DESIGN ANALYSIS & CALCULATIONS
SOIL-CEMENT LEVEES & GRADE CONTROLS
ADDITIONAL INVESTIGATION - DESERT GREENBELT
REATA PASS WASH CHANNELIZATION
BETWEEN PINNACLE PEAK ROAD &
EXTENSION OF DEER VALLEY ROAD
SCOTTSDALE, ARIZONA

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May 12, 1998

AEE Job No. 7-117-000062
Report No. 3A

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May 12, 1998
AEE Job No. 7-117-000062
Report No. 3A

Simons, Li & Associates, Inc.
3150 Bristol Street
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Attention: Lan Yin-Li Weber, Ph.D., P.E.
Vice President/Senior Program Manager

Ladies & Gentlemen:

RE: DESIGN ANALYSIS & CALCULATIONS
SOIL-CEMENT LEVEES & GRADE CONTROLS
ADDITIONAL INVESTIGATION - DESERT GREENBELT
REATA PASS WASH CHANNELIZATION
BETWEEN PINNACLE PEAK ROAD &
EXTENSION OF DEER VALLEY ROAD
SCOTTSDALE, ARIZONA

Pursuant to the request of Lan Yin-Li Weber, Ph.D., P.E. of Simons, Li & Associates, Inc. (SLA), presented herein are the results of our field investigation (including test pit and test boring logs), results of all laboratory testing completed to date, and recommended criteria for the design of levees and grade control structures for the above referenced project. Items addressed include embankment and foundation design recommendations, stability and settlement analyses, site seismic design criteria, and discussions regarding potential seepage. Included in Appendices C and D, respectively, are design calculations and completed forms required by the Federal Emergency Management Agency (FEMA).

Report No.1A, submitted on April 6, 1998, presented the results of geologic mapping and seismic refraction surveys completed within the Upper Reata Pass Wash. The results of all soil-cement mix designs prepared for the Desert Greenbelt Reata Pass Wash Channelization project were presented in Report No. 2A, also dated April 6, 1998.

Should you have any questions concerning this report, please do not hesitate in contacting the undersigned.

Respectfully submitted,

AGRA Earth & Environmental, Inc.

Registered Professional Engineer (Civil) CERTIFICATE NO. 25151 KEITH H. DAHLEN Date Signed 5/12/98 ARIZONA, U.S.A.

Keith H. Dahlen, P.E.
Senior Engineer

Reviewed by:

Registered Professional Engineer (Civil) CERTIFICATE NO. 13872 LAWRENCE A. HANSEN Date Signed 5/12/98 ARIZONA, U.S.A.

Lawrence A. Hansen, Ph.D., P.E.
Senior Vice President

c: Addressee (6)

njf/J2-98/4-22-98

TABLE OF CONTENTS

PAGE

Introduction 1
Project Description 1
Investigation 2
Site Conditions & Geotechnical Profile 3
Criteria for Design of Levees & Grade Controls 4
References 21

APPENDICES

Appendix A - Field Investigation
Appendix B - Laboratory Test Results
Appendix C - Design Calculations
Appendix D - Completed FEMA Forms

MAP POCKET

Site Plan
Geologic Profile

Registered Professional Engineer (Civil)
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1.0 INTRODUCTION

Presented herein are a description of the recently completed field investigation and results of all subsurface investigations and testing completed to date for the Reata Pass Wash Channelization project. Also included are the results of stability analyses performed for temporary excavations and permanent embankment slopes for the soil-cement embankments, results of embankment settlement analyses, site seismic design criteria, and recommendations for overexcavation, recompaction and site grading.

2.0 PROJECT DESCRIPTION

Channelization of Reata Pass Wash is planned between Pinnacle Peak Road and the eastward extension of Deer Valley Road, and in designated areas of the wash alignment extending southward past Bell Road. The proposed channel is located to the east of Pima Road along and to the west of the west flank of the McDowell Mountains in Scottsdale, Arizona. The channelization project will essentially straighten (in a northerly to southerly direction) what is now a series of meandering washes, the largest of which is Reata Pass Wash.

Two sections of the channelized wash abut bedrock along the channel's east side. The first section, approximately 350 feet in length, is located immediately south of Pinnacle Peak Road. The second section consists of an approximate 1/4-mile stretch located to the north of the extension of Deer Valley Road. Current plans, which are being prepared by Simons, Li & Associates (SLA), indicate the majority of the channelization will be constructed with soil-cement levees and grade control structures. A large portion of Upper Reata Pass Wash also will be lined on the floor of the channel with either soil-cement or Armor-Flex, cable-tied concrete blocks. Concrete will likely be utilized on downstream face of many of the grade control structures in areas where high flow velocities are anticipated.

The channel will vary in width from about 80 feet to 120 feet to the north of Deer Valley Road and will widen to about 200 to 350 feet to the south. In many areas south of Deer Valley Road, channelization will only occur on the west side to collect westward flows originating from the McDowell Mountains.

3.0 INVESTIGATION

3.1 BACKHOE TEST PITS

Twenty-four backhoe test pits were excavated to depths of about 6.5 to 10 feet below existing site grades with a Ford 555 backhoe. Logs of the test pits were prepared and bulk samples of selected soils were collected by Dennis C. Pickens, engineering assistant, of AGRA Earth & Environmental, Inc. (AEE), at locations shown on the site plan located in the map pocket.

The sampling program was predetermined based on the existing test data in order to obtain representative samples of all soil types (both good and marginal for soil-cement) known to be present along the alignment. The intent was to collect sufficient samples from individual test pits such that soils of similar or slightly different classification from different pits could be combined, thus representing what actually might occur during construction.

3.2 PREVIOUS INVESTIGATIONS BY AEE

AEE previously performed test borings and test pits along the proposed Reata Wash alignment for Greiner, Inc. (AEE Job Nos. E95-86 and 6-117-000029). A total of 30 test pits and nine test borings were advanced for the two projects. Laboratory testing performed on selected samples included moisture content, grain-size analysis and Atterberg limits tests. Soil-cement mix designs were performed on two of the samples.

The logs of the test borings and test pits performed for the previous projects are included in Appendix A. The results of the sieve analyses, Atterberg limits tests and the two soil-cement mix designs are presented in Appendix B.

3.3 LABORATORY ANALYSIS

Moisture content, sieve analysis, Atterberg limits, and moisture-density tests, and soil-cement mix designs, were performed on combined bulk samples obtained from Test Pit Nos. TP-1 through TP-24, and hand-dug pits HP-1 and HP-2. Similar testing was performed on previous selected samples obtained from the channel alignment. The results of all tests are presented in Appendix B. Sand equivalent tests also were performed on selected samples obtained from Test Pits TP-1 through TP-24. The results of these tests are included in Appendix B.

4.0 SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 SITE CONDITIONS

The immediate project site area is native desert. Luxury homes and residential streets are located within about 100 to 200 feet of the edge of the planned channelized Reata Pass Wash to the north of Deer Valley Road and within portions of DC Ranch, located near Union Hills Drive. At two locations between Pinnacle Peak Road and the eastward extension of Deer Valley Road, the wash directly abuts steeply protruding ridges which are part of the western edge of the mainly northwest- to southeast-trending McDowell Mountains. Vegetation in the area consists of desert shrubs, cacti and trees, including palo verde and mesquite. The site naturally drains in a southerly direction.

4.2 GEOTECHNICAL PROFILE

The generalized geotechnical profile varies from the south (south of Bell Road) to north end of the project, at Pinnacle Peak Road. As indicated on the test boring and test pit logs and on the Geotechnical Profile, included in the map pocket, the materials present generally consist of the following, based on station limits:

South of Bell Road (Approximate Station 18+00) to Station 162+00

In general, relatively loose to medium dense, nonplastic to low plasticity, non-cemented silty sand and relatively clean sand with some gravel extend to depths of about 1 to 3 feet below existing site grades. These soils overlie dense to very dense sand, gravel, cobbles and boulders, some of which are up to 3 feet in diameter. In some areas, especially within the active washes, the surficial finer grained soils are not present.

Station 162+00 to Station 230+00

The soils within this reach are similar to those encountered within the section to the south, however, medium plasticity clay is intermixed with the sandy and gravelly soils. The soils typically are not as coarse grained or as dense as those present to the south.

Station 230+00 to Station 270+00

The profile of the northern reach consists of nonplastic to low plasticity, predominantly silty sand and silty sand with gravel, to various depths, as indicated on the Geotechnical Profile. In some areas the soil overlies bedrock. The bedrock present on the ridge just to the north of Deer Valley Road consists mainly of schist, and the ridge located adjacent to Pinnacle Peak Road consists mainly of quartzite. The geology of the northern reach is discussed in detail in Report No. 1A.

5.0 CRITERIA FOR DESIGN OF LEVEES & GRADE CONTROLS

Presented in the following sections are recommended design criteria for levees and grade control structures planned along Reata Pass Wash. Included are stability analyses of temporary construction slopes and permanent embankment slopes, discussions regarding settlement and seepage potential, site seismic design criteria, and recommendations for overexcavation, compaction and general site grading. Design calculations are presented in Appendix C.

5.1 FOUNDATION DESIGN CRITERIA

5.1.1 Overexcavation Limits

The soils present along the vast majority of the project alignment are amenable to design of the soil-cement channel system. The foundation soils and isolated bedrock (at the north end of the project) present at depth are sufficiently firm along the entire alignment for support of the soil-cement embankments, grade control structures and channel floor systems planned. Typically, medium dense to very dense, sandy to gravelly materials were encountered along the entire alignment at depths of more than about 2 feet below existing site grades. Looser, more recent deposits of silty sand to sand, with isolated gravel and clayey sand, are present near-surface.

Relative to overexcavation and preparation of foundation soils for the channel structures, the upper 18 inches (minimum) of existing site soils should be overexcavated and replaced with structural fill (as described below). The exposed surfaces should be moisture-conditioned to a depth of at least 12 inches to within 2 percent of optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density, determined in accordance with

ASTM D698. Soils present at depths greater than 18 inches are generally considered acceptable for direct foundation support provided that the exposed surface is scarified to a depth of 6 inches, moisture-conditioned and compacted as described above. Where excessively coarse materials are encountered, the requirement for scarification and compaction of the exposed surface may be waived at the discretion of the geotechnical engineer. Overexcavation of bedrock is not recommended, except where required to construct soil-cement structures. Scarification and compaction of exposed bedrock will not be required.

In many areas, tree roots (when excavated) may impact the near-surface soils to a depth of more than 18 inches. For such areas where embankments or soil-cement structures are to be constructed, the overexcavation limit should be extended to a depth of at least 12 inches below the depth of impacted soil. Any other soft zones present at the exposed cut surface should also be overexcavated and replaced with structural fill as directed by the geotechnical engineer.

5.1.2 Structural & Embankments Fills

All fill required to raise the site to subgrade elevation, or used for the construction of channel embankments and grade control structures, should be free of vegetation, debris and other deleterious material and contain particles no larger than 8 inches in dimension. The plasticity index of the embankment materials as determined in accordance with ASTM D4318 should not exceed 25. Most of the soils tested within the project limits are suitable for construction of embankments. Particles up to 24 inches in dimension may be placed within the embankments provided that they are encapsulated with finer grained materials. Fills should be placed in lifts which do not exceed 8 inches in compacted thickness, unless the earthwork contractor can demonstrate repeatedly that adequate compaction can be achieved with thicker lifts.

If overexcavation at the base of soil-cement structures is required for any reason, the site should be brought back to subgrade elevation with structural fill containing particles no larger than 6 inches in dimension, and the soils should possess a plasticity index of no more than 15 when tested in accordance with ASTM D4318. Some selection and or blending of soils may be required to develop usable structural fill materials.

5.1.3 Embankment Settlements

Provided site grading is performed in accordance with Section 5.1.1, settlements of the dense foundation soils are expected to be minimal, on the order of 1/2 inch or less. Settlements of the embankment soils are expected to occur mostly during construction, and are estimated at 1 to 2 percent of the embankment height. The soil-cement is not expected to settle, except for that which occurs during compaction.

5.2 SEISMICITY

The majority of known or suspected active faults that are significant to a seismic risk analysis of the Arizona region lie outside the state and are remote to the project area. These faults include:

- Strike-slip and normal faults associated with the San Andreas/Gulf of California system.
- Normal faults in northwestern Arizona and southwestern Utah associated with the Intermountain Seismic Belt.
- The Pitaycachi and related faults in northeastern Sonora, source of the great Sonoran earthquake of 1887.

Given the long recurrence in interval (probably several thousand or tens of thousands of years) for events associated with all faults except the San Andreas system, the probability of the PGA exceeding a value of 0.05g during the life of the project appears to be extremely low. It is our judgment that the seismic stability of the proposed levee system may be adequately and conservatively analyzed using a seismic acceleration of 0.10g.

5.3 STABILITY OF TEMPORARY CUT SLOPES & PERMANENT EMBANKMENTS

Based on a review of the Project Design Plans, prepared by SLA, and subsequent discussions with Randall Beck, P.E. of SLA, the general slope conditions for temporary construction and permanent embankments being considered are listed in Table 1.

TABLE 1
Typical Embankment Conditions for Stability Analyses

Structure	Type of Excavation	Cut or Fill Slope?	Planned Slope (H:V)	Soil-Cement Exposed Face (?)	Maximum Height or Depth (feet)
Channel Levee (Inboard Face)	Temporary	Cut	1:1	No	20
	Permanent	Cut & Fill	1:1	Yes	25
Channel Levee (Outboard Face)	Permanent	Fill	3:1	No	5.5
Grade Control Structures	Temporary	Cut	1:1	No	10
	Permanent	Cut	1.5:1	Yes	16

Although other slope configurations are planned, many of which include benched slope configurations, the slopes indicated above appear to be the most critical in terms of height of embankment and steepness of slope with respect to stability.

