URS

June 4, 2012

Sherrill Schoepe
Shadow Run Ranch, LLC
Post Office Box 1249
Pauma Valley, California 92061

Subject: Addendum to Geologic Hazards Study
Shadow Run Ranch, Draft EIR
Project Issue Item Nos. 20-2 through 20-5
County Project Numbers: TM 5223; MUP 00-30; BC 00-0205
URS Project No. 27661027.10000

Dear Ms. Schoepe:

In accordance with our proposal dated February 22, 2012, URS Corporation (URS) has prepared this addendum report in response to the County of San Diego, Department of Planning and Land Use (County) Project Issue Checklist.

PURPOSE

Project Issue Item Nos. 20-2 through 20-5 pertain to our previous report "Update Geologic Hazards Study – Shadow Run Ranch Pauma Valley, California" dated September 29, 2009". Our previous study was performed for the project draft EIR. The County's comments pertain to our geologic hazards assessment of the existing water supply reservoir at the site. The purpose of this addendum is to respond to these comments.

BACKGROUND INFORMATION

As described in our previous report, the existing reservoir was constructed in the early 1960's by making a shallow, bowl-shaped cut into the alluvial fan deposits underlying the mesa top and creating a low earth-fill embankment around the margins of the reservoir. A layer of bentonite was placed along the bottom of the reservoir to improve water retention. The topography of the reservoir area is shown on Figure 9 from our previous report (attached).

At the time of our previous study, an existing 24-inch outlet pipe maintained the reservoir water level at below about 1,085.4 feet Mean Sea Level (MSL). However, according to the preliminary grading plan prepared by Masson & Associates, Inc. a new spillway is proposed at elevation 1,082.6 feet MSL. The preliminary grading plan is included as Attachment A.

We had estimated the embankment fill slope to be up to about 25 feet high (measured from the approximate water level to the fill slope toe). With the addition of the new spillway, the water level will be lowered by about 2.8 feet. The embankment height will also be lowered by about 2.8 feet.

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Cross sections are shown on Figure 10 from our previous report (attached). Note the water level is planned to be about 3 feet lower than the level shown on Figure 10.

RESPONSES TO PROJECT ISSUES

Our responses to County Project Issues are provided below:

ITEM 20-2 – RESERVOIR EMBANKMENT STABILITY (PART 1)

Based on our previous study, the County had indicated that the existing reservoir would be subject to jurisdiction under the Department of Water Resources California Division of Safety of Dam (DSOD) based on the height of the embankment. Per DSOD criteria, a dam[1] 25 feet or more in height would be jurisdictional size. The existing reservoir storage capacity at that time was approximately 41 acre feet, which is non-jurisdictional size. With the new spillway, the reservoir storage is reduced to an estimated 34.5 acre-feet at elevation 1,083 MSL based on a previous topographic survey of the reservoir bottom (TerraData, 2000).

The new spillway at elevation 1,082.6 feet will lower the maximum water level by about 2.8 feet. The embankment height would also be lowered from 25 feet to about 22 feet (measured from the water level to the fill slope toe) and would not be of jurisdictional size according to DSOD criteria.

ITEM 20-3 – RESERVOIR EMBANKMENT STABILITY (PART 2)

As discussed in our previous study, we had performed preliminary geotechnical analyses to evaluate the stability of the fill slopes comprising the existing reservoir embankment. The embankment slopes are inclined at about 2.5 to 1 and 3 to 1 (horizontal to vertical), and are up to about 25 feet high (the height of the entire fill slope, including the slope above the water level). Our analyses indicated the relatively flat fill slopes should be grossly stable for both static and pseudo-static conditions.

As requested by the County, the results of the slope stability analyses are included as an Appendix (Appendix B attached to this addendum report). Appendix B provides a summary of the slope stability analyses. For the purpose of the draft EIR, the computed factors of safety meet minimum standards of stability.

ITEM 20-4 – FAULT RUPTURE

Our previous study included recommendations for building setbacks from the active Elsinore fault, mapped as the Main Fault on site. A previous version of the tentative map included a building pad to the east of the Main Fault. We had recommended that habitable structures not be sited in this area. According to the current grading plan, this issue was resolved by eliminating the house pad in question.

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[1] A dam is considered any artificial barrier.

ITEM 20-5 – OTHER HAZARDS

Our previous study addressed impacts and mitigations from potential geologic and seismic hazards, including reservoir overtopping during an earthquake. As mitigation measures, our previous study recommended that the project drainage system should be checked for its ability to handle short-term concentrated flows if seismic-induced overtopping of the reservoir were to occur. County comment Item 20-5 included the need for an evaluation of the project drainage system, as recommended. The County comment also requested consideration of the worst case scenario of failure of the existing reservoir embankment. These comments are addressed below.

Assessment of Potential Reservoir Overtopping

Overtopping of the reservoir may be a potential effect as a result of seismic shaking from a local or distant earthquake. The natural hillside east of the reservoir is underlain by granitic rock, which if shaken by an earthquake, is unlikely to slide into the reservoir and create an overtopping wave. However, the effects of seismic shaking on an enclosed body of water (like a lake or reservoir) could produce oscillation of the water surface, known as a seiche. The seiche is essentially like a standing wave, wherein the edges of the wave can slosh over, or overtop the enclosing banks. In this case, some of the water within the reservoir could slosh or run-up over the top the embankment. If enough water were to slosh over the embankment, it could produce concentrated flows that could impact the proposed house pads some distance downslope from the reservoir.

The potential for seismic-induced overtopping is further reduced by the increased freeboard in the reservoir. In our previous study, it was noted that the existing reservoir freeboard (about 5 feet) would significantly reduce potential seismic-induced overtopping. The top of the existing embankment is at approximate elevation 1,090 feet MSL, and is about 10 to 15 feet wide (about a vehicle width). With the new spillway (and the resulting lowered water level at 1,082.6 feet), the reservoir freeboard has been increased by about 3 feet, which increases the total freeboard up to about 8 feet

In order to evaluate potential overtopping flows, we performed simplistic analyses to estimate the potential height of a seiche, based on published literature[2]. The approach represents a simplified method to estimate the wave height of a seiche generated by seismic motion in a lake or other enclosed body of water. The analysis was performed to assess potential wave run-up resulting from a seiche. As outlined in Attachment B, the predicted wave height estimated with the strong ground motion from an earthquake with a 500-year return is small, at about less than a centimeter high.

The predicted low wave height, together with the increased freeboard indicates the likelihood of reservoir overtopping during an earthquake should be low.

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[2] National Institute of Building Sciences, 1997, Earthquake Loss Estimation Methodology, HAZUS Technical Manual, Volume II, prepared for Federal Emergency Management Agency

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Assessment of Drainage Features

According to the preliminary grading plan (Attachment A), the project preliminary design includes new drainage features at and in the area below the reservoir, including: the new spillway, roadway brow ditches, earth swales, and hydromodification catch basins.

As shown on the attached preliminary plans, the new access road below the reservoir includes 3-foot wide brow ditches on the upslope side and several catch basins. The proposed catch basins are storm water IMP (Integrated Management Practice) bioretention facility features, which include overflow risers between 36- and 48-inches in diameter. These are primarily water quality treatment basins, which are also designed to accommodate the runoff from the 100-year storm. The overflow risers could be up-sized if necessary.

The new spillway will be about 20 feet wide and can accommodate up to about 2,000 cubic feet per second, according to Masson & Associates. If water flowed into the spillway during a seismic event, the spillway would direct flow away from the proposed residences into a natural drainage course below the southeast part of the reservoir. The drainage course feeds into proposed catch basins. Existing stockpiled boulders on the slope below the proposed spillway (see Figure 9) would help disperse flow.

The proposed residential pads will have earth swale ditches at the top of nearby slopes. The earth swales would route any overland flow away from the proposed residences.

Failure of the Existing Embankment

As part of this comment, we were asked to consider the worse-case scenario of failure of the existing reservoir embankment. As discussed above per Item 20-3, the reservoir embankment slope had been analyzed for static and dynamic slope stability and is considered stable from a geotechnical perspective. The stability analyses indicate only shallow sloughing of the embankment may occur during strong earthquake shaking. The bentonite layer lining the reservoir would reduce leakage that might result from cracking and/or lurching of the slope.

The bowl-shaped excavation made to create the reservoir is evident on the 1961 topographic map (see Figure 9). The fill creating the low embankment slope around the west and south part of the reservoir (see current topography, Figure 9) appears to have been constructed at a later date.

With the 3-foot lowered water level, storage within the reservoir is mostly within a cut area underlain by alluvial fan deposits. The water is essentially in “dead storage” inasmuch as the existing embankment fill soils provide little containment. Therefore, the worse-case scenario of the failure of the embankment would likely not result in major, complete release of water from the reservoir, because the embankment retains only a portion of the water in storage. Deep seated instability of the embankment fill slope presents a low hazard based on our previous stability analyses.

We had noted that the two existing 12-inch discharge pipes could be used to drawdown the reservoir following an earthquake. The pipes could be upsized if necessary, and additional drainage lines could be installed.

We anticipate additional geotechnical investigations would be performed for final design of the project. The proposed mitigations include a new spillway, lowered reservoir level and proposed drainage features. For the purpose of the EIR, no significant impacts are anticipated as result of seismic induced reservoir overtopping or failure of the embankment.

CLOSURE

This letter report should be considered an addendum to our previous report dated September 29, 2009. If there are any further comments or questions, please let us know.

