quaternary-age alluvial deposits (Qal): are found throughout the Landfill. Soil types include Hanford coarse sandy loam, 2 to 9 percent slopes and Chino loam (Woodruff and others, 1970). Previous trenching (Kleinfelder 1989a and 1989b) show that the youngest alluvial deposits are typically interbedded yellowish brown sand and gravel mix. The younger alluvial deposits show characteristics of sheet flow and braided stream deposition. The clasts are subround to subangular with a small population of angular clasts indicating local sources for the clasts.

Artificial Fill

Artificial Fill (af): is present in areas along the southern flanks of the southern ridge system. This area has been used to store daily cover for landfill use and consists of stockpiled granular aterial associated with rock crushing operations on-site.

APPENDIX B - LITTLE ROCK FAULT PHOTOGRAPHS

Photo Number 1 - Depositional Contact "Fault B" between the grey Grandionite and the overlying tan Anaverde Formation

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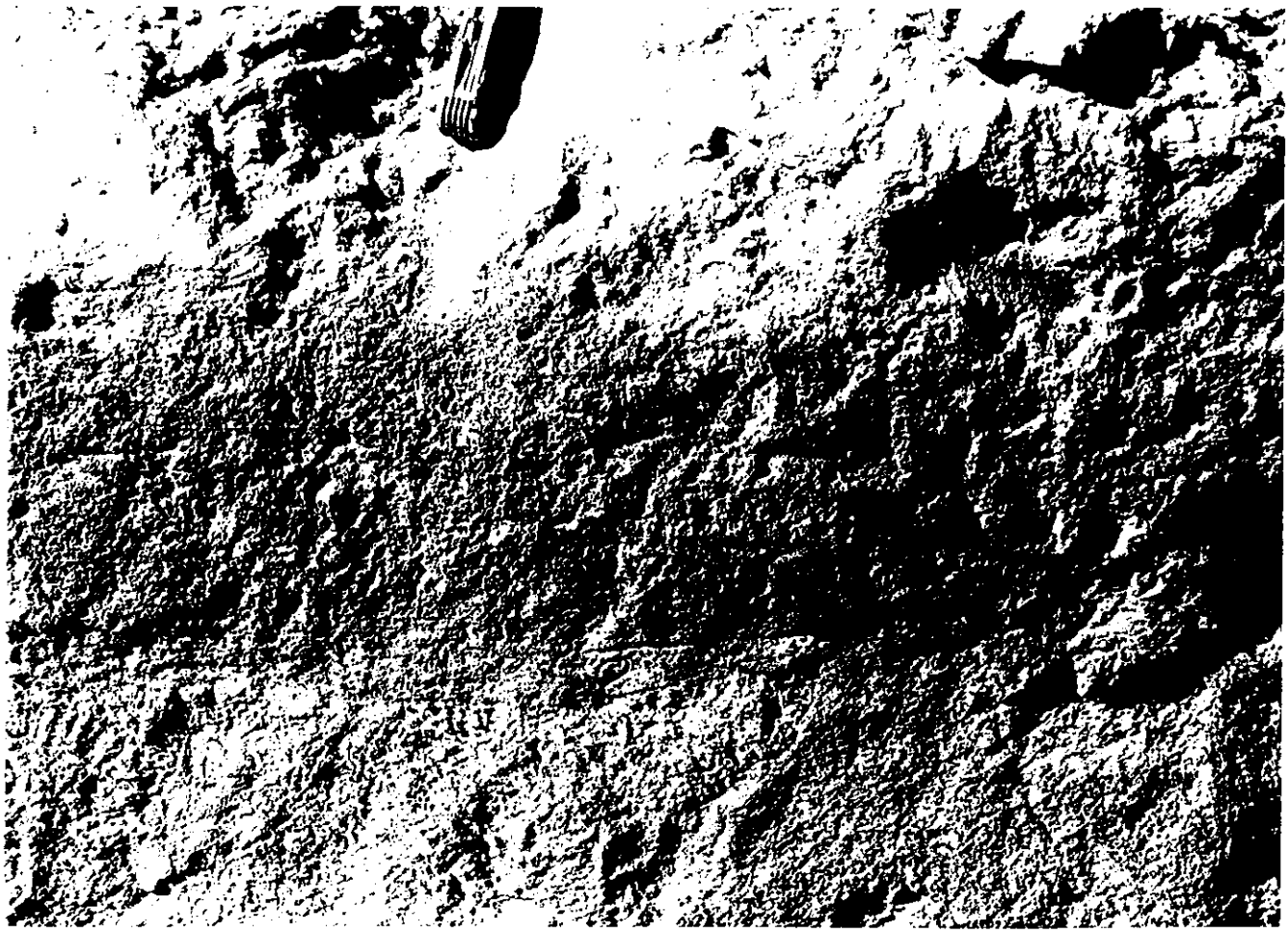