Stability analyses were performed for the above cases using PC STABL5M (Achilleos, 1998)*, developed by Purdue University. This program considers a generalized shear surface and utilizes a limiting equilibrium (simplified Janbu or simplified Bishop) method of slices procedure. Random trial shear surfaces are generated and analyzed to determine the critical circular shear surface. In the simplified Bishop procedure, which was utilized for the stability analyses, it is assumed that the forces on the sides of each slice are in a horizontal direction. This assumption conservatively implies that there is no friction between slices.

Based on a review of the test pit and borings, and laboratory test data, the strength parameters listed in Table 2 were utilized to represent the project site soil conditions. The soil parameters are considered to be representative of the gravelly and sandy soils abundant throughout the alignment. Some of the soils within cuts containing clay (to the north of Station 160+00) possess higher cohesion intercepts, on the order of about 200 to 500 psf. The cases analyzed and associated computed safety factors, for each of the slopes presented in Table 1, are based on either temporary or permanent slope conditions and potential seepage conditions, as presented in Table 3.

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*References are listed at the end of this report.

TABLE 2
Soil Parameters Used for Stability Analysis

Soil Stratum	Moist Unit Weight (pcf)	Cohesion Intercept (psf)	Internal Friction Angle (degrees)
All Cut Surface Soils	115	50	35
All Fill Soils	115	0	35

TABLE 3
Results of Stability Analysis

Structure	Case No.	Total Depth (feet)	Slope Configuration (H:V)	Minimum Computed Safety Factor
Channel Levee (Inboard Face)				
Temporary	1A	20	1:1	1.15
	1B	20	1.2:1	1.27
	1C	18	1:1	1.21
Permanent w/ Soil-Cement				
Post-Construction	1D	Varies	1:1	6.17
Flood	1E	23	1:1	1.99
Rapid Drawdown (Post Flood)	1F	23	1:1	1.12
Pseudo-static & Flood	1G	25	1:1	1.54
Channel Levee (Outboard Face)				
Permanent				
Post-Construction	2A	5.5	3:1	3.06
Pseudo-static	2B	5.5	3:1	2.35
Grade Control Structure				
Permanent w/ Soil-Cement				
Post-Flood	3A	13 (Max.)	1.5:1	2.13

The results of the analyses are plotted in Figures 1 through 10. The results indicate safe temporary excavation slopes (safety factor greater than 1.2 for temporary conditions) of 1H:1V (horizontal to vertical) up to a depth of 18 feet. As discussed in Report No. 4, Addendum No. 1 (dated February 19, 1998), a flatter slope (1.2H:1V), or a combination slope of 1H:1V and 1.5H:1V (within the bottom 10 feet) should be considered for excavations deeper than 18 feet to reduce the potential for shallow surficial failures and sloughing. Some areas of the project contain soils which are less or more cohesive than used for the stability analysis. Therefore, some areas will stand at 1H:1V with little or no sloughing and other areas will slough and experience shallow failures if left exposed for extended periods.

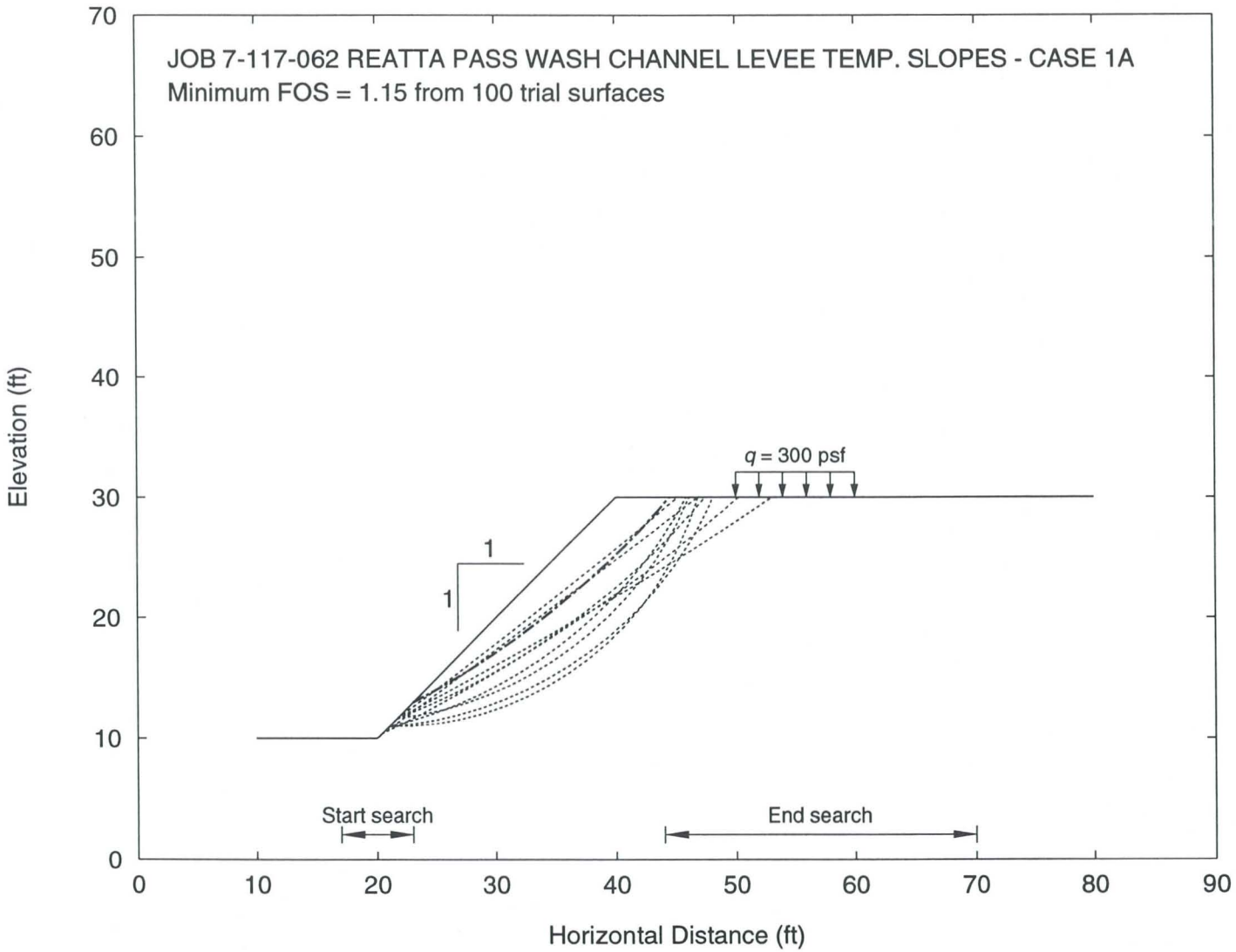

FIGURE 1

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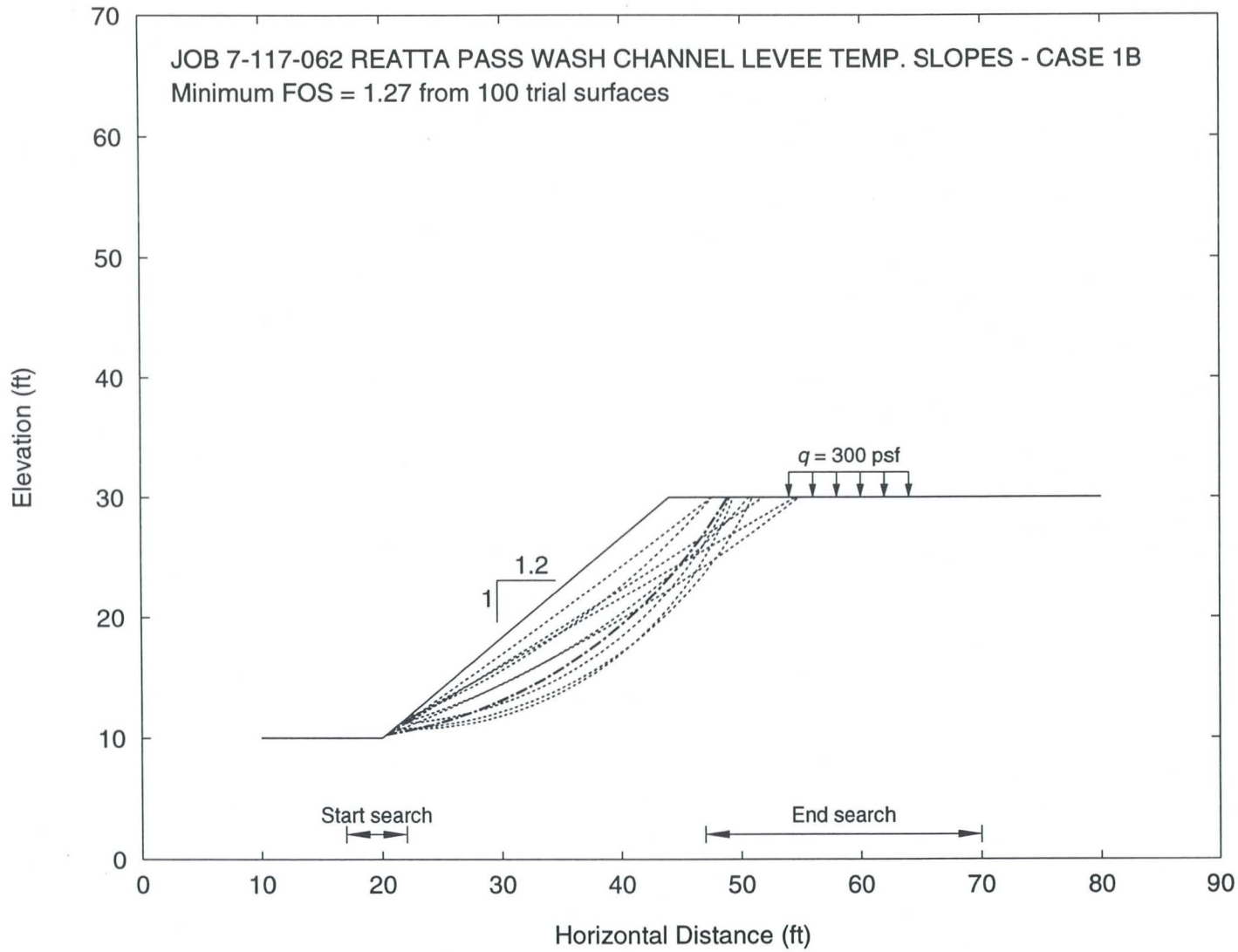

FIGURE 2

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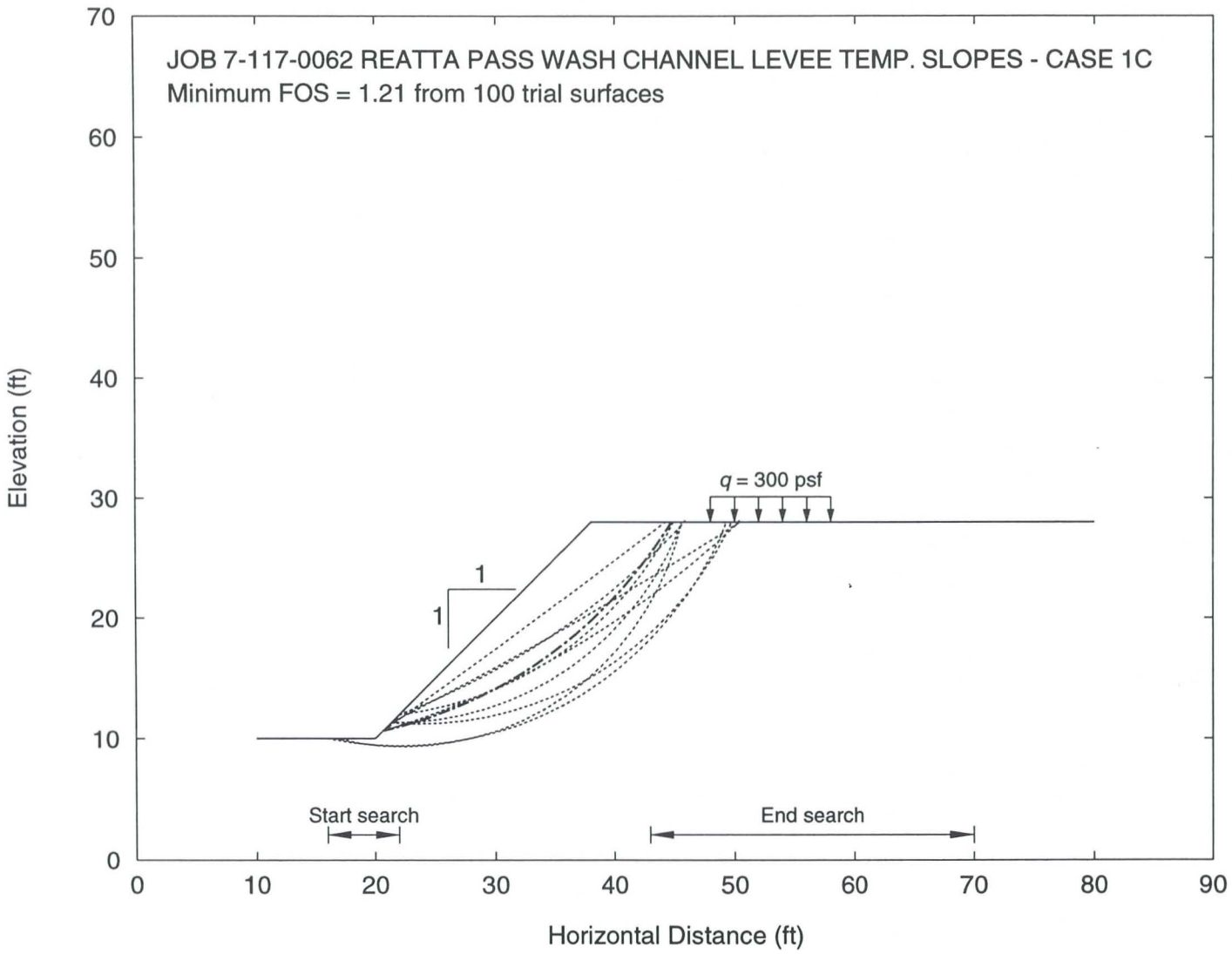