Sincerely,

URS CORPORATION

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Exp. 5/31/13
STATE OF CALIFORNIA

Charles Robin (Rob) Stroop, G.E. 2298
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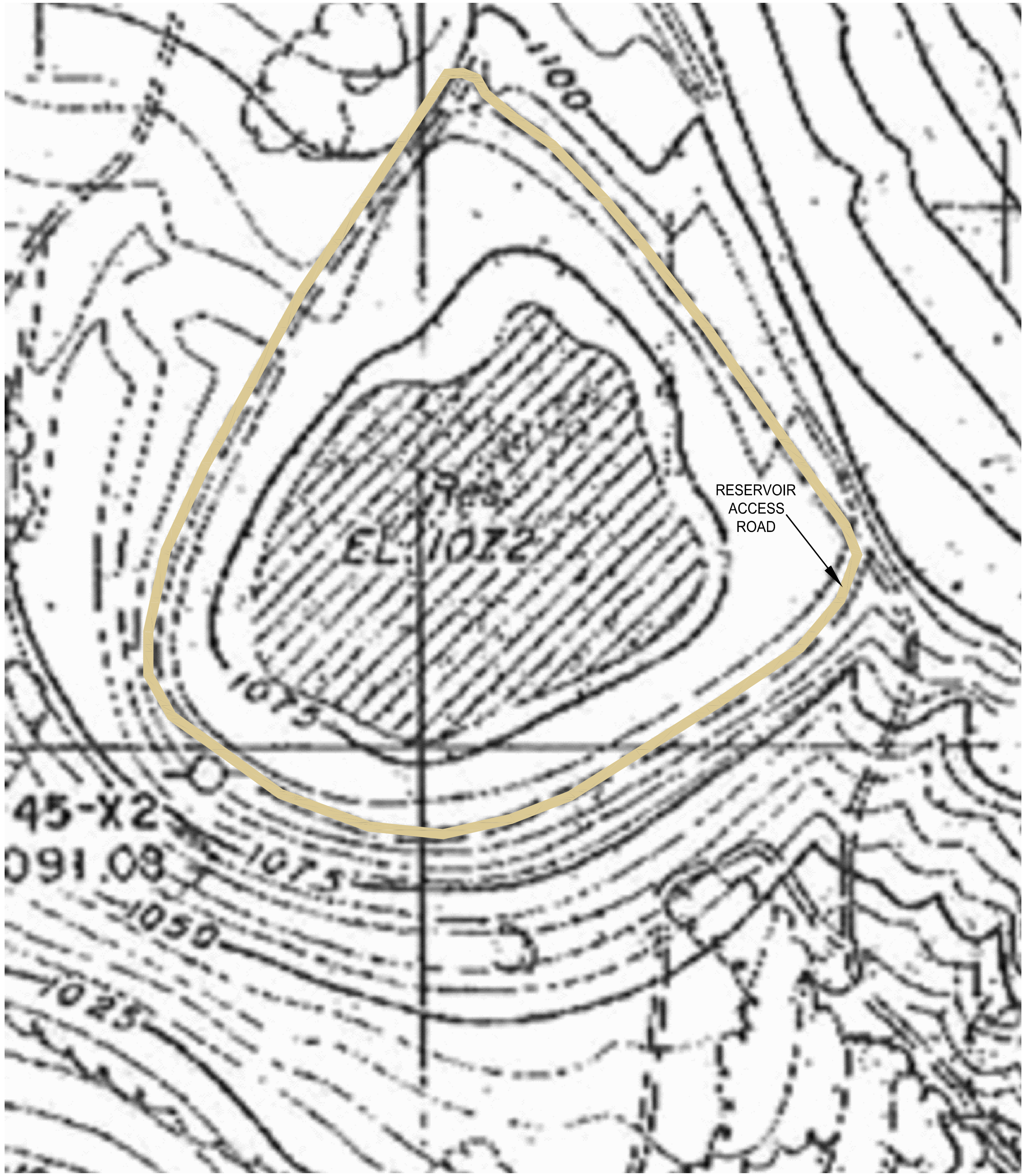
REGISTERED PROFESSIONAL ENGINEER
CHARLES R. STROOP
NO. 2298
Exp. 3/31/14
GEOTECHNICAL
STATE OF CALIFORNIA

DLS/CRS:ml

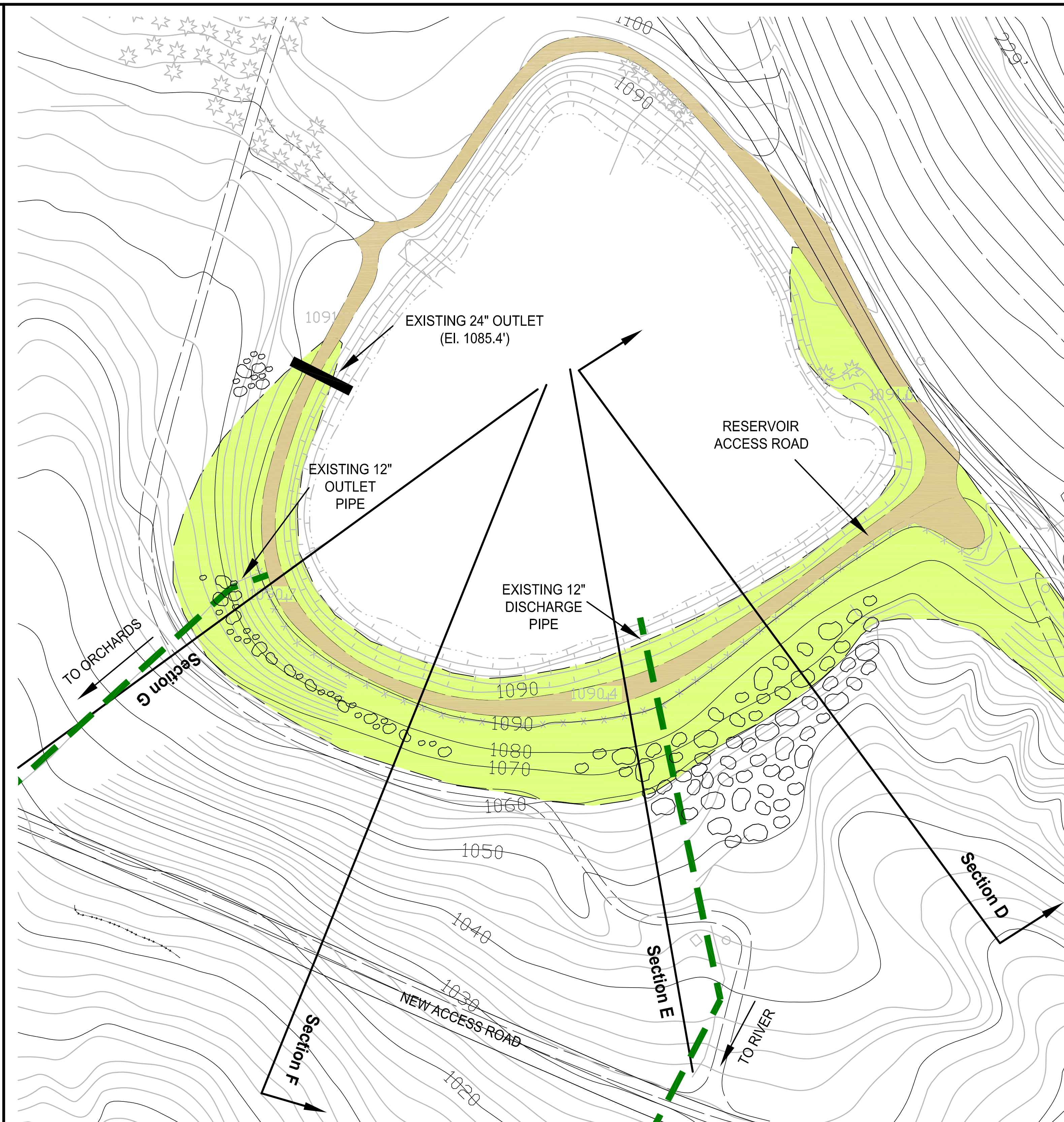
Attachments:

Attachment A: Preliminary Grading Plan
Attachment B: Assessment of Seiche Hazards
Appendix B: Previous Slope Stability Analyses



1961 TOPOGRAPHIC MAP

SOURCE: San Diego County, Sheet 430–1767



CURRENT TOPOGRAPHY

LEGEND

FILL (APPROXIMATE LIMITS)