Photo Number 2 - Depositional Contact between underlying grey Grandionite and the tan Anaverde Formation

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Photo Number 3 - Contact between the Little Rock Fault and the overlying and unbroken Quaternary Terrace deposits

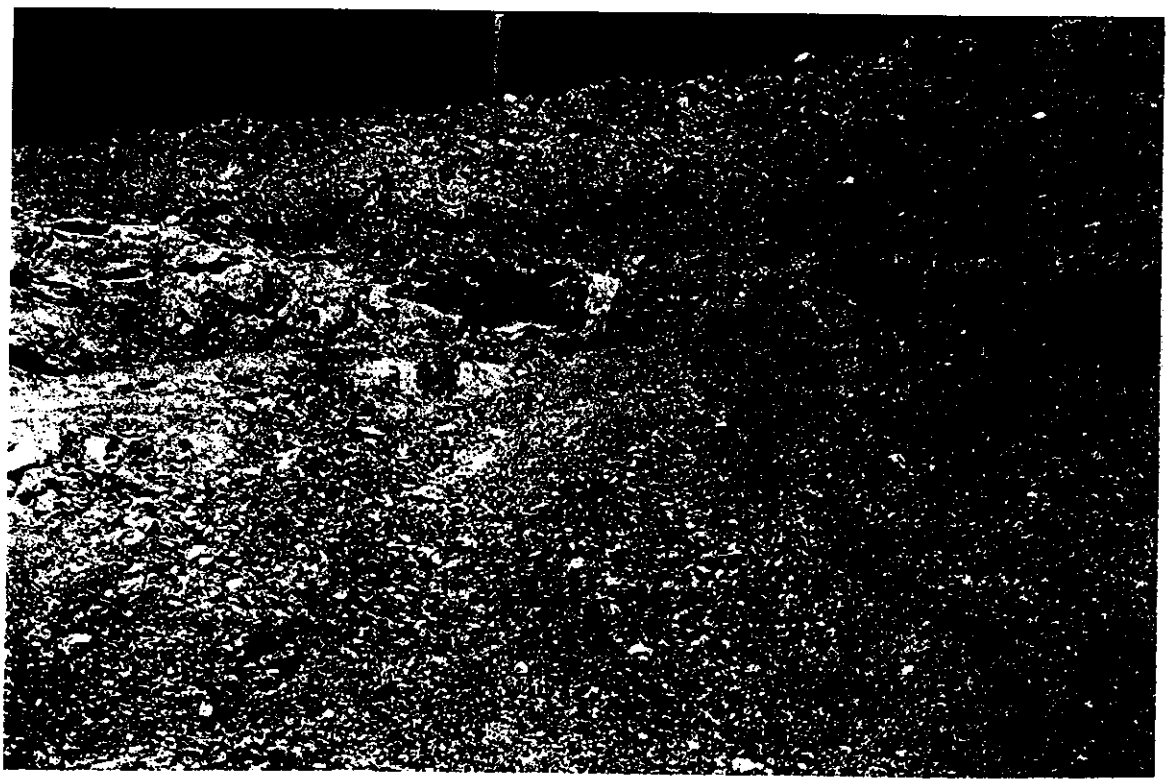

Photo Number 4 -Looking west at the contact between the Little Rock Fault and eight feet of unbroken Quaternary Terrace deposits overlying the fault