FIGURE 3

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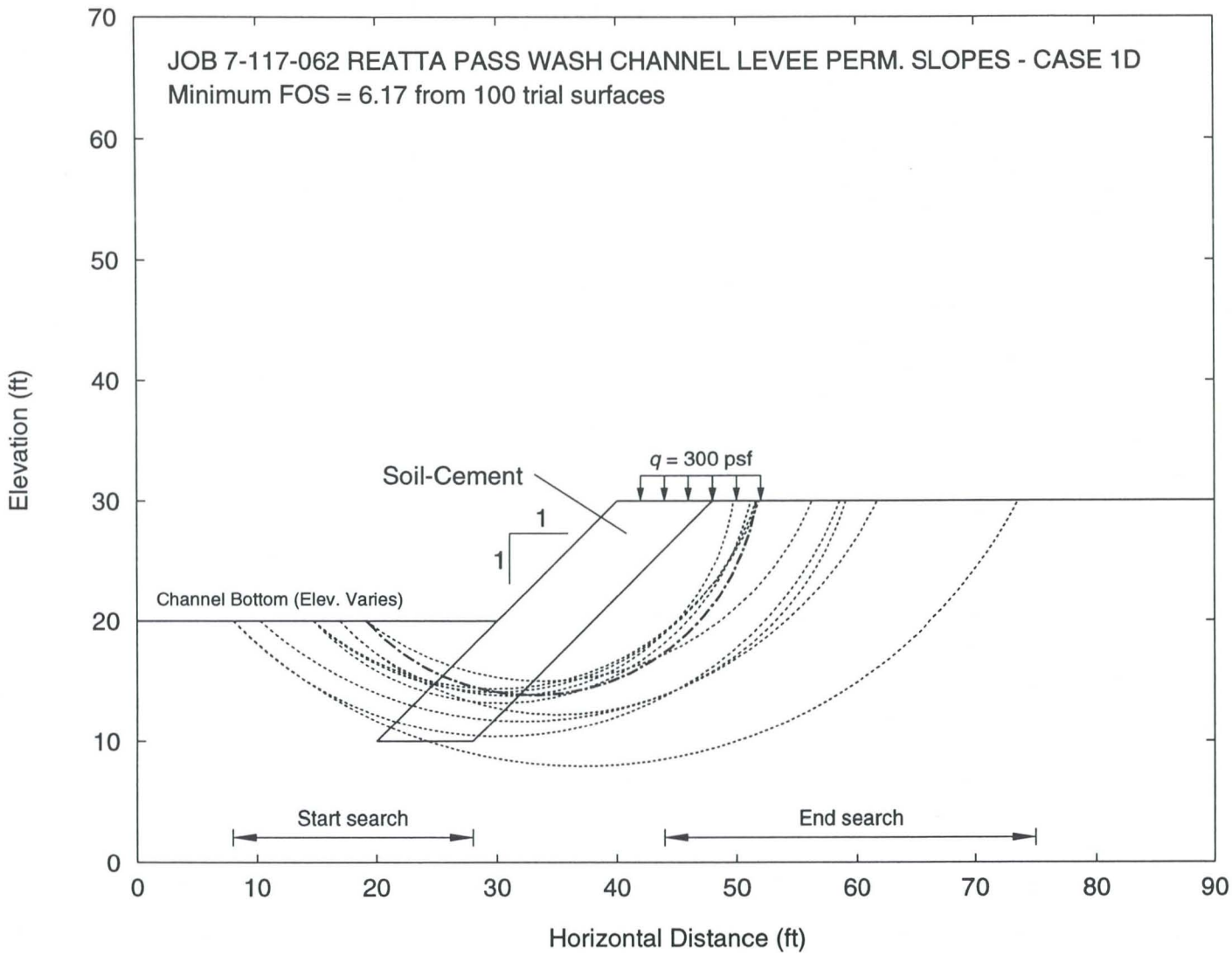

FIGURE 4

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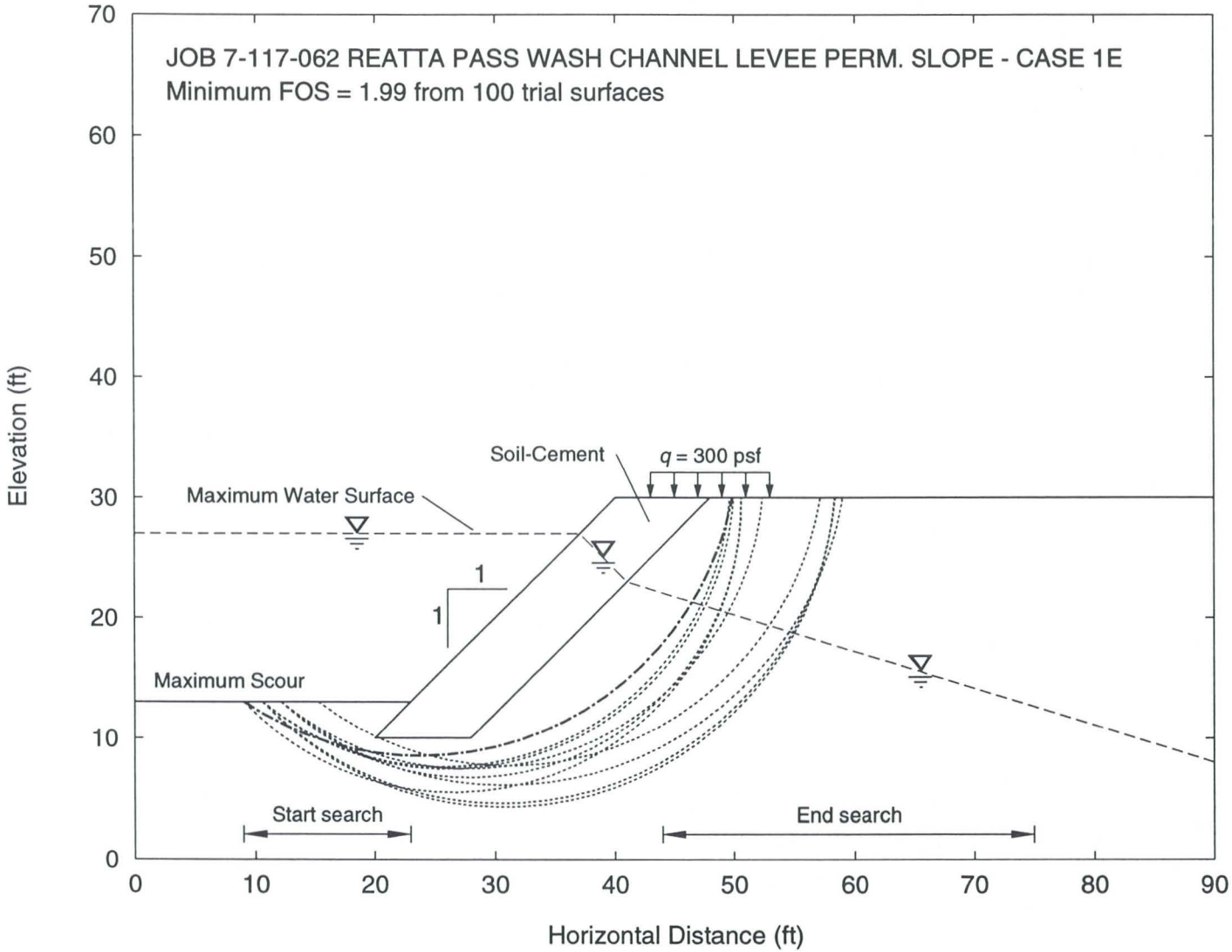

FIGURE 5

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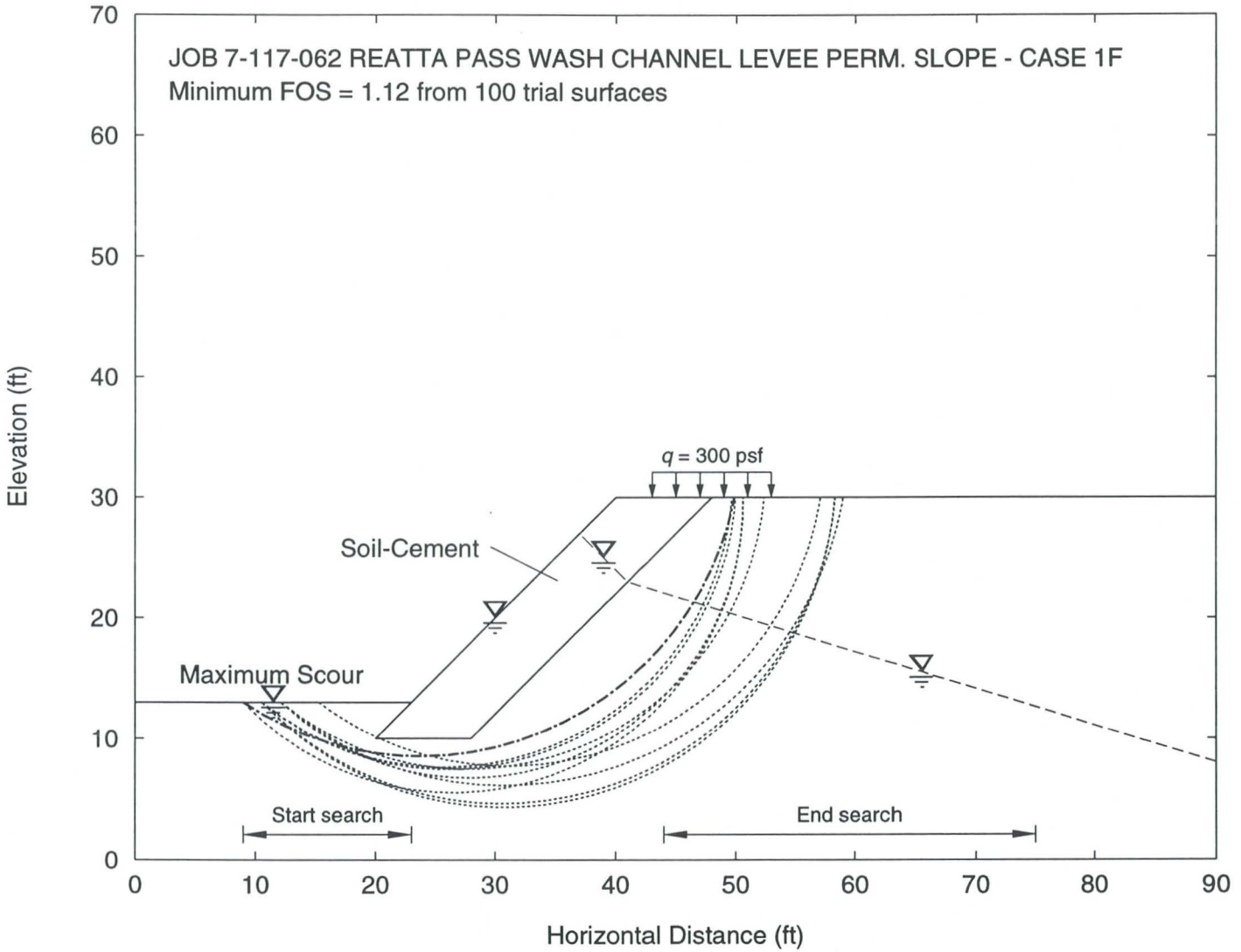

FIGURE 6

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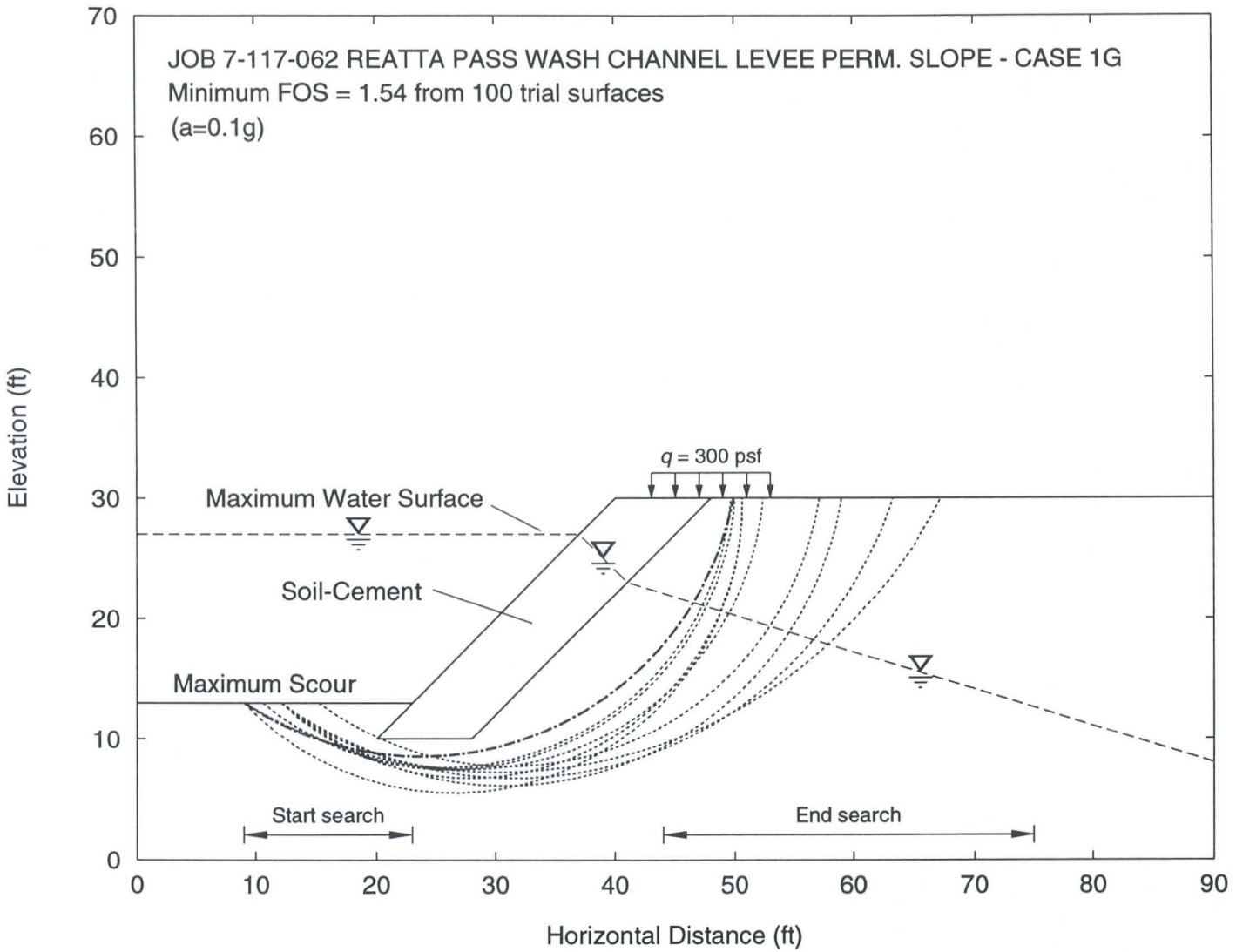