STOCKPILED BOULDERS (APPROXIMATE LIMITS) NOT TO SCALE

N

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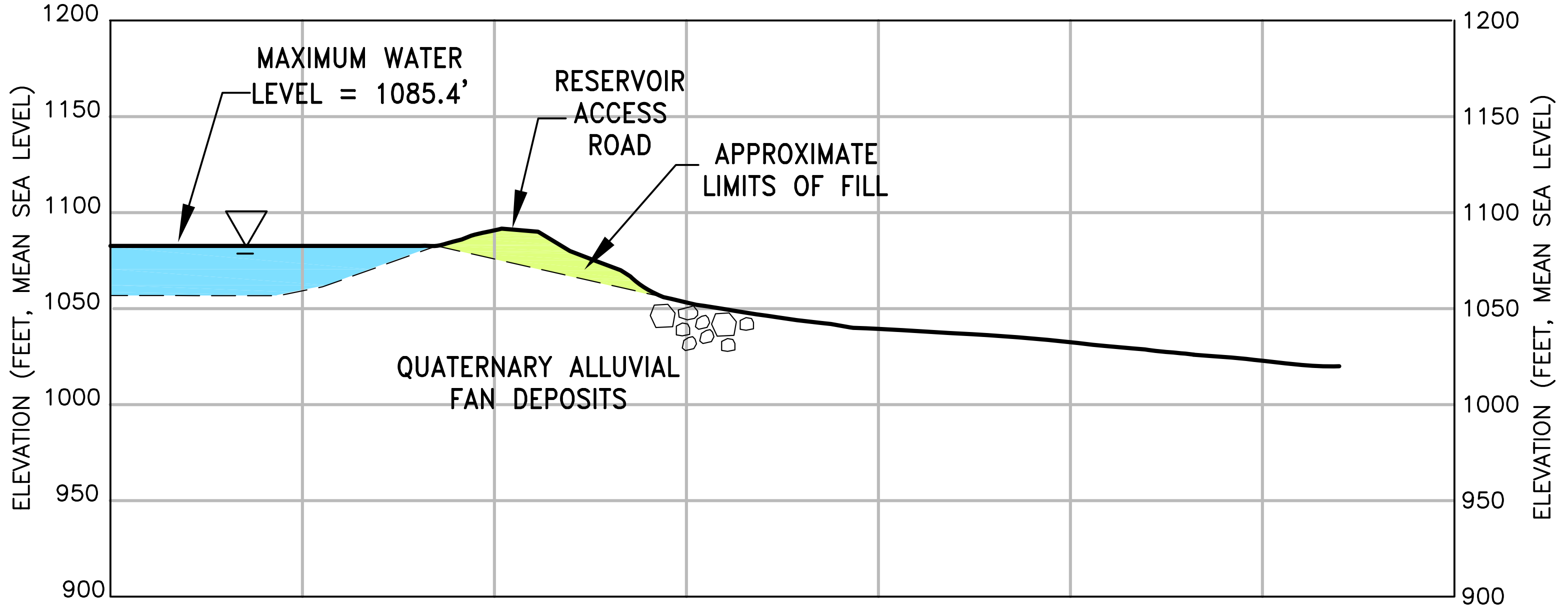
TOPOGRAPHIC MAPS
EXISTING RESERVOIR
SHADOW RUN RANCH

50 0 50 100 Feet

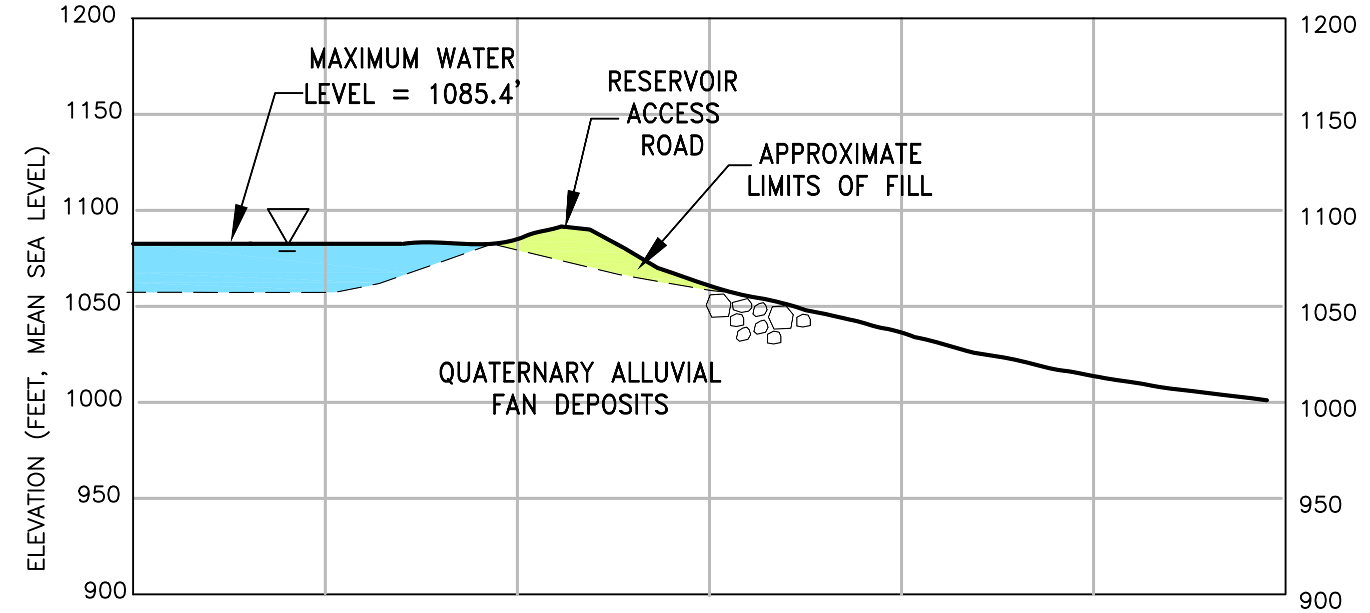
SCALE: 1"= 100'

CHECKED BY:	DATE: 04–14–09	FIG. NO:
PM: DLS	PROJ. NO: 27665024.00003	9

SECTION D



SECTION E



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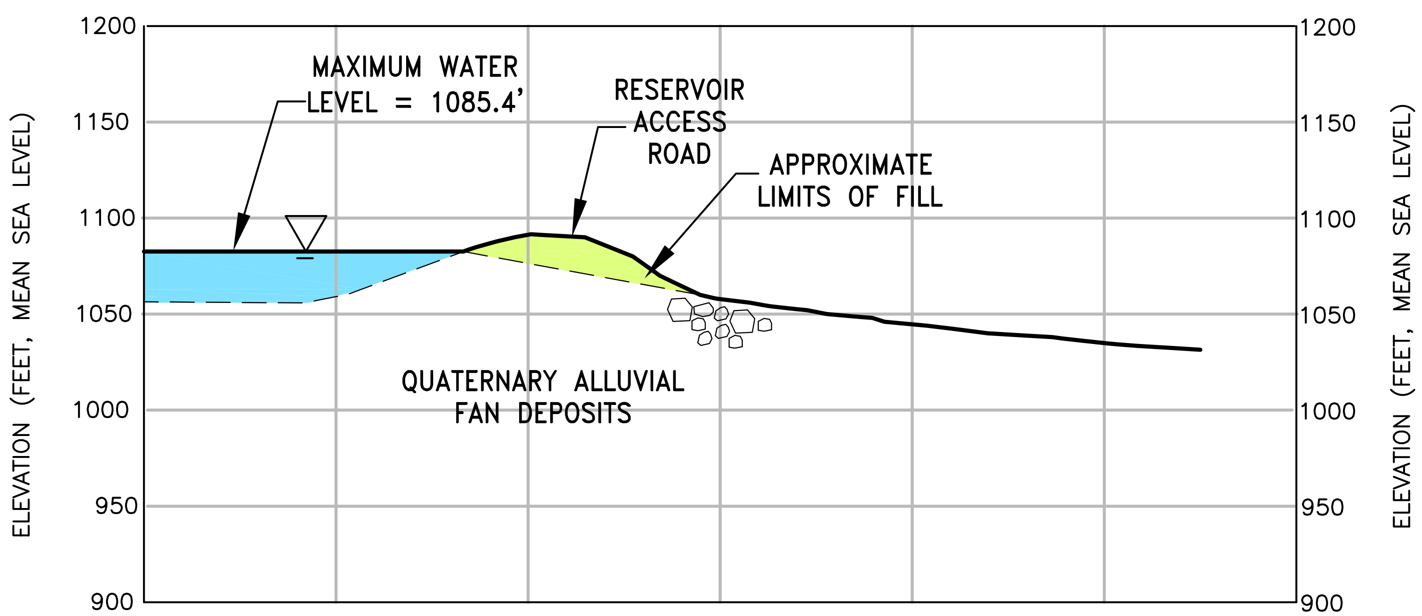

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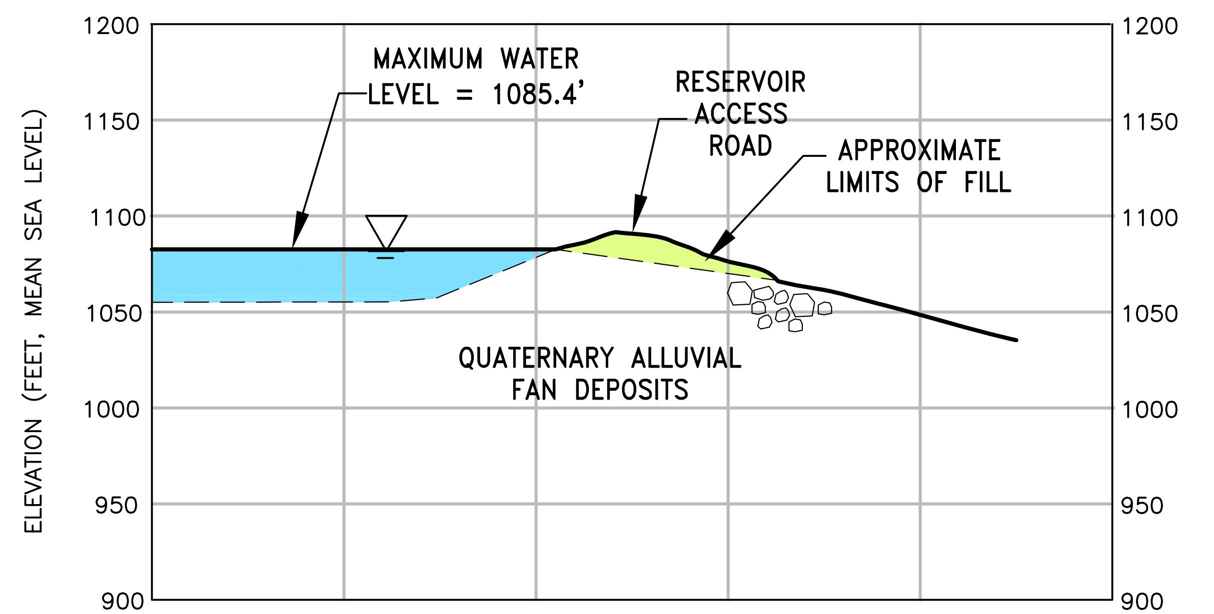