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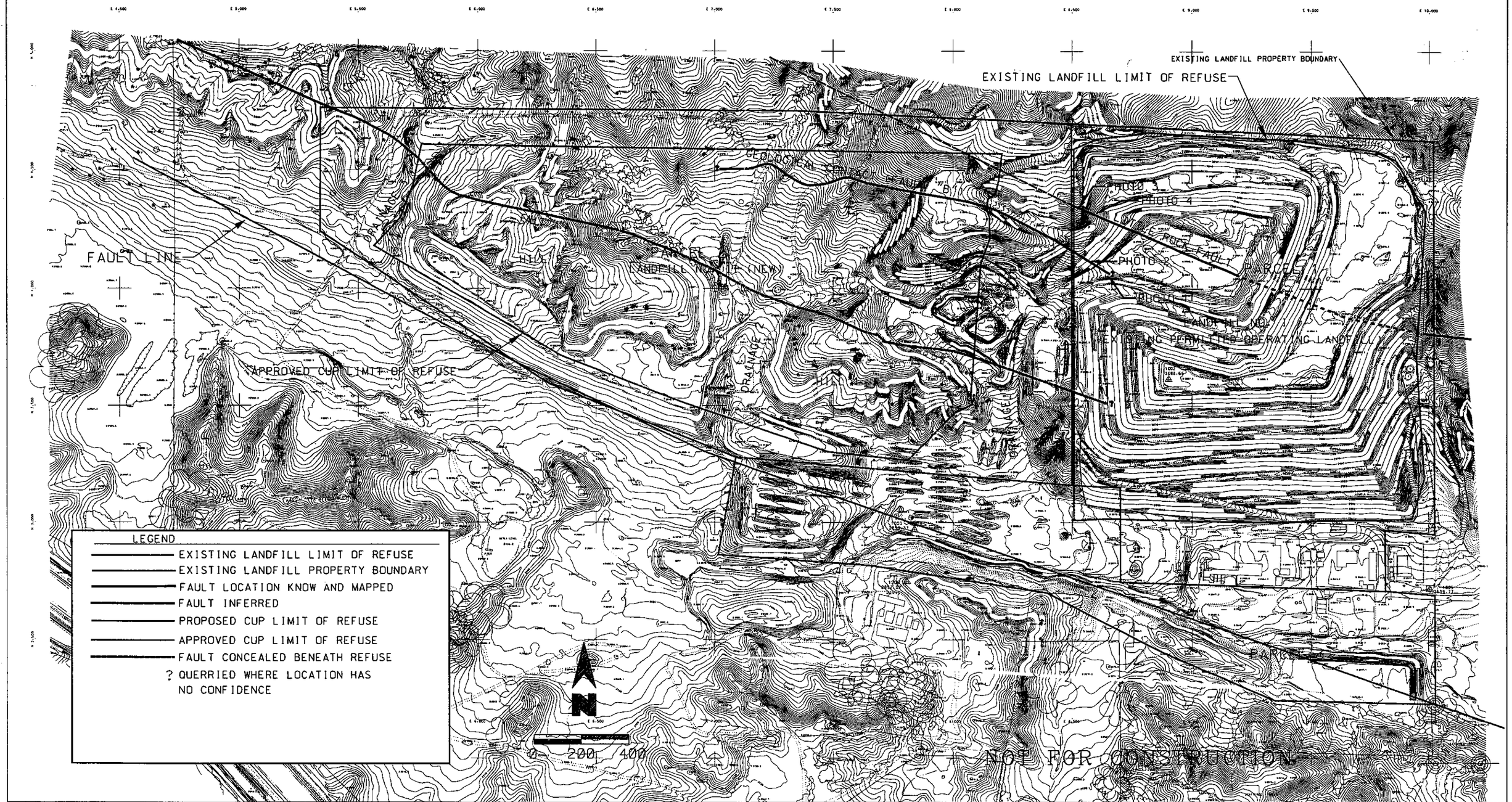
FIGURE 1

Enlarged Landfill II Property Boundary and

Refuse Limits Showing Fault Locations



REV.	DATE	DESCRIPTION	BY
1	2/23/00	MOVED LITTLE ROCK FAULT	MSL

DATE: 8/17/99
SCALE: 1" = 400'
DRAWN BY: M. LEICHTFUSS
CHECKED BY:
APPROVED BY:
REF. DWGS.:

LOCATION: ANTELOPE VALLEY PUBLIC LANDFILL

OWNER: PALMDALE DISPOSAL
PALMDALE, CA

GAS CONTROL ENGINEERING, INC.
1230 North Jefferson, Suite J
Anaheim, California 92806
(714) 632-9969
FAX (714) 632-9968

DESCRIPTION: ENLARGED LANDFILL II PROPERTY BOUNDARY AND REFUSE LIMITS SHOWING FAULT LOCATIONS

PROJECT NO.: 1124-4-2
REF. DWGS.:
FILE NAME: FIGURE 1

SHEET: FIGURE 1

...\faults\figure1c.dgn