FIGURE 7

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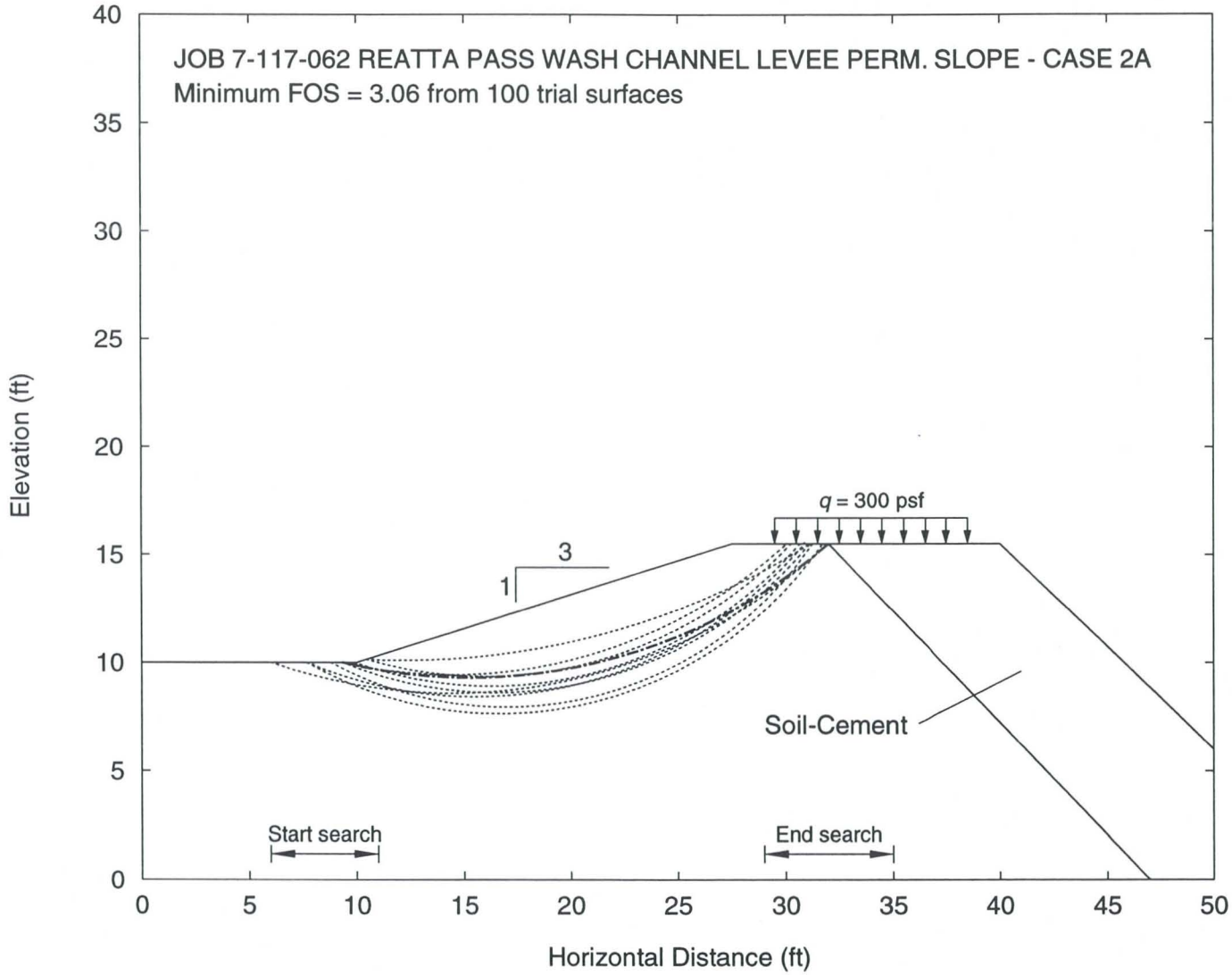

FIGURE 8

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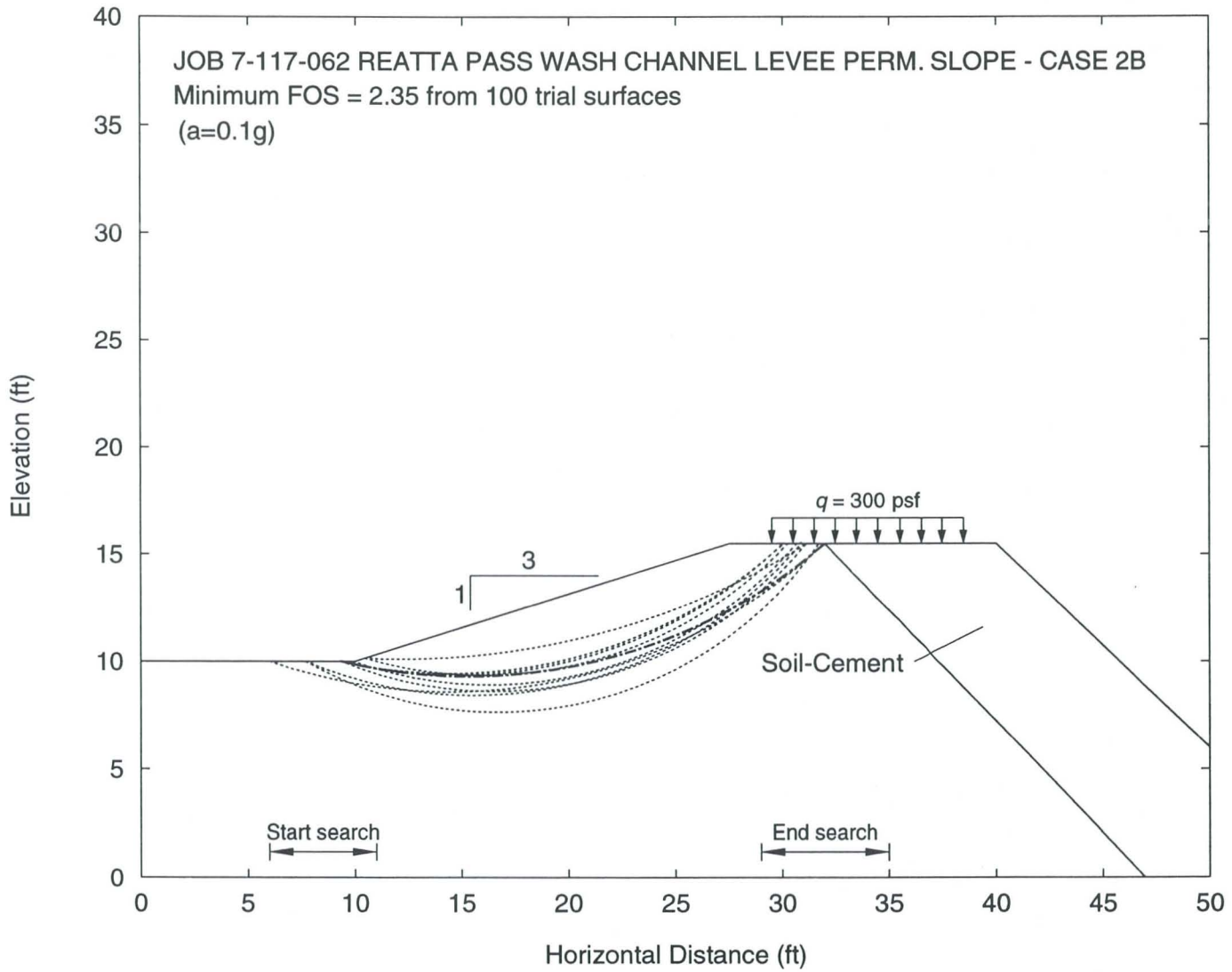

FIGURE 9

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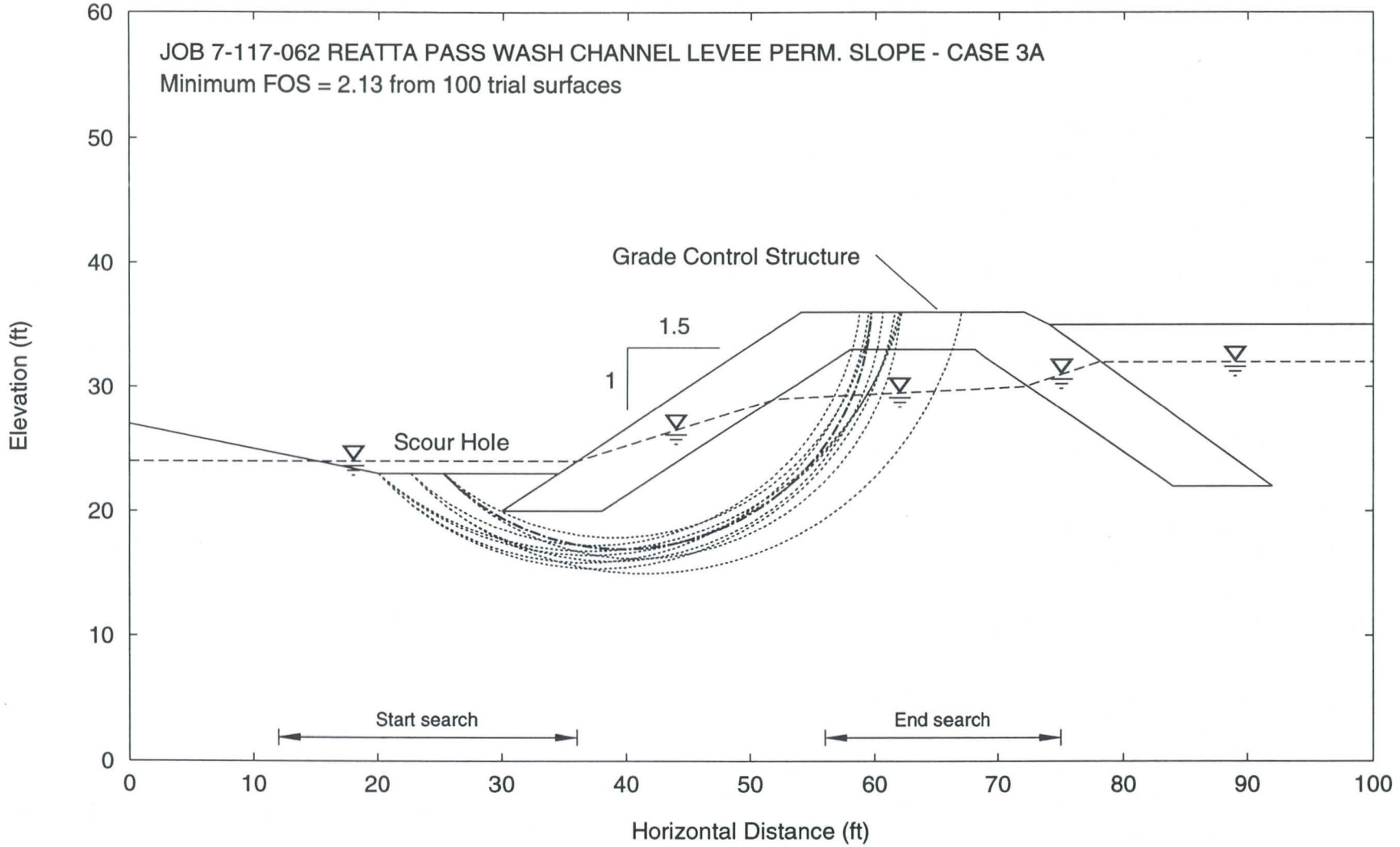

FIGURE 10

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As indicated for Cases 1D through 1G, the channel levee system currently designed with a 1H:1V slope is considered to be stable under a variety of conditions. The post-construction condition (Case 1D) assumes that the channel will be backfilled to its design elevation as the soil-cement embankment is raised. The flooding condition (Case 1E) assumes a full scour condition adjacent to the embankment, and a relatively short duration of flooding that would be anticipated at or near the maximum water surface level. The potential for a fully developed phreatic surface extending through the soil-cement embankment is considered to be extremely low. However, the full phreatic condition also was assumed for Cases 1F and 1G representing rapid drawdown and pseudo-static conditions, respectively. Safety factors of 1.2 and 1.5 are generally considered to be acceptable for temporary and permanent slopes. A safety factor of 1.1 is generally considered acceptable for analysis of pseudo-static and rapid drawdown conditions.

The outboard side of the levees will be raised above existing site grades in some areas about 3 to 5.5 feet. A 3H:1V slope will be used to transition the top of the levee to the surrounding site grades. As indicated by the results of the stability analyses for Cases 2A and 2B, the outboard slopes are considered to be safe in terms of stability. The only concern relative to the slopes should be rill erosion induced by rainfall impacting the mostly erodible project site soils.