GENERALIZED CROSS SECTIONS D, E, F AND G
EXISTING RESERVOIR
SHADOW RUN RANCH

URS	50 0 50 100 Feet SCALE: 1"= 100'	CHECKED BY:	DATE: 04-14-09	FIG. NO: 10
		PM: DLS	PROJ. NO: 27665024.00003	

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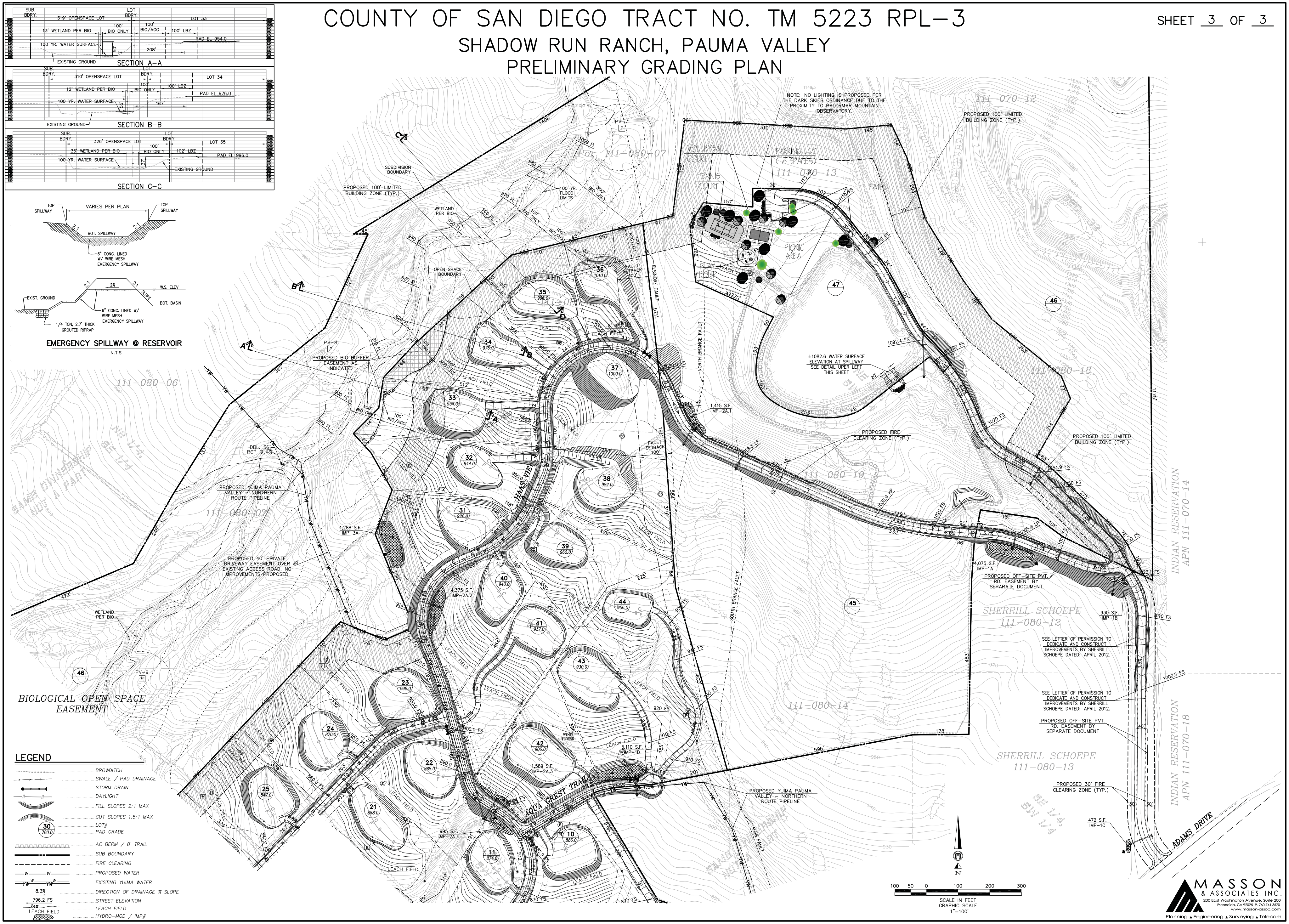
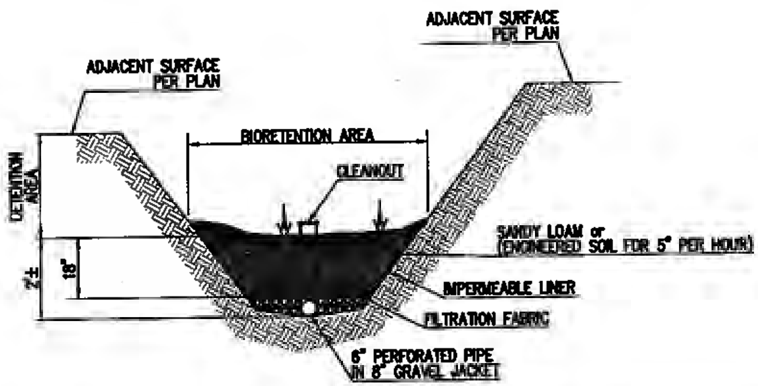
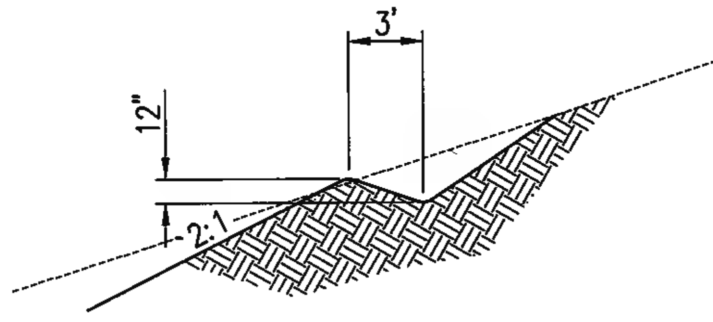


Attachment A- Preliminary Grading Plan



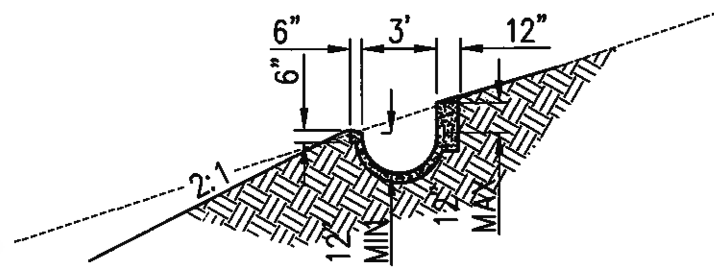
BIORETENTION FACILITY SECTION

Scale: NTS



EARTH SWALE DITCH DETAIL

N.T.S.



D–75 BROW DITCH DETAIL

N.T.S.

Attachment A- Preliminary Grading Plan

Attachment B

Assessment of Seiche Hazards

Shadow Run Ranch- Addendum to Geologic Hazards Study

The procedure used to evaluate the seiche hazards in the reservoir were adopted from the Earthquake Loss Estimation Methodology HAZUS Technical Manual Volume 2 (prepared by the National Institute of Building Services and dated 1997). A seiche is an oscillating wave in an enclosed body of water such as a reservoir that occurs due to an external disturbance such as an earthquake. The simplified procedure presented here can be used to assess the wave run-up in the reservoir by incorporating the reservoir dimensions, wavelength and peak ground accelerations.

The peak wave height generated by an earthquake can be estimated with the following equation:

$$H = \sqrt{\frac{A}{L(\pi f)^2}}$$

where H = peak wave height (cm)

A = peak ground acceleration (in g's)

f = frequency of the lake (Hz)

L = wavelength = 5.12 / f^2

In the above equation, the frequency cancels out of the equation. Assuming a peak ground acceleration of 1g, the peak wave height is 0.14 cm.

The period of the seiche can be estimated with the following equation:

$$T_n = \frac{2l_b}{n\sqrt{gd}}$$

where T_n = period (sec)

l_b = length of the basin

n = number of nodes

g = gravitational acceleration

d = depth of water

Assuming a 400 foot length of basin and a 20 foot depth of water, the period of one node is approximately 30 seconds. This equation assumes a uniform and constant cross section in the reservoir basin.

This appendix provides slope stability analyses performed for our previous report “Update Geologic Hazards Study – Shadow Run Ranch Pauma Valley, California” dated September 29, 2009”.

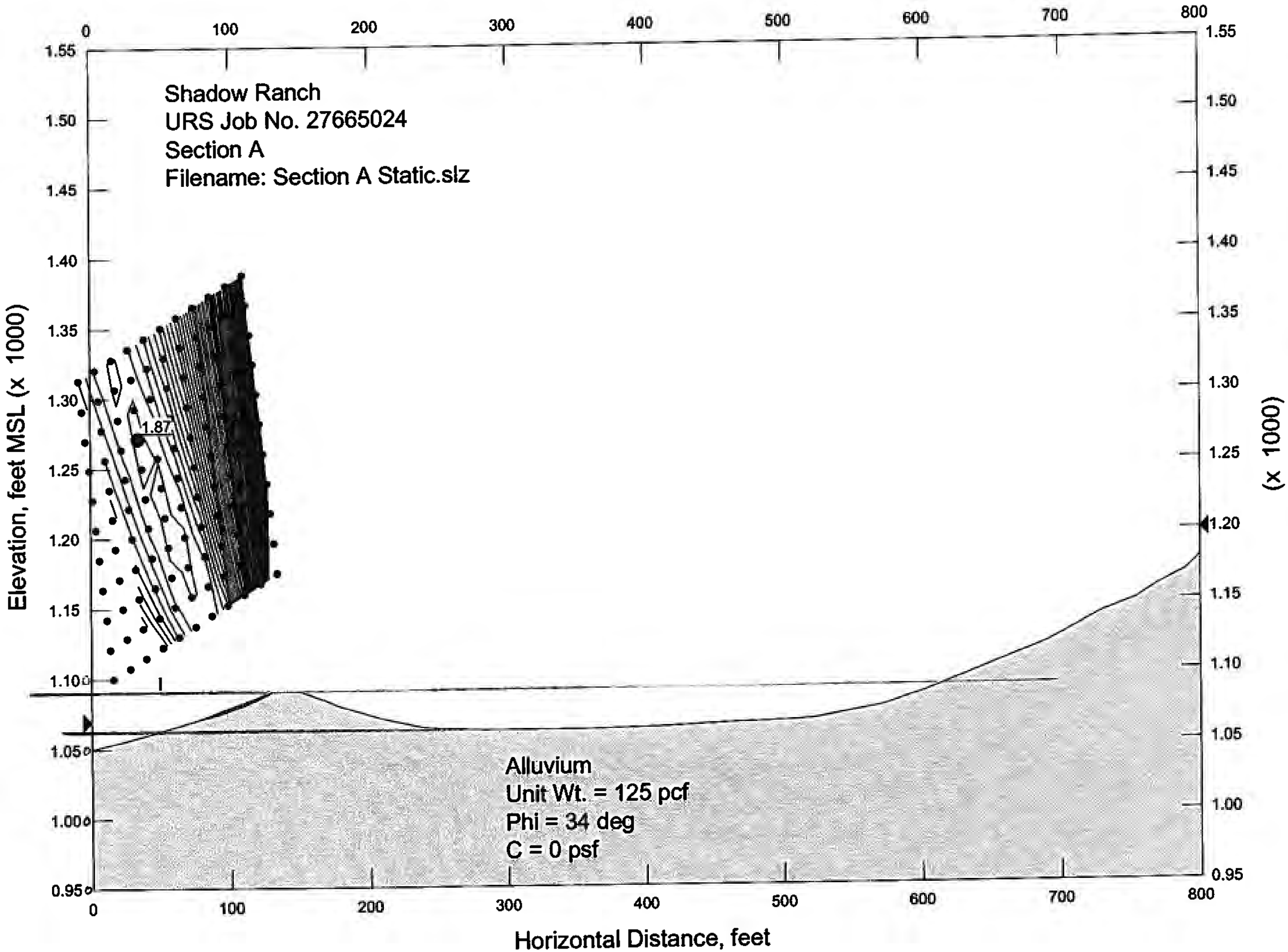
Project Name: Shadow Run Ranch Geologic Hazards Study
Location: Pauma Valley, California
Project Number: 27665024.00002
By: JLN
Date: 05/30/05

Summary of Slope Stability Analysis

Case No.	Section	Minimum Factor of Safety (FS)		Location of Minimum FS
1a	A-A'	1.87	Static Case	West/Downstream
1b	A-A'	1.12	Psuedo-Static Case	West/Downstream
2a	A-A'	1.89	Static Case	West/Upstream
2b	A-A'	1.13	Psuedo-Static Case	West/Upstream
3a	B-B'	1.65	Static Case	South/Downstream
3b	B-B'	1.07	Psuedo-Static Case	South/Downstream
4a	B-B'	2.25	Static Case	South/Upstream
4b	B-B'	1.27	Psuedo-Static Case	South/Upstream

Notes:
1. Per Caltrans recommendations, the seismic coefficient, k, was assumed to be 0.2g, which is equal to 1/3 PGA.
2. The PGA was evaluated to be 0.59g from the California Geological Survey (CGS) for an earthquake return period of years (10% probability in years).
3. The strength properties for the fill were conservatively assumed to be the same as that of alluvium.
4. The strength properties of alluvium/fill were assumed to be $c=0$; $\Phi=34°$; $\gamma=125$ psf.
4. No water seepage through the embankment was assumed.
5. Groundwater level is assumed to be deeper than 100 feet.
6. The water level in the reservoir was conservatively assumed to be zero.

CASE No. 1a



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Alluvium
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Phi = 34 deg
C = 0 psf
Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
0
100
200
300
400
500
600
700
800
1.55
1.50
1.45
1.40
1.35
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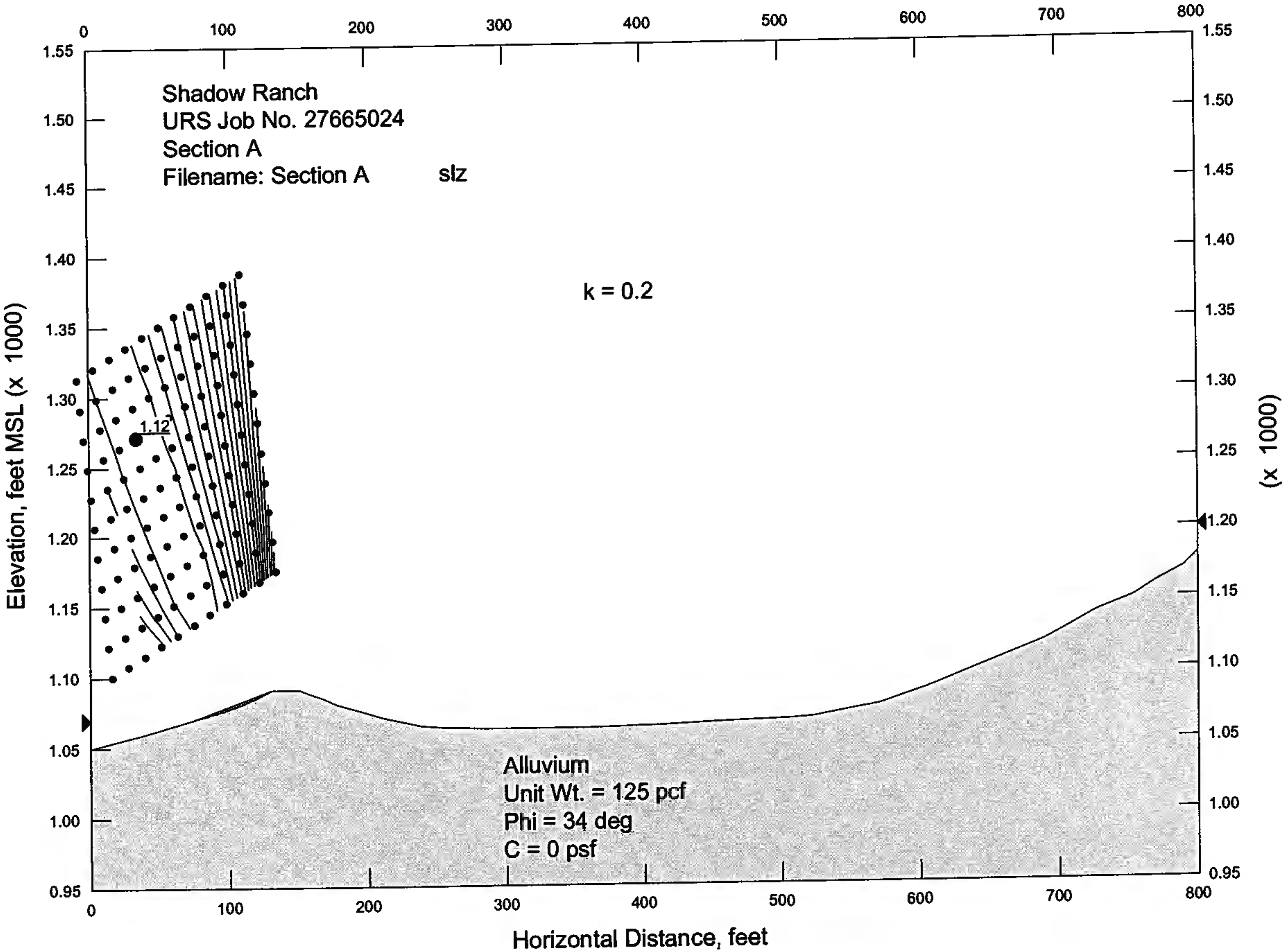
1.25
1.20
1.15
1.10
1.05
1.00
0.95