The grade control structures will be constructed with permanent soil-cement stabilized embankments. Temporary excavations for grade control structures were not analyzed as the depths of excavation will not exceed about 16 feet, and flatter (1.5H:1V) slopes likely will be utilized to match the slope of the stabilized embankments. Case 3A assumes that flooding has scoured the soils just downstream of the grade control and a phreatic head has developed within the structure due to upstream ponding of water. The analysis for this condition indicates a safety factor of more than 2.0. As stated previously, the potential for a fully developed phreatic surface is considered to be low since flows within the channel are anticipated to be of short duration, no more than about 2 to 3 days, and the native soils are relatively free draining.

The analyses are based on soil conditions observed in the test pits. Should the soil conditions change appreciably in certain areas, the stability should be re-evaluated. Also, temporary excavations required along the bedrock ridges likely can be completed to 0.5H:1V. However, such excavation slopes should be observed and inspected by a representative of the geotechnical engineer.

5.4 EARTHWORK FACTORS

Given the large scale of the project, it is difficult to assess what the final disposition of materials excavated from the channel will be. Relative to the volume of soils being excavated strictly for use as soil cement and the outer soils portion of the embankments, the finer grained near-surface soils will shrink more than the coarser grained soils when reused. However, if a considerable percentage of the oversize (plus 3-inch material) is wasted rather than crushed for aggregate, that material would be considered as waste and the net shrink value would increase. Should the contractor utilize the oversize materials, the overall shrink value likely will decrease. Given the unknowns involved, an estimate of 10 to 15 percent shrink is considered to be appropriate. Relative to the mass excavation which far outweighs the amount that will be used for soil cement, the shrink value may also vary substantially depending on the intended use of the materials.

REFERENCES

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Felt, E.J. and Abrams, M.S., 1957, Strength and Elastic Properties of Compacted Soil Cement Mixtures, Authorized Reprint from ASTM Special Technical Publication No. 206, Development Department Bulletin D16.

Hansen, K.D., and Lynch, J.B., 1995, Controlling Floods in the Desert with Soil-Cement, Authorized Reprint From: Second CANMETACI International Symposium on Advances in Concrete Technology, Las Vegas, NV, June 11-14.

APPENDIX A

FIELD INVESTIGATION

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TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4 1/2" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. A CME-55 or CME-75 truck-mounted drill rig is used to advance the auger. The drill rigs are powered with six-cylinder Ford industrial engines capable of delivering about 7,000 to 8,400 foot-pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 16,000 to 20,000 pounds downward force.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Hammer Drill Drilling with the Hammer drill is accomplished with a Drill Systems AP1000 drill rig advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted on the boring log, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger is used only in portions of the boring where blow counts are relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing is either 9" O.D. by 6" I.D. or 6 5/8" O.D. by 4" I.D. and employs an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing are recorded in 1′ increments, as noted on the boring logs. Standard penetration tests or 2.42" diameter ring samples taken are noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as the DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.

TEST DRILLING EQUIPMENT & PROCEDURES (CONT.)

Schramm Rotadrill The Schramm T64H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 inches/pounds of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 4", or larger, diameter Tricone roller bits or 4" to 6" diameter down-the-hole hammer. Cutting removal is facilitated by compressed air or air/water mixtures and collected in a cyclone. Where noted on the boring logs, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, an Aardvark drill through casing hammer is utilized, permitting simultaneous drilling and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute. Standard penetration, 2.42" diameter ring samples, Shelby tubes, pitcher tube or Denison samples taken are noted on the boring logs.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140-pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per 6 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Also, representative samples are obtained from the cuttings from the hammer and Schramm drill rig.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the boring logs.

njf/M1-95/7-11-95

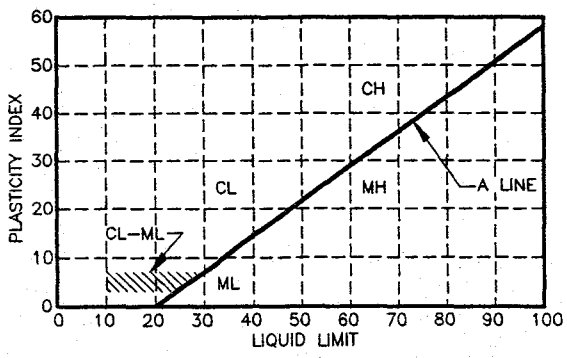
UNIFIED CLASSIFICATION SYSTEM FOR SOILS

Soils are visually classified by the Unified Soil Classification System on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" ASTM Designation: D2487.

MAJOR DIVISION				GRAPH SYMBOL	GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures or sand-gravel-cobble mixtures.
					GP	poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCH ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts of high plasticity, silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCH ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, silty and sandy clays of high plasticity.

NOTE: Coarse-grained soils with between 5% & 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the hatched zone on the plasticity chart to have dual symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Boulders	Above 300mm (12in.)
Cobbles	300mm to 75mm (12in. to 3in.)
Gravel	75mm (3in.) to No. 4 sieve
Coarse gravel	75mm to 19mm (3in. to 3/4in.)
Fine gravel	19mm (3/4in.) to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

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TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. F-1

JOB NO. E95-86 DATE 6-8-95

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	10-50/2"			GP	slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown
									very dense	
5				S	13-16-15			SC	slightly moist	**CLAYEY SAND**, some fine grained gravel, subrounded to subangular, low plasticity, brown
									very firm	
10				U	100/1"					**SILTY SAND, GRAVEL & COBBLES**, subrounded to subangular, poorly graded, nonplastic, brown
				A					slightly moist	
15				U	59	113	2	GM	very firm to hard	
20				S	10-20-25					
25				S	24-50/5"					
30				S	15-20-20			SM	slightly moist	**SILTY SAND & GRAVEL**, poorly graded, subrounded to subangular, nonplastic, brown
35				S	15-50/4"				very firm to hard	
										Auger refused at 36'
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery
T - Thin Walled Shelby Tube

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. F-2

JOB NO. E95-86 DATE 6-8-95

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	1-12-30			GP	slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown
									dense	
5				S	8-15-14				slightly moist	**SILTY SAND**, considerable poorly graded gravel, subrounded to subangular, nonplastic, brown
10				U	20		2	SM	firm to very firm	
15				U	39	112	2			
20				S	50/5"				slightly moist hard	**SILTY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, nonplastic to low plasticity, light brown
25				S	50/4"			SP-SM		
30				S	30-50/4"		2			
35				S	28-50/5"					
40				S	13-50/5"					
45										Auger refused at 42'
50										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2" O.D., 1.38" I.D. Tube Sample.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery

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PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST BORING NO. F-3

JOB NO. 6-117-000029 DATE 2-24-96

LOCATION Foothills Drive Bridge
RIG TYPE AP-1000
BORING TYPE 9" Dual Percussion Hammer
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0	8								slightly moist	**SILTY SAND**, poorly graded sand, subrounded to subangular, nonplastic, brown
	11									
	10									
	10								medium dense to dense	
	9									
5	11									
	12									
	12							SM		
	10									
	12									
10	13									
	6									
	13									
	11									
	1									
15	12									
	15									
	57									
	133								slightly moist to moist	**SILTY SAND & GRAVEL**, some to considerable cobbles, fine grained gravel, poorly graded sand, subrounded to subangular, nonplastic, light brown
	225									
20	112									
	131									
	114									
	80								dense to very dense	note: cobbles & some small boulders (1' to 2' diameter) from 38' to 42'
	86									
25	80									
	65									
	68									
	67									
	25									
30	32									
	43							GP/		
	35							GM		
	40									
	26									
35	24									
	177									
	361			A			1			
	160									
	301									
40	120									
	98									
	263			A						
	100									
	36									
45	103									
	33									
	19									
	100									
50	50									

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2.5" O.D., 2" I.D. Tube Sample. or 2" O.D., 1.38" I.D.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery

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6-117-000029 04/07/98

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST BORING NO. F-3

JOB NO. 6-117-000029 DATE 2-24-96

LOCATION Foothills Drive Bridge
RIG TYPE AP-1000
BORING TYPE 9" Dual Percussion Hammer
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50	17			S	8-24-		2		moist to very moist (from 57' to 58')	**SILTY SAND & GRAVEL**, continued
	38				36					
	49									
	23									
	19									
55	20									
	23									
	32			A			3	GP/		
	33							GM		
	27			S	14-30-					
60	50				50/4"					
	30									
	35									
	60									
	50			A			2			
65	39									
	60									
	63									
	70			S	50/4"					
70										Stopped Hammer at 69' Stopped Sampler at 69'4"
75										
80										
85										
90										
95										
100										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill Cuttings
S - 2.5" O.D., 2" I.D. Tube Sample. or 2" O.D., 1.38" I.D.
U - 3" O.D., 2.42" I.D. Tube Sample.
NR - No Recovery

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6-117-000029 04/07/98

PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-1

JOB NO. E95-86 DATE 7-20-95

Location: Sta. 270+00, on centerline

RIG TYPE CME-55

BORING TYPE 6 5/8" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	10-11-12	95.8	5	SM	moist firm	**SILTY SAND**, trace of fine grained gravel, poorly graded, subrounded to subangular, nonplastic, brown
									slightly moist very dense	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, grayish brown
5				S A	50/2"			GP		
10										Auger refused at 9'6"
15										
20										
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-2

JOB NO. E95-86 DATE 7-20-95 Location: Sta. 260+00, on centerline

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	9-8-8				slightly moist	**SILTY SAND**, occasional gravel, poorly graded, subrounded to subangular, nonplastic to low plasticity, brown
								SM	moderately firm to hard	
5				S	50/5"					
10										Auger refused at 8'
15										
20										
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-3

JOB NO. E95-86 DATE 7-20-95

Location: Sta. 250+00, 20' R

RIG TYPE CME-55

BORING TYPE 6 5/8" Hollow Stem Auger

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	12-25-30				slightly moist very dense to dense	**SILTY SAND**, some gravel, occasional cobbles, poorly graded, subrounded to subangular, nonplastic, brown
								SM		
5				S	18-3-40					
10				S	38-35-32				slightly moist hard	**CLAYEY SAND**, trace of fine grained gravel, poorly graded, subrounded to subangular, low plasticity, brown
								SC		
15				S	16-24-32					
20										Stopped Auger at 15' Stopped Sampler at 16'6"
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-4

JOB NO. E95-86 DATE 7-20-95 Location: Sta. 236+50, on centerline

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	1-2-3				slightly moist loose to dense	**SILTY SAND**, some gravel, poorly graded, subrounded to subangular, nonplastic, brown
5				S	8-9-10			SM		
10				S	7-17-15					
15				S	11-11-17					
20										Stopped Auger at 15' Stopped Sampler at 16'6"
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-5

JOB NO. E95-86 DATE 7-20-95 Location: Sta. 225+00, on centerline

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	1-6-25				slightly moist	**CLAYEY SAND**, trace of fine grained gravel, poorly graded, subrounded to subangular, low to medium plasticity, brown
									very firm to hard	
								SC		
5				S	15-50/3"					
										Auger refused at 7'
10										
15										
20										
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE

A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

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PROJECT Desert Greenbelt Phase I

LOG OF TEST BORING NO. RP-6

JOB NO. E95-86 DATE 7-20-95 Location: Sta. 220+00, on centerline

RIG TYPE CME-55
BORING TYPE 6 5/8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	6-6-5				slightly moist moderately firm to hard	**CLAYEY SAND**, some fine grained gravel, trace of cobbles, poorly graded, subrounded to subangular, low to medium plasticity, brown
5				S	15-20-23			SC		
10				S	35-50/3"					
				A				GP-GC	slightly moist	**CLAYEY SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, medium plasticity, brown
15										Auger refused at 15'
20										
25										

GROUNDWATER

DEPTH	HOUR	DATE
	none	

SAMPLE TYPE
A - Drill cuttings.
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.
T - 3" O.D. thin-walled Shelby tube.