CASE No. 16



Shadow Ranch
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Alluvium
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Phi = 34 deg
C = 0 psf
Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
0
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0.95
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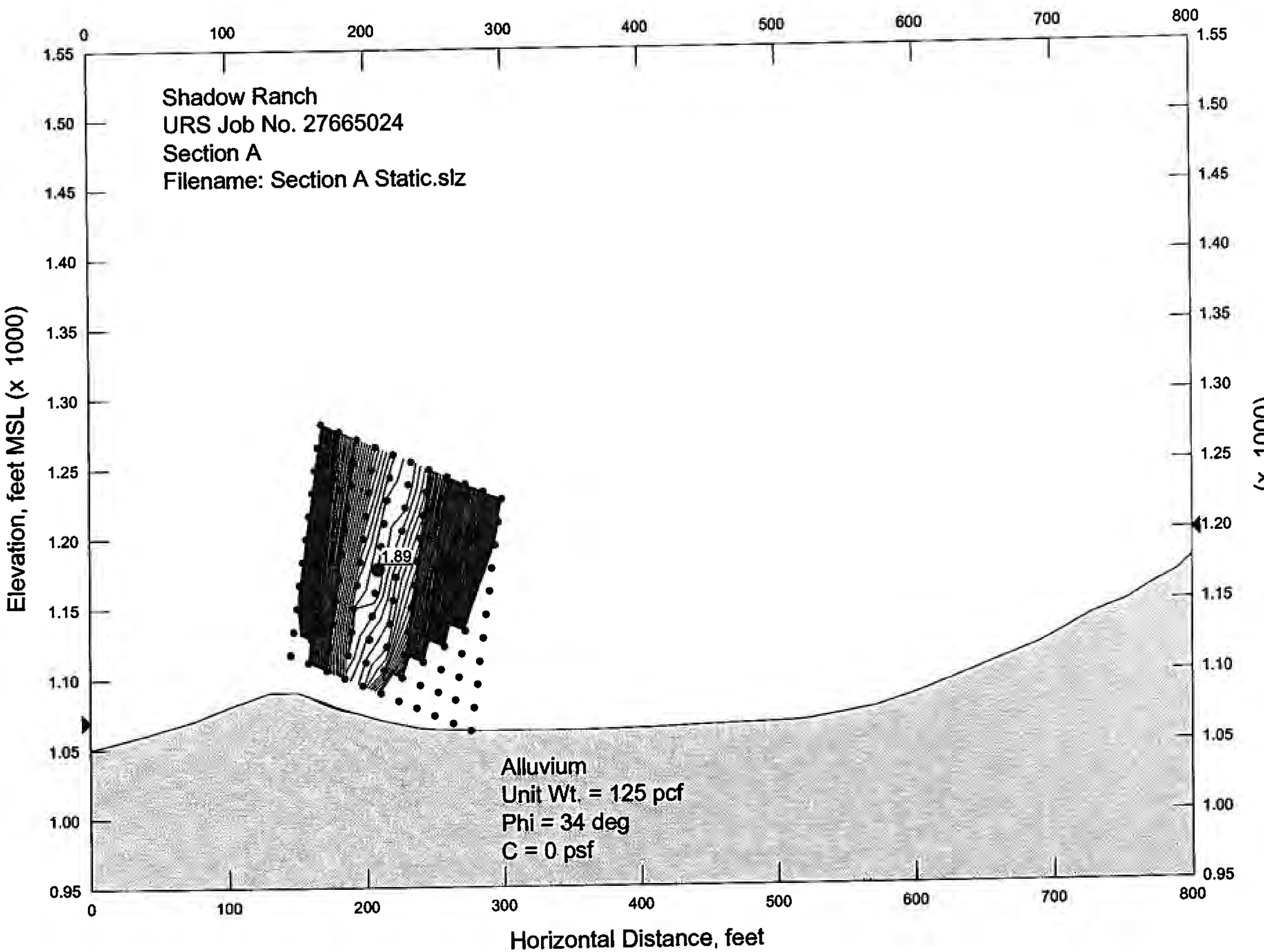
1.45
1.50
1.55

Case No. 2a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(x 1000)
Horizontal Distance, feet
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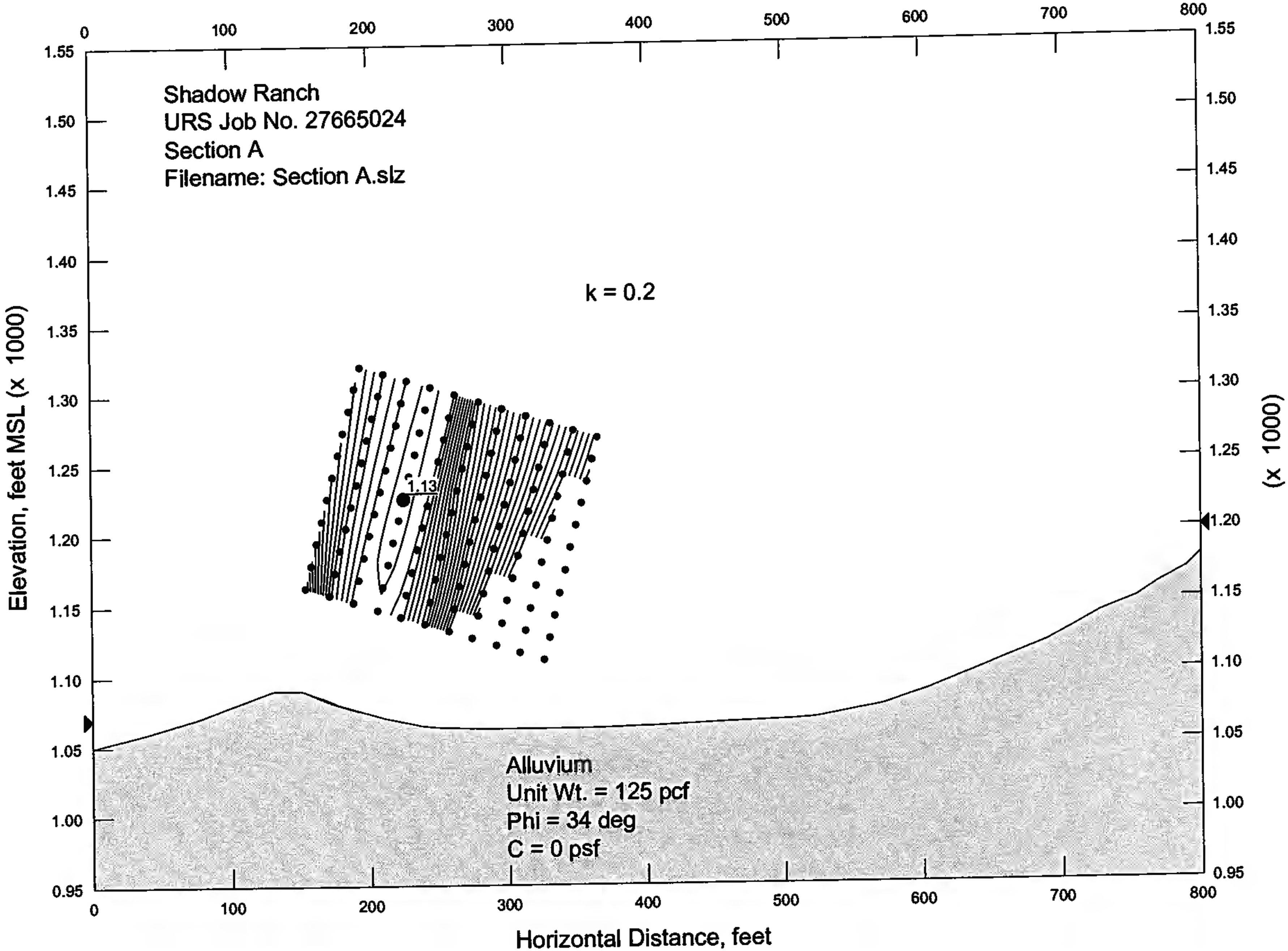

Shadow Ranch
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C = 0 psf
Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
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1.55