AGRA Earth & Environmental
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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP1

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 215+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SW	slightly moist	**SAND & GRAVEL**, occasional to considerable cobbles, well graded, subrounded to subangular, nonplastic, yellowish brown
					SC	slightly moist to moist	**CLAYEY SAND**, trace of gravel, poorly graded, subrounded to subangular, nonplastic, dark brown
5						slightly moist	**GRANITE**, fine to medium grained, decomposed to highly weathered, soft to very soft, gray
10							Stopped Backhoe at 9'6"
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP2

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 210+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SILTY SAND**, considerable gravel, occasional cobbles, poorly graded, subrounded to subangular, weakly lime cemented, nonplastic, brown
					SM		
5							
10							
							Stopped Backhoe at 11'6"
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP3

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 200+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND & GRAVEL**, some cobbles, trace of silt, poorly graded, subrounded to subangular, nonplastic, brown
			D				
					SP-SM		
5							
10							
							Stopped Backhoe at 12'
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-3A

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 200+75, 190' L
ELEVATION 1948' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SP-SM	slightly moist	**SILTY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, nonplastic, brown
					GM	slightly moist	**SILTY SAND, GRAVEL & COBBLES**, poorly graded, angular to subangular, nonplastic, brown
5					SP-SM	slightly moist	**SILTY SAND**, some fine grained gravel, occasional large gravels, poorly graded, subrounded to subangular, nonplastic, brown
					GM	slightly moist	**SILTY SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown
10					SM/SC	slightly moist	**SILTY TO CLAYEY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, weakly lime cemented, low plasticity, brown
15			D		SM	slightly moist	**SILTY SAND**, some fine grained gravel, predominantly fine to medium grained gravel, subrounded to subangular, nonplastic, brown
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

6-117-000029 04/07/98

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP4

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 190+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND & GRAVEL**, occasional cobbles, poorly graded, subrounded to subangular, nonplastic, brown
					GP		
5							
10							
							Stopped Backhoe at 11'
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP5

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 180+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**CLAYEY SAND & GRAVEL**, some cobbles, trace of small boulders, angular to subrounded, low plasticity, reddish brown note: increase in cobbles with depth below 4'
					GP-GC		
5							
			D				
							Stopped Backhoe at 8'2"
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP6

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 173+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND & GRAVEL**, some cobbles, trace of clay, poorly graded, angular to subrounded, nonplastic, reddish brown note: boulders up to 36" diameter on surface
					GP-GC		
			D				
5							
							Stopped Backhoe at 6'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-6A

JOB NO. 6-117-000029 DATE 2-22-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 171+60, 200' L
ELEVATION 1860' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D	2	SM	slightly moist	**SILTY SAND**, some fine grained gravel, subrounded to subangular, nonplastic, brown
5					GM	slightly moist	**SILTY SAND & GRAVEL**, poorly graded, subrounded to subangular, nonplastic, brown
10					ML	slightly moist	**CLAYEY TO SANDY SILT**, low plasticity, brown
15			D		GP	slightly moist	**SILTY SAND, GRAVEL & COBBLES**, occasional boulders, poorly graded, angular to subangular, nonplastic, brown note: maximum estimated particle size of 18"
20							Stopped Trackhoe at 19'6"
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-6B

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 174+40, 270' R
ELEVATION 1862' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0					SM	slightly moist	**SILTY SAND**, some fine grained gravel, predominantly fine to medium grained, subrounded to subangular, nonplastic to low plasticity, brown
			D	1		slightly moist	**CLAYEY SAND, GRAVEL & COBBLES**, occasional boulders, poorly graded, subrounded to subangular, low plasticity, light brown note: estimated maximum particle size of 24"
5					GP-GC		
10			D				
15							Trackhoe refused at 14'
20							
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP7

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 170+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND & GRAVEL**, some cobbles, poorly graded, angular to subrounded, nonplastic, reddish brown note: maximum estimated particle size of 6" diameter
					GP		
5							
							Stopped Backhoe at 8'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP8

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 160 + 00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					SP	slightly moist	**SAND**, occasional gravel & trace of cobbles, poorly graded, subangular to subrounded, low plasticity, light reddish brown note: maximum particle size of 10" diameter
5					GP	slightly moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, low plasticity, light reddish brown
							Stopped Backhoe at 6'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP9

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	..one	

BACKHOE TYPE CAT 416B
LOCATION Sta. 150+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					SP	slightly moist	**SAND**, considerable gravel, trace of cobbles, poorly graded, subangular to subrounded, nonplastic, reddish brown
5			D		GP	slightly moist	**SAND & GRAVEL**, some to considerable cobbles, poorly graded, angular to subrounded, nonplastic, reddish brown note: maximum estimated particle size of 12" diameter
10							Stopped Backhoe at 8'4"
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP10

JOB NO. E95-86 DATE 7-21-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 140+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, reddish brown note: dense cobble layer from 2' to 3' & 5' to 7'
					GP		
5							
							Stopped Backhoe at 6'10"
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-10A

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 140+40, 275' L
ELEVATION 1770' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SILTY SAND & GRAVEL**, predominantly fine grained gravel, subrounded to subangular, nonplastic, brown note: increase in gravel with some cobbles from 6' to 8'
					GM		
5							
			D	2			
10							
						slightly moist	**SILTY SAND & GRAVEL**, some cobbles & boulders, poorly graded, subrounded to subangular, nonplastic to low plasticity, light brown note: estimated maximum particle size of 24"
					GM/		
15			D		GC		
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-10B

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 140+40, 255' R
ELEVATION 1780' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist (very dense)	**SILTY SAND, GRAVEL & COBBLES**, some cobbles & boulders, trace of clay, poorly graded, subrounded to subangular, nonplastic to low plasticity, brown to light brown note: maximum particle size of 18"
			D				
					GM-GP		
5							
10							Trackhoe refused at 10'
15							
20							
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP11

JOB NO. E95-86 DATE 7-24-95

BACKHOE TYPE CAT 416B
LOCATION Sta. 130 + 00, on centerline
ELEVATION
DATUM

GROUNDWATER

DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 24" diameter
5							
							Stopped Backhoe at 6'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP12

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 120 + 00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		GP	slightly moist	**SAND & GRAVEL**, some silt, poorly graded, subrounded to subangular, nonplastic, brown
					GP	slightly moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 18" diameter
5							
							Stopped Backhoe at 6'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP13

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 110+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					SP	slightly moist	**SAND & GRAVEL**, some silt, poorly graded, subrounded to subangular, nonplastic, brown
					GP	slightly moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 24" diameter
5					SP	slightly moist to moist	**SAND**, considerable gravel, poorly graded, subrounded to subangular, nonplastic, reddish brown
					GP	slightly moist to moist	**SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, reddish brown note: maximum particle size of 18" diameter
10							Stopped Backhoe at 8'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP14

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 100+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	slightly moist	**SILTY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, weakly cemented, nonplastic, brown
5					GM	slightly moist	**SILTY SAND & GRAVEL**, some cobbles, poorly graded, subrounded to subangular, nonplastic, brown
10							Stopped Backhoe at 9'
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-14A

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 100+00, 190' R
ELEVATION 1681' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D	2		slightly moist	**SAND, GRAVEL & COBBLES**, some boulders, trace to some clay, poorly graded, subrounded to subangular, weakly lime cemented, nonplastic, brown to light brown note: maximum estimated particle size of 24"
5					GP		
10			D				
15							
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-14B

JOB NO. 6-117-000029 DATE 2-23-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 100+15, 510' R
ELEVATION 1682' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D	3		slightly moist	**CLAYEY SAND, GRAVEL & COBBLES**, some boulders, poorly graded, subrounded to subangular, low plasticity, brown note: maximum estimated particle size of 24"
5			D		GP-GC		
10							
15							Stopped Trackhoe at 20'
20							
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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6-117-000029 04/07/98

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP15

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 90 + 00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					GP	slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown
5							
10							Stopped Backhoe at 8'
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP16

JOB NO. E95-86 DATE 7-24-95

BACKHOE TYPE CAT 416B
LOCATION Sta. 80+00, on centerline
ELEVATION
DATUM

GROUNDWATER

DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	slightly moist	**SILTY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, weakly cemented, nonplastic, brown
5					GM	slightly moist	**SILTY SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown to reddish brown note: maximum particle size of 12" diameter
10							Stopped Backhoe at 10'6"
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP17

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 70+00, 10' R
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SILTY SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown to reddish brown
5					GM		
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE

B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP18

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 60+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0					SM	slightly moist	**SILTY SAND**, some gravel, poorly graded, subrounded to subangular, weakly lime cemented, nonplastic, brown
5					GM	slightly moist	**SILTY SAND, GRAVEL & COBBLES**, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 24" diameter
10							Stopped Backhoe at 9'6"
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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ENGINEERING GLOBAL SOLUTIONS

PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP19

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 50+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	slightly moist	**SILTY SAND**, some gravel, poorly graded, subrounded to subangular, nonplastic, brown
5					GP	slightly moist	**SILTY SAND & GRAVEL**, occasional cobbles, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 18" diameter
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP20

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 29+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 18" diameter
					GP		
5							
							Stopped Backhoe at 7'
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Desert Greenbelt Phase I

LOG OF TEST PIT NO. RTP21

JOB NO. E95-86 DATE 7-24-95

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CAT 416B
LOCATION Sta. 16+00, on centerline
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/Rock Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SAND, GRAVEL & COBBLES**, some silt, poorly graded, subrounded to subangular, nonplastic, brown note: maximum particle size of 24" diameter
					GP		
5							
							Stopped Backhoe at 8'6"
10							
15							
20							
25							

SAMPLE TYPE
B - Undisturbed Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

AGRA Earth & Environmental
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PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-22

JOB NO. 6-117-000029 DATE 2-24-96

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 33+30, 135' R
ELEVATION 1550' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D	3		slightly moist	**SAND, GRAVEL & COBBLES**, occasional boulders, trace of clay, poorly graded, subrounded to subangular, low plasticity, brown note: maximum estimated particle size of 18"
					GP		
5							
10							
						slightly moist	**SAND, GRAVEL & COBBLES**, some boulders, some silt & clay, poorly graded, subrounded to subangular, weakly lime cemented, low plasticity, brown to light brown note: maximum estimated particle size of 18"
					GP		
15			D				
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

6-117-000029 04/07/98

PROJECT Additional Investigation
Desert Greenbelt Phase I Project

LOG OF TEST PIT NO. RTP-23

JOB NO. 6-117-000029 DATE 2-24-96

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE MS-380 Trackhoe
LOCATION Sta. 33+30, 440' R
ELEVATION 1948' +/-
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	slightly moist loose	**SILTY SAND**, some fine grained gravel, poorly graded, subrounded to subangular, nonplastic, brown
5			D		GM	slightly moist loose	**SILTY SAND & GRAVEL**, some cobbles, poorly graded, subrounded to subangular, nonplastic, brown
10					GP-GC	slightly moist very dense	**CLAYEY SILT, SAND & GRAVEL**, some cobbles, occasional boulders, poorly graded, subrounded to subangular, low plasticity, light brown note: maximum estimated particle size of 18"
20							Stopped Trackhoe at 20'
25							

SAMPLE TYPE
T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

6-117-000029 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-1

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 22+00, 75' R
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D		SM	slightly moist	**SILTY SAND**, predominantly fine to medium grained sand, nonplastic, light brown
1			D			slightly moist	**GRAVELLY SAND**, with cobbles, maximum 2' boulders, well graded sand & gravel, rounded to subrounded, nonplastic, brown
2							
3							
4					SP		
5							
6							
7							
8							
9							Backhoe refused at 9'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-2

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 30+00, 50' R
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SAND, GRAVEL & COBBLES**, cobbles up to 12" in diameter. subrounded to rounded well graded gravel, predominantly fine to medium grained subrounded to rounded, sand, nonplastic, brown
1							
2							
3							
4					GP		
5							
6							
7							
8							
9							Stopped Backhoe at 9'
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-3

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 42+00, 100' R
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to dry	**SILTY SAND, GRAVEL & COBBLES**, cobbles up to 6" in diameter, subrounded to rounded poorly graded gravel, subrounded to rounded well graded sand, no lime, nonplastic, brown
1							
2							
3							
					GP/ GM		
4							
5							
6							
7							
8							
9							Stopped Backhoe at 9'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-4

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 52+00, 50' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to dry	**SILTY SAND**, predominantly fine grained, nonplastic, brown
					SM		
1							
2						slightly moist to dry	**SANDY GRAVEL & COBBLES**, rounded to subrounded cobbles (up to 6" in diameter), poorly graded gravel rounded to subrounded well graded sand, nonplastic, brown
3							
4							
5			D		GP		
6							
7							
8							
9							Stopped Backhoe at 9'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-5

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 64+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SILTY SAND**, trace of fine grained gravel, predominantly fine to medium grained, some lime, nonplastic, brown
1							
2							
3					SM		
4							
5							
6							
7							
8							
9			D		SW	slightly moist	**GRAVELLY SAND**, predominantly fine grained gravel, predominantly coarse grained subrounded to rounded sand, nonplastic, brown Stopped Backhoe at 10'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-6

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 75+00, 20' R
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SAND, GRAVEL & COBBLES**, cobbles up to 2' in diameter, rounded to subrounded well graded sand & gravel, no lime, nonplastic, brown
1							
2							
3					GP		
4							
5							
6							
7							
8							Stopped Backhoe at 8'
9							
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-7

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 85+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to dry	**GRAVELLY SAND**, trace of cobbles (up to 6" in diameter), rounded poorly graded gravel, rounded well graded sand, no lime, nonplastic, brown note: one 2'6" boulder at 2'
1							
2			D				
3							
4							
					GP/ GM		
5							
6							
7							
8							
9							Stopped Backhoe at 10'
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-8

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 105+00, 100' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to dry	**SAND, GRAVEL & COBBLES**, some 6" cobbles, occasional 1" cobbles, subrounded to rounded poorly graded gravel, subrounded to rounded well graded sand, no lime, nonplastic, brown
1						medium dense	note: larger cobbles at 8'
2							
3					GP/ GM		
4							
5							
6							
7							
8							Stopped Backhoe at 8'
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-9

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 125+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SAND, GRAVEL & COBBLES**, some cobbles, subrounded to rounded well graded sand & gravel, nonplastic, brown
1			D				
2							
3					GP		
4							
5							
6							
7							
8							
9							Stopped Backhoe at 9'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-10

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 135+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**GRAVELLY SAND**, trace of boulders (up to 24" in diameter), fine grained gravel, subangular to subrounded, predominantly medium to coarse grained sand, nonplastic, brown
1							
2							
3					SP		
4							
5							
6							
7							
8							Stopped Backhoe at 8'
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-11

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 145+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**GRAVELLY SAND**, fine grained gravel, subangular to subrounded, well graded sand, nonplastic, brown
1							
2							
3					SP		
4							
5							
6							
7							
8							
9							Stopped Backhoe at 9'
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-12

JOB NO. 7-117-000062 DATE 10-15-97

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 155+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**GRAVELLY SAND**, trace of clay, predominantly fine grained gravel, subangular to subrounded, well graded sand, nonplastic, brown
1							
2					SP		
3							
4							
5							
6							
7							Stopped Backhoe at 7'
8							
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
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7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-13

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 166+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist	**SILTY SAND**, fine grained gravel, well graded sand, no lime, nonplastic, brown note: occasional 24" boulder
1							
2			D		SM		
3							
4							
5							
6			D			slightly moist to moist	**SAND, GRAVEL & COBBLES**, cobbles up to 12" in diameter, subrounded to rounded sand & gravel, nonplastic, brown
					GP		
7							
8							Stopped Backhoe at 8'
9							
10							