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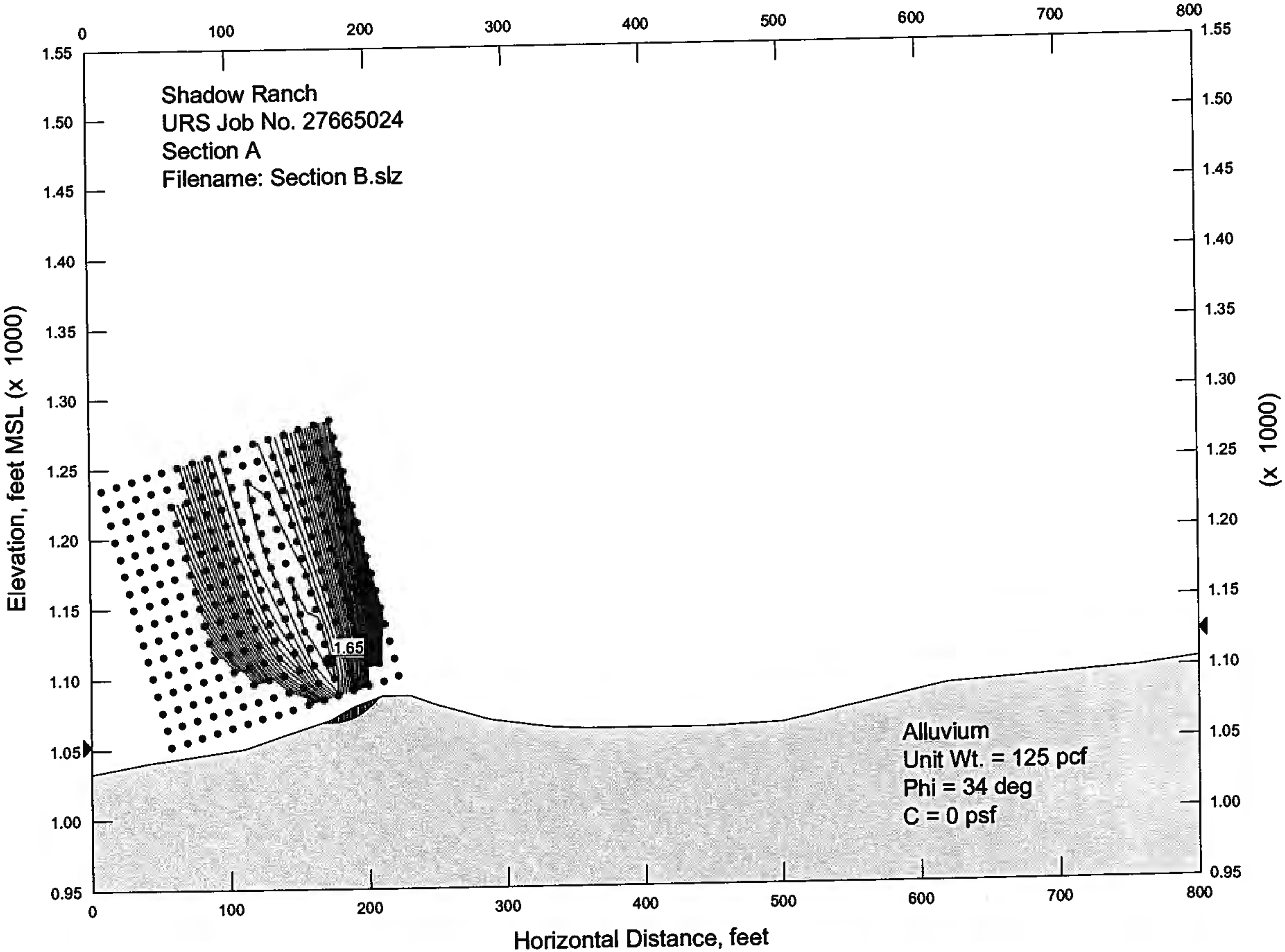
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Section A
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Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
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100
200
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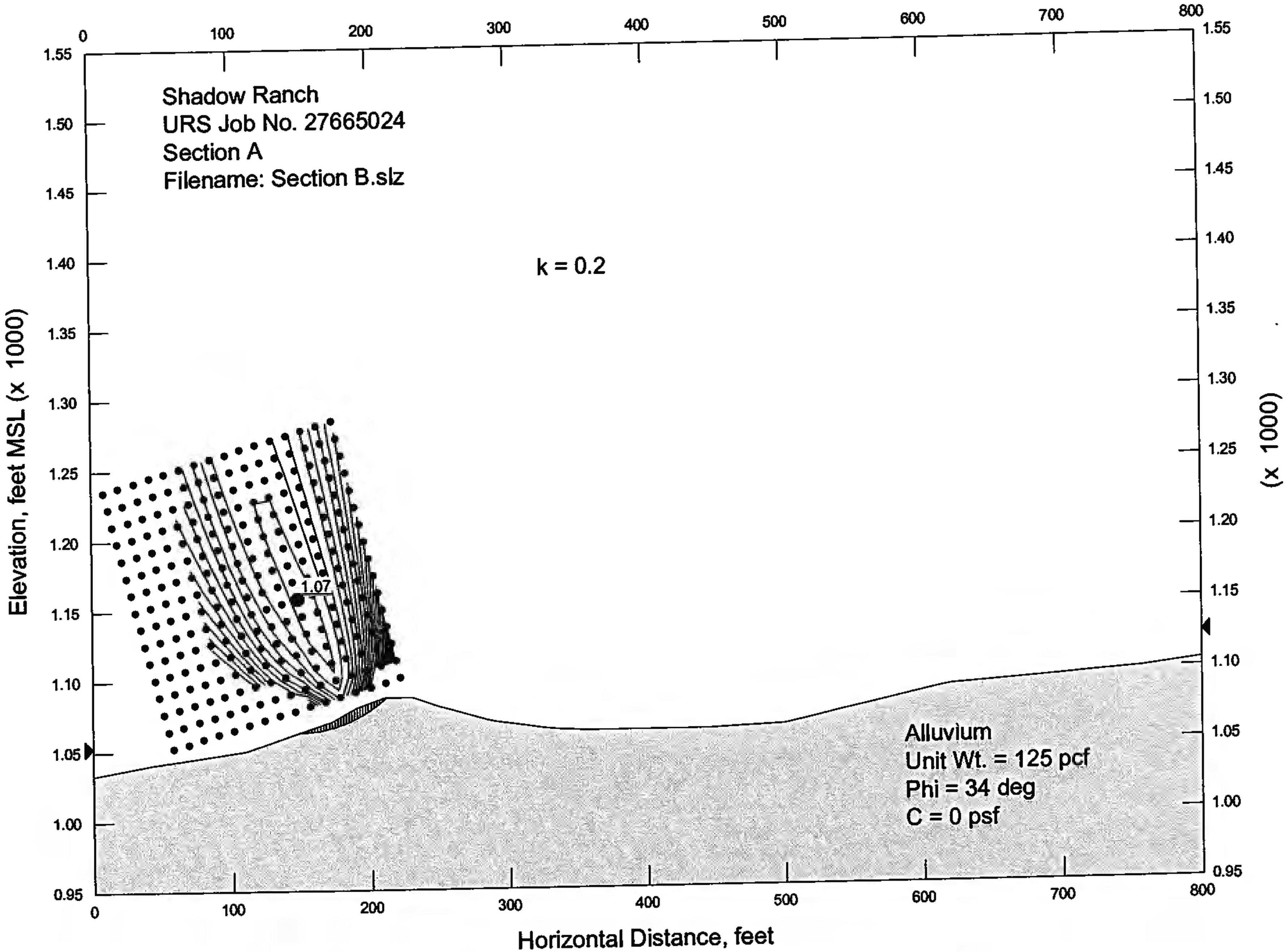
CASE No-36


Shadow Ranch
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Section A
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C = 0 psf
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(x 1000)
Horizontal Distance, feet
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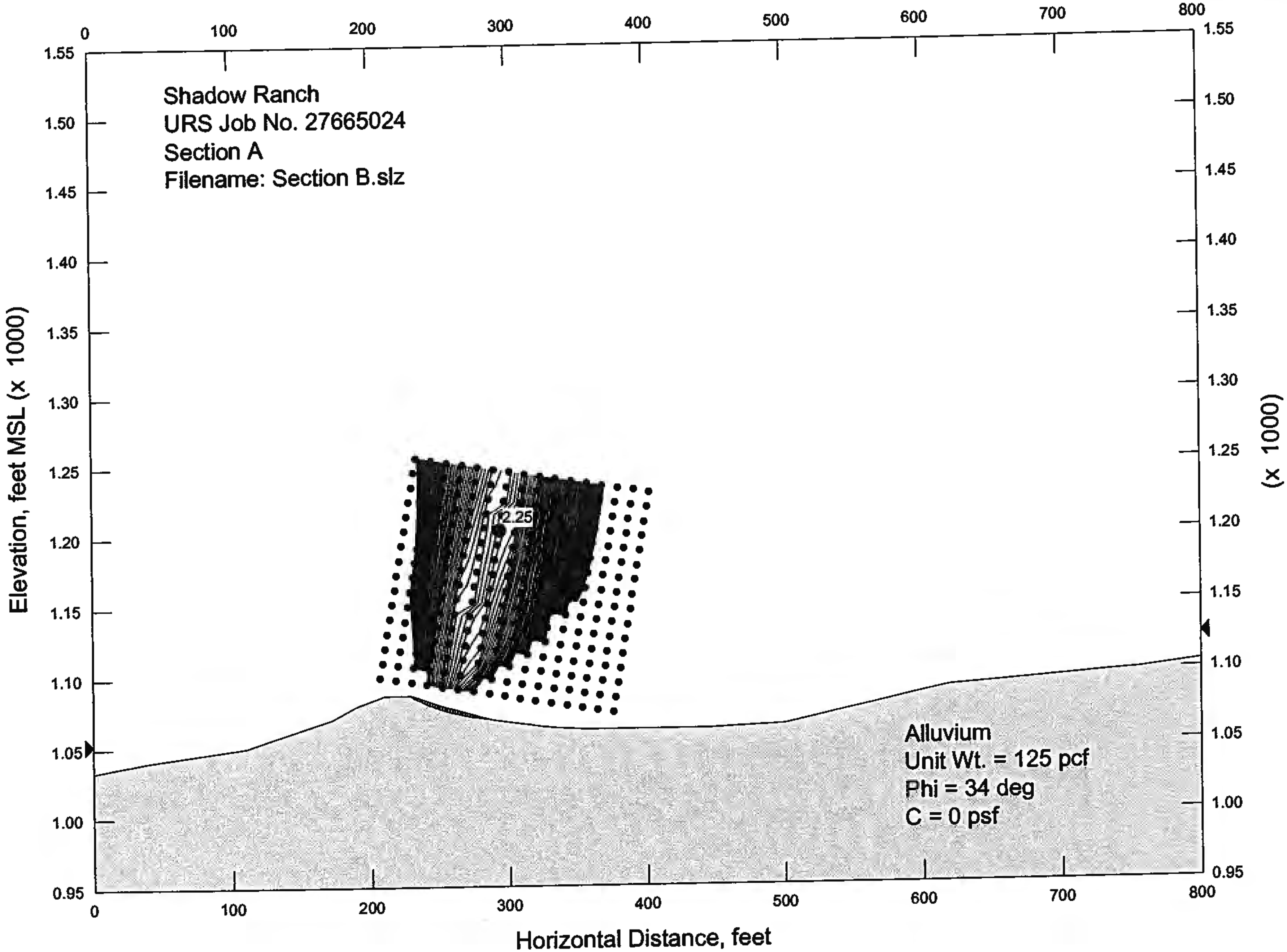
Case No. 4a



Shadow Ranch
URS Job No. 27665024
Section A
Filename: Section B.slz
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Alluvium
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Phi = 34 deg
C = 0 psf
Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
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400
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0.95
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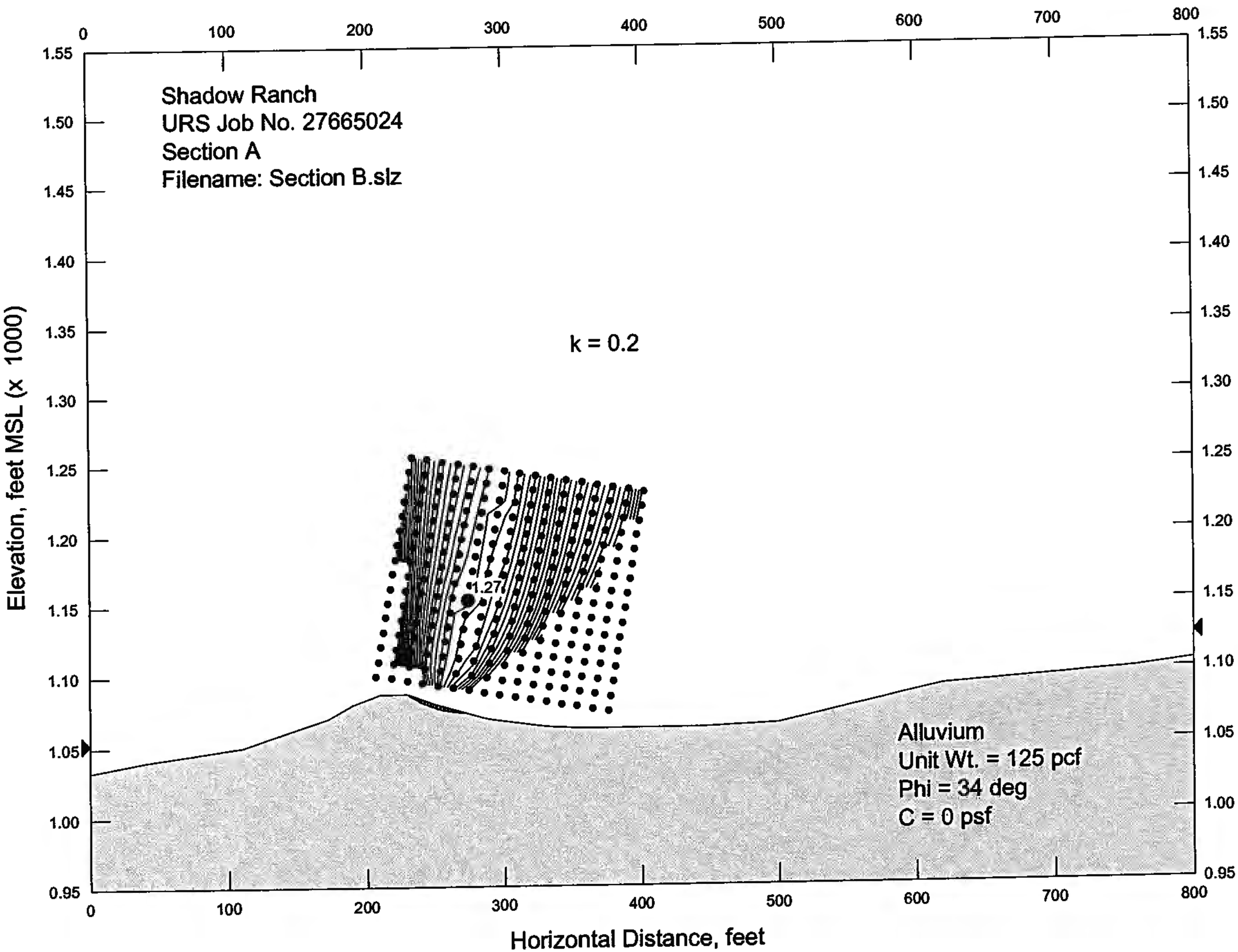
CASE No. 46



Shadow Ranch
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1.27
Alluvium
Unit Wt. = 125 pcf
Phi = 34 deg
C = 0 psf
Elevation, feet MSL (x 1000)
(x 1000)
Horizontal Distance, feet
0
100
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600
700
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1.05
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1.25
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1.45
1.50
1.55

California Home Thursda

Department of Conservation

California Geological Survey

Probablistic Seismic Hazards Assessment Page

Earthquakes (Recent & Historic)

California Fault Database

Loss Estimation

Aquist-Priolo Earthquake Fault Zoning Act

Seismic Shaking Hazard Maps of California

CGS Links

About Us

Contact Us

Jobs

Site Map

Help/FAQ

California Geological Survey

My CA

Probabilistic Seismic Hazards Mapping Ground Motion Page

User Selected Site

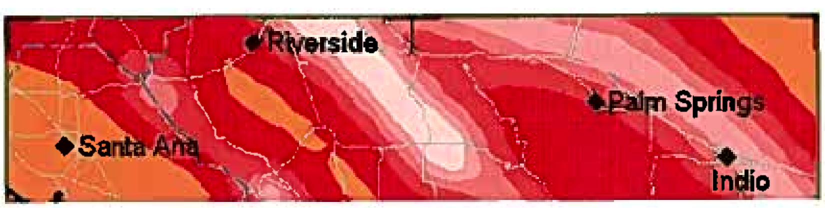
Longitude	-117.035
Latitude	33.348

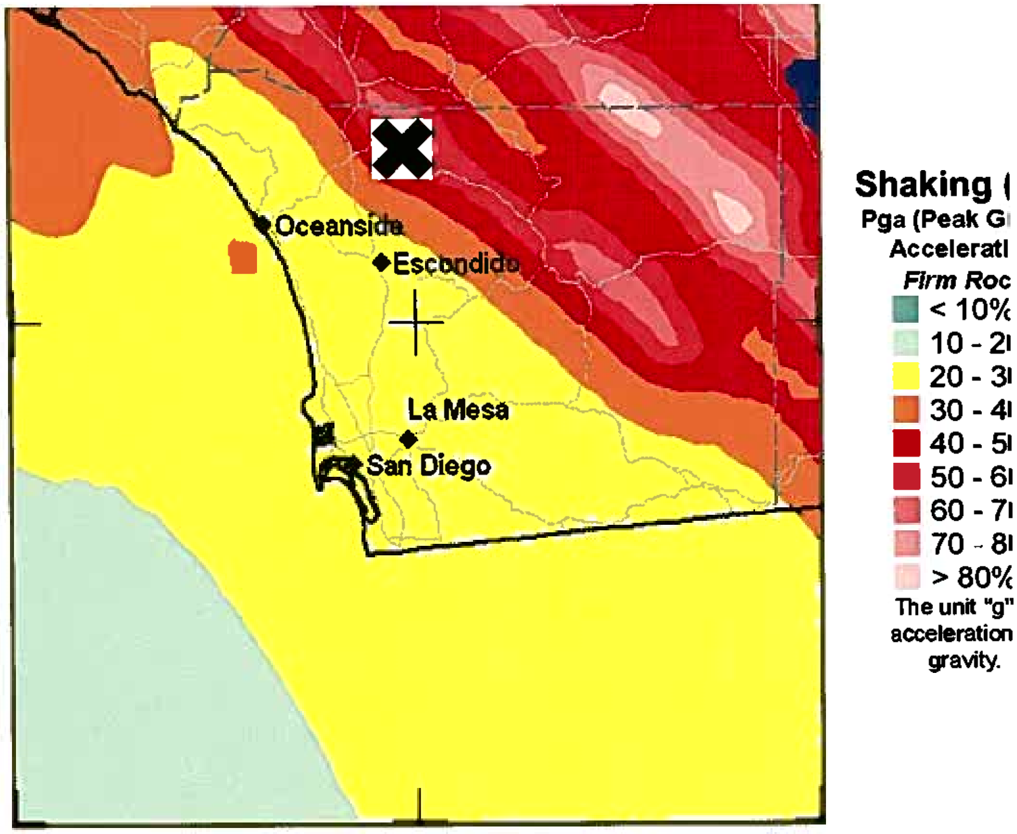
Ground Motions for User Selected Site

Ground motions (10% probability of being exceeded in 50 years) are expresse of the acceleration due to gravity (g). Three values of ground motion are show ground acceleration (Pga), spectral acceleration(Sa) at short (0.2 second) and ı long (1.0 second) periods. Ground motion values are also modified by the loca conditions. Each ground motion value is shown for 3 different site conditions: (conditions on the boundary between site categories B and C as defined by the code), soft rock (site category C) and alluvium (site category D).

Ground Motion	Firm Rock	Soft Rock	Alluvium
Pga	0.59	0.59	0.59
Sa 0.2 sec	1.378	1.378	1.378
Sa 1.0 sec	0.507	0.6	0.689

NEHRP Soil Corrections were used to calculate Soft Rock and Alluvium. *Ground Motion values were interpolated from a grid (0.05 degree spacing) of calculated values. Interpolated ground motion may not equal values calculated for a specific site, therefore these values are not intended for design or analysis.*





***Click here** to return to the statewide PSHA map or enter new coordinat*

Longitude: [ ] Latitude: [ ] Submit

Please enter coordinates as Decimal Degrees
Example: Longitude -122.0017 Latitude 36.9894

Back to Top of Page

Last edited on April 12, 2005