7-117-000062.GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-14

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 176+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to moist	**CLAYEY SAND & GRAVEL**, predominantly fine grained gravel, subangular to subrounded, predominantly well graded sand, low to medium plasticity, dark brown note: occasional cobbles
1					SC		
2							
3							
4							**SAND, GRAVEL & COBBLES**, some clay, boulders up to 24" in diameter, poorly graded sand & gravel, rounded to subrounded, low to medium plasticity, brown
					GC	slightly moist to moist	
5							
6							
7							Stopped Backhoe at 7'
8							
9							
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
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PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-15

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 184 + 00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SILTY SAND**, predominantly fine to medium grained, no lime, nonplastic, light brown
1							
2							
3							
4					SM		
5							
6							
7							
8							
9							Stopped Backhoe at 10'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-16

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 197+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	**SAND, GRAVEL & COBBLES**, trace of clay, cobbles up to 12" in diameter, subangular to subrounded well graded sand & gravel, nonplastic, light brown
1							
2							
3					GM/		
					GP		
4							
5							
6							
7							
8							Backhoe refused at 8'
9							
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-17

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 205+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to dry	**SILTY SAND TO SAND**, some fine grained gravel, predominantly medium to caorse grained sand, nonplastic, brown
1							
2							
3					SM/		
					SP		
4							
5							
6							
7							
8							
9							Stopped Backhoe at 9'
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-18

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 222+00, 10' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			moist	**SILTY SAND TO CLAYEY SAND**, trace of clay, well graded sand, no lime, nonplastic to low plasticity, reddish brown note: 6" cobbles at 8'
1							
2							
3					SM/ SC		
4							
5							
6							
7							
8							Stopped Backhoe at 8'
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-19

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 231+00, 10' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			moist	**SILTY SAND**, trace of boulders, trace of clay, well graded sand, no lime, nonplastic, reddish brown note: refused on boulders at 8'
1							
2							
3					SM		
4							
5							
6							
7							
8							Backhoe refused at 8'
9							
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-20

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 238+00, on centerline
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to moist	**SANDY CLAY TO CLAYEY SAND**, well graded sand, no lime, medium plasticity, brown
					SC		
1							
2						slightly moist to moist	**SILTY SAND**, some cobbles (up to 6" in diameter), well graded sand, nonplastic, brown
3							
4					SM		
5			D				
6							
7							
8							Stopped Backhoe at 8'
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-21

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 247+00, 25' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist to	**SILTY SAND TO SAND**, trace of cobbles (up to 6" in diameter), poorly graded sand, predominantly coarse grained, no lime, nonplastic, brown
						moist	
1							
2							
3					SM/		
					SP		
4							
5							
6							
7							
8							Stopped Backhoe at 8'
9							
10							

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

7-117-000062 GWH 04/07/98

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-22

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0			D			moist	**SILTY SAND**, trace of cobbles, well graded, nonplastic, brown note: trace of fine grained gravel note: low plasticity from 8' to 9'
1							
2							
3					SM		
4							
5							
6							
7							
8			D				
9							Stopped Backhoe at 9'
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-23

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 257+00, 10' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	**SILTY SAND**, some gravel & occasional cobbles up to 3" in diameter, well graded sand, nonplastic, brown note: material became weakly lime cemented with cobbles at 4', strongly lime cemented at 6'
1			D				
2							
3					SM		
4							
5			D				
6							
7							Backhoe refused at 6'6"
8							
9							
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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PROJECT Additional Investigation - Desert Greenbelt

LOG OF TEST PIT NO. TP-24

JOB NO. 7-117-000062 DATE 10-16-97

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE Ford 555D
LOCATION Sta. 264+00, 30' L
ELEVATION
DATUM

Depth in Meters	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Soil/USCS Classification	REMARKS	VISUAL CLASSIFICATION
0						moist	**SILTY SAND**, trace of fine grained gravel, well graded sand, nonplastic, brown
1					SM		
2							
3							
4			D			moist	**CLAYEY SAND**, some fine grained gravel, well graded sand, medium plasticity, reddish brown
5							
6					SC		
7							
8							
9							Stopped Backhoe at 9'
10							

7-117-000062 GWH 04/07/98

SAMPLE TYPE

T - Tube Sample.
D - Disturbed Bulk Sample.
U - 76mm O.D. 61mm I.D. Tube Sample

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APPENDIX B

LABORATORY TEST RESULTS

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AGRA Earth & Environmental, Inc.

PROJECT: ADDITIONAL INVESTIGATION-DESERT GREENBELT
LOCATION: REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ

JOB NO: 7-117-000062
WORK ORDER NO: 2
DATE SAMPLED: 10-20-97

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or	SAND								GRAVEL								COBBLES		
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #
PERCENT PASSING BY WEIGHT																							
TP13 @ 2-5' & TP15 @ 0-8'	SM	NV	NP	13	18	23	27	31	43	55	57	76	82	88	91	95	96	99	100	100	100	100	20/23
TP13 @ 6-8' & TP16 @ 0-8'	SP-SM	NV	NP	8.7	12	17	21	25	35	45	49	60	66	73	77	83	87	92	96	100	100	100	21/24
TP14 @ 0-4' & TP18 @ 0-8'	SP-SM	NV	NP	5.4	7	10	13	17	29	45	53	82	90	95	97	98	99	99	100	100	100	100	22/26
TP14 @ 0-8' & TP15 @ 0-8'	SM	NV	NP	12	16	22	26	30	40	52	57	73	80	86	89	93	95	98	100	100	100	100	22,23&2
TP17 @ 0-8'	SP	NV	NP	3.4	7	15	21	28	45	62	69	89	94	97	98	99	100	100	100	100	100	100	25
TP19 @ 0-7' & TP20 @ 5-7'	SP-SM	NV	NP	8.2	12	17	21	25	38	52	58	81	87	93	95	97	98	98	99	100	100	100	27/29
TP20 @ 0-2' & TP21 @ 0-8'	SC-SM	25	7	16	20	25	29	33	46	59	65	87	92	96	98	99	100	100	100	100	100	100	28/30
TP21 @ 0-8' & TP23 @ 1-4'	SP-SM	NV	NP	10	14	20	24	29	41	55	61	81	87	93	95	97	97	98	100	100	100	100	30/33
TP23 @ 1-4' & TP24 @ 4-9'	SP-SC	31	13	7.5	9	12	15	18	28	41	47	71	81	93	97	99	99	100	100	100	100	100	33/35
TP21@0-8',TP22@0-2'&TP22@	SP-SM	NV	NP	9.3	13	18	23	28	43	58	64	85	90	95	97	98	99	100	100	100	100	100	30,31&3

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AGRA Earth & Environmental, Inc.

PROJECT: ADDITIONAL INVESTIGATION-DESERT GREENBELT
LOCATION: REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ

JOB NO: 7-117-000062
WORK ORDER NO: 2
DATE SAMPLED: 10-20-97

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or	SAND								GRAVEL								COBBLES		
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #

PERCENT PASSING BY WEIGHT

TP1 @ 0-1' & TP4 @ 0-2'	SM	NV	NP	35	44	52	56	60	69	76	78	85	88	91	93	96	98	100	100	100	100	100	5/9
TP1 @ 1-9' & TP5 @ 8.5-10'	SP-SM	NV	NP	9.5	14	20	26	32	43	60	65	78	82	87	90	93	95	98	100	100	100	100	6/12
TP2 @ 0-9' & TP4 @ 5-9'	SP-SM	NV	NP	8.5	13	18	22	25	33	40	43	55	60	67	71	79	83	90	95	100	100	100	7/10
TP3 @ 0-9' & TP6 @ 0-8'	SP-SM	NV	NP	9.5	13	19	23	27	37	46	50	63	68	75	78	83	86	91	94	100	100	100	8/13
TP4 @ 0-2' & TP5 @ 0-3'	SM	NV	NP	46	56	64	67	69	75	80	82	90	93	96	97	99	99	100	100	100	100	100	9/11
TP7 @ 2-9' & TP8 @ 0-8'	SP-SM	NV	NP	7.7	11	17	21	25	36	46	49	61	67	73	77	82	85	90	95	100	100	100	14/15
TP7 @ 2-9' & TP9 @ 1-9'	SP-SM	NV	NP	5.9	9	15	19	23	35	47	52	70	76	83	86	89	92	96	100	100	100	100	14/16
TP9 @ 1-9'	SP-SM	NV	NP	6.1	9	15	19	24	32	49	53	70	76	82	85	90	94	96	100	100	100	100	16
TP10 @ 0-8' & TP11 @ 0-9'	SP-SM	NV	NP	9.3	14	21	26	31	46	62	68	86	92	97	98	99	100	100	100	100	100	100	17/18
TP11 @ 0-9' & TP12 @ 0-7'	SP-SM	NV	NP	7.8	12	20	25	31	49	64	70	82	89	94	95	98	99	100	100	100	100	100	18/19

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental, Inc.

PROJECT: ADDITIONAL INVEST.- DESERT GREENBELT
LOCATION: REATTA PASS WASH CHANNELIZATION

JOB NO: 7-117-000062
WORK ORDER NO: 1
DATE SAMPLED: 07-07-97

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or Clay	SAND								GRAVEL								COBBLES		
					Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #

PERCENT PASSING BY WEIGHT

HP-1 @ L-6 ALLUV	SP-SM	NP	0	9	13	19	24	30	45	58	64	80	8[illegible]	93	95	97	97	98	99	99	100	100	1
HP-2 @ L-1 STRMBED	SP	NP	0	3	5	12	16	22	38	57	65	91	96	98	98	99	99	99	99	100	100	100	2

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AGRA Earth & Environmental, Inc.

PROJECT: DESERT GREENBELT - PHASE I
LOCATION: PIMA ROAD BETWEEN BELL & PINNACLE PEAK

JOB NO: E95-86
WORK ORDER NO: 6
DATE SAMPLED: 07-21-95

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or Clay	SAND								GRAVEL								
					Fine			Medium			Coarse		Fine				Coarse				
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	Lab #

PERCENT PASSING BY WEIGHT

DB-1 @ 5 - 6'	CL	30	9	78	87	91	93	94	96	97	97	99	99	99	100	100	100	100	100	100	215
DB-1 @ 20 - 21.5'	SM	40	14	24	29	34	37	41	54	67	71	92	97	100	100	100	100	100	100	100	218
RP-1 @ 0 - 1.5'	SM	NV	NP	24	28	35	39	44	55	66	71	87	93	97	100	100	100	100	100	100	195
RP-3 @ 10 - 11.5'	SC	30	10	17	22	30	35	40	54	66	71	86	92	98	99	100	100	100	100	100	202
RP-4 @ 5 - 6.5'	SM	NV	NP	19	25	34	41	47	62	74	78	92	95	97	100	100	100	100	100	100	205
RP-5 @ 0 - 1.5'	SC	28	9	26	32	42	48	55	71	82	85	94	97	99	100	100	100	100	100	100	208
RP-6 @ 5 - 6.5'	SC	30	10	21	24	30	33	38	50	64	70	89	95	100	100	100	100	100	100	100	211
RP-6 @ 13 - 15'	GP-GC	33	16	8.2	9	11	13	15	21	29	33	47	54	64	71	85	98	100	100	100	213

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental, Inc.

PROJECT: DESERT GREENBELT - PHASE I
LOCATION: PIMA RD BETWEEN BELL & PINNACLE PEAK RDS

JOB NO: E95-86
WORK ORDER NO: 8
DATE SAMPLED: 07-31-95

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or	SAND								GRAVEL								COBBLES		
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #

PERCENT PASSING BY WEIGHT

RTP 12 @ 0 - 2'	GP	NV	NP	2.5	4	6	8	10	17	23	25	34	37	44	48	55	59	69	73	87	100	100	254
RTP 14 @ 0 - 2'	SM	NV	NP	19	25	33	37	42	53	62	66	79	82	87	89	92	92	93	95	100	100	100	253
RTP 16 @ 0 - 2'	SM	NV	NP	23	31	40	45	51	62	72	76	87	90	95	97	99	99	100	100	100	100	100	255
RTP 19 @ 0 - 4'	SM	NV	NP	25	31	38	41	45	55	65	68	82	86	92	94	96	97	98	100	100	100	100	252

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AGRA Earth & Environmental, Inc.

PROJECT: DESERT GREENBELT - PHASE I
LOCATION: PIMA RD BETWEEN BELL & PINNACLE PEAK RDS

JOB NO: E95-86
WORK ORDER NO: 9
DATE SAMPLED: 07-31-95

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or	SAND								GRAVEL								COBBLES		
				Clay	Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #

PERCENT PASSING BY WEIGHT

CN5A-1 @ 5 - 6'	SC-SM	26	6	41	48	55	58	61	69	75	78	90	95	99	100	100	100	100	100	100	100	100	257
CN5A-2 @ 10 - 11.5'	SM	27	5	34	40	46	50	54	67	78	83	96	98	99	100	100	100	100	100	100	100	100	262
CN5B-1 @ 5 - 6'	SM	36	9	42	49	54	57	61	71	80	83	94	98	99	100	100	100	100	100	100	100	100	270
CN5B-2 @ 5 - 6'	SM	32	6	39	44	48	52	55	67	76	80	95	98	99	100	100	100	100	100	100	100	100	273
CN5B-3 @ 10 - 11.5'	SC	32	9	37	43	49	52	55	64	74	77	92	95	99	100	100	100	100	100	100	100	100	278
RTP-1	SW	NV	NP	2.1	4	11	16	22	39	59	66	88	93	98	98	100	100	100	100	100	100	100	280
RTP-3	SP-SM	NV	NP	5.0	8	13	16	20	33	46	52	73	83	95	97	99	99	100	100	100	100	100	281
RTP-5	SC	29	12	15	19	24	27	31	40	48	52	61	66	73	77	84	89	96	100	100	100	100	282
RTP-6	GP-GC	30	12	7.1	9	12	14	17	23	29	32	41	45	53	58	67	72	78	89	96	100	100	283
RTP-9	GP	NV	NP	3.7	6	10	13	17	27	36	39	52	57	66	72	80	86	93	96	100	100	100	284

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ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental, Inc.

PROJECT: DESERT GREENBELT PHASE I
LOCATION: PIMA RD & DEER VALLEY RD; SCOTTSDALE

JOB NO: 6-117-000029
WORK ORDER NO: 2
DATE SAMPLED: 02-27-96

MECHANICAL SIEVE ANALYSIS
GROUP SYMBOL, USCS (ASTM D-2487)

SIEVE SIZES

				Silt or Clay	SAND								GRAVEL								COBBLES		
					Fine			Medium			Coarse		Fine				Coarse						
Location & Depth	USCS	LL	PI	#200	#100	#50	#40	#30	#16	#10	#8	#4	1/4"	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	Lab #

PERCENT PASSING BY WEIGHT

RTP-3A @ 0.0 - 5.0'	SP-SM	NV	NP	11	14	21	24	29	41	54	58	74	79	84	85	86	87	89	91	95	95	100	11
RTP-6A @ 0.0 - 4.0'	SM	NV	NP	17	22	29	33	37	47	58	62	81	88	94	96	98	98	99	100	100	100	100	7
RTP-10A @ 7.0 - 10.0'	SP-SM	NV	NP	8.1	10	15	19	23	36	55	61	82	86	91	93	94	96	97	100	100	100	100	13
RTP-14A @ 0.0 - 5.0'	GP	NV	NP	4.1	5	8	9	12	18	26	30	46	53	62	67	75	79	87	94	100	100	100	16
RTP-6B @ 2.0 - 5.0'	GP-GC	25	7	7.3	9	13	15	17	22	28	30	37	40	46	48	53	58	65	72	87	87	100	9
RTP-14B @ 0.0 - 5.0'	GP-GC	25	9	5.1	7	10	13	15	22	30	33	48	54	63	68	76	81	87	92	100	100	100	18
RTP-22 @ 0.0 - 5.0'	GP	23	6	4.4	6	10	12	15	23	30	33	44	50	58	63	71	76	84	90	92	98	100	20
RTP-22 @ 15.0 - 20.0'	GP	28	8	3.9	6	9	13	17	28	37	39	48	53	60	65	75	82	92	99	100	100	100	21

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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	NATIVE	LAB NO:	SEE BELOW
SAMPLE SOURCE:	SEE BELOW	DATE SAMPLED:	10-20-97

SAND EQUIVALENT VALUE OF SOILS AND FINE AGGREGATE
ASTM D-2419

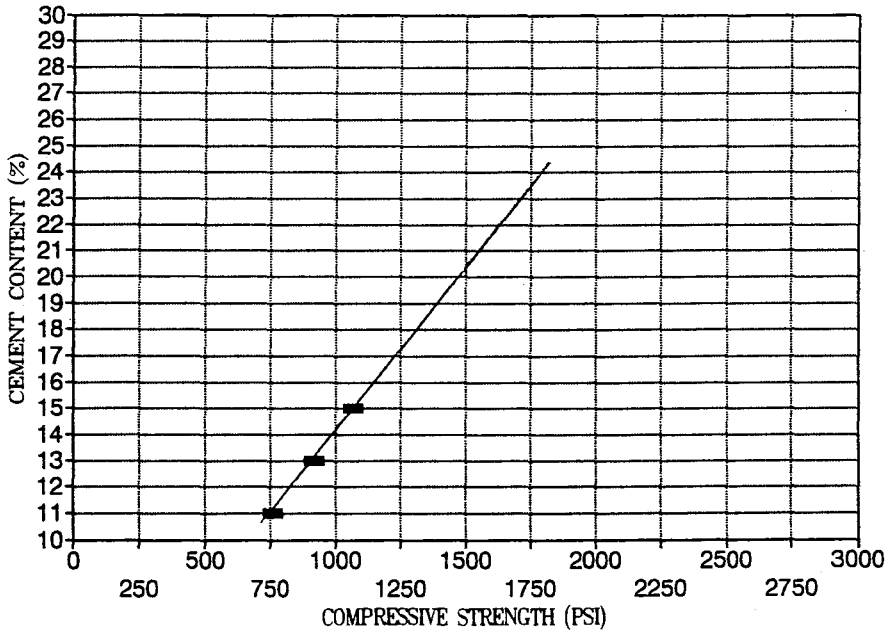
SAMPLE ID	LOCATIONS AND DEPTH	AVG CLAY READING	AVG SAND READING	SAND EQUIVALENT
5/9	TP1 @0-1'&TP4 @ 0-2'	5.9	1.8	31
6/12	TP1 @1-9'&TP5 @ 8.5-10'	5.5	3.3	60
7/10	TP2 @0-9'&TP4 @ 5-9'	8.4	3.1	37
8/13	TP3 @0-9'&TP6 @ 0-8'	6.1	3.2	52
9/11	TP4 @0-2'&TP5 @ 0-3'	6.1	1.3	21
14/15	TP7 @2-9'&TP8 @ 0-8'	5.9	3.2	54
14/16	TP7 @2-9'&TP9 @ 1-9'	6.2	3.7	60
16	TP9 @1-9'	4.6	3.3	72
17/18	TP10 @0-8'&TP11 @ 0-9'	5.4	3.3	61
18/19	TP11 @0-9'&TP12 @ 0-7'	7.7	3.4	44
20/23	TP13 @2-5'&TP15 @ 0-8'	6.7	3.0	45
21/24	TP13 @6-8'&TP16 @ 0-8'	9.8	3.1	32
22/26	TP14 @0-4'&TP18 @ 0-8'	11.4	3.1	27
22/23&24	TP14@0-8',TP15@0-8'&TP16@0-8'	9.2	3.1	34
25	TP17 @0-8'	4.5	3.3	73
27/29	TP19 @0-7'&TP20 @ 5-7'	7.5	3.2	43
28/30	TP20 @0-2'&TP21 @ 0-8'	6.6	2.9	44
30/33	TP21 @0-8'&TP23 @ 1-4'	7.6	3.3	43
33/35	TP23 @1-4'&TP24 @ 4-9'	11.5	2.9	25
30/31&32	TP21@0-8'&TP22@0-2'TP22@8-9'	8.5	3.2	38

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	5/9
SAMPLE SOURCE	TP1 @ 0-1' & TP4 @ 0-2'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	20.5	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	22.5	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	5/9
SAMPLE SOURCE:	TP1 @ 0-1' & TP4 @ 0-2'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

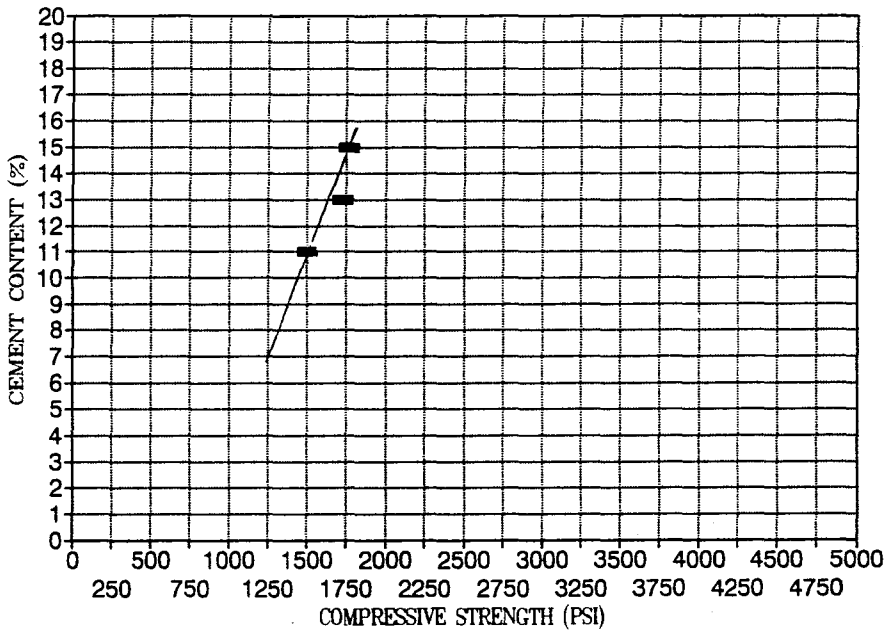
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
115	2063	8.0	126.3	4.00	11.0	10560	840		
116	2017	7.5	124.1	3.99	11.0	8460	677	758	760
117	2040	8.2	124.7	3.99	13.0	11331	906		
118	2055	8.3	125.5	3.99	13.0	11707	936	921	920
119	2054	7.9	125.9	3.99	15.0	13209	1056		
120	2017	8.4	123.1	3.97	15.0	13308	1075	1066	1070

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	6/12
SAMPLE SOURCE	TP1 @ 1-9' & TP5 @ 8.5-10'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	10.9	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	12.9	%



AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	6 &12
SAMPLE SOURCE:	TP1 @ 1-9' & TP5 @ 8.5-10'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

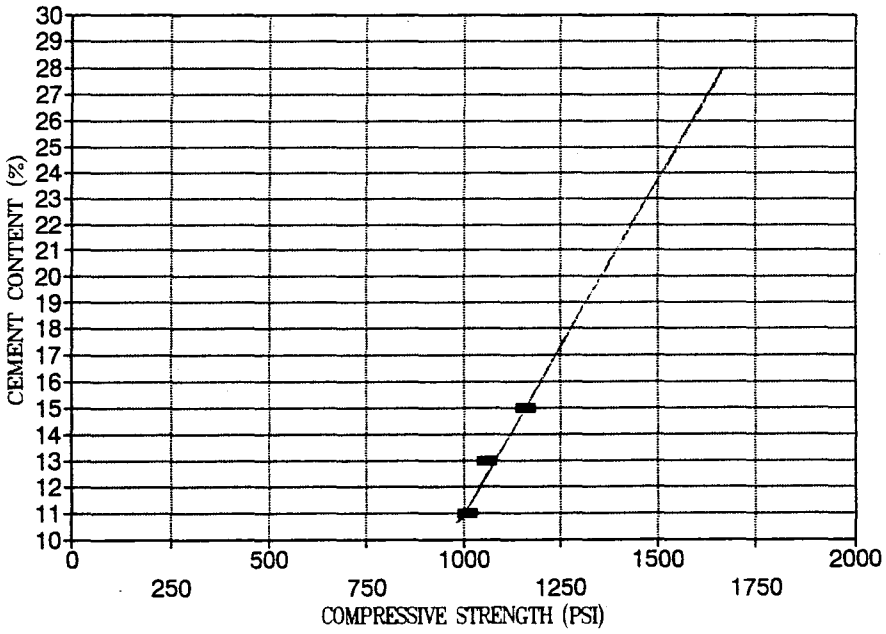
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
55	2139	8.1	130.9	3.97	11.0	17975	1452		
56	2154	7.8	132.2	3.98	11.0	19162	1540	1496	1500
57	2124	7.4	130.8	3.89	13.0	20329	1711		
58	2139	7.8	131.2	3.99	13.0	21832	1746	1728	1730
59	2123	7.9	130.1	3.99	15.0	22128	1770		
60	2130	7.7	130.8	3.99	15.0	22010	1760	1765	1770

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	7/10
SAMPLE SOURCE	TP2 @ 0-9' & TP4 @ 5-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	23.9	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	25.9	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	7/10
SAMPLE SOURCE:	TP2 @ 0-9', TP4 @ 5-9'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

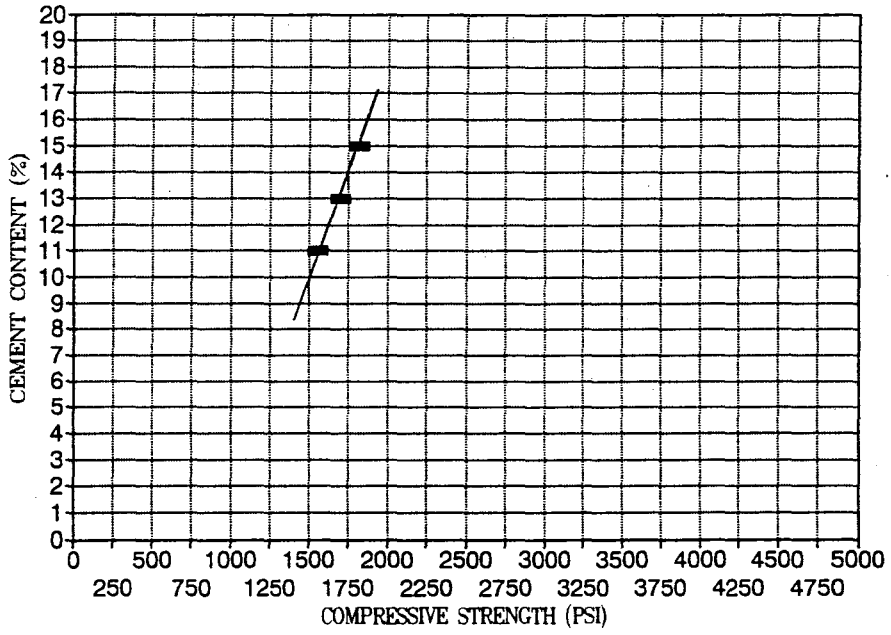
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
73	2121	6.3	132.0	3.99	11.0	12320	985		
74	2125	6.1	132.5	3.99	11.0	12952	1036	1011	1010
75	2110	6.4	131.2	3.98	13.0	13387	1076		
76	2083	6.4	129.5	3.99	13.0	13071	1045	1061	1060
77	2060	7.5	126.7	3.99	15.0	14139	1131		
787	2078	5.8	129.9	3.99	15.0	14930	1194	1162	1160

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	8/13
SAMPLE SOURCE	TP3 @ 0-9' & TP4 @ 5-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	**PSI**
CORRESPONDING CEMENT CONTENT:	10.0	**%**
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	12.0	**%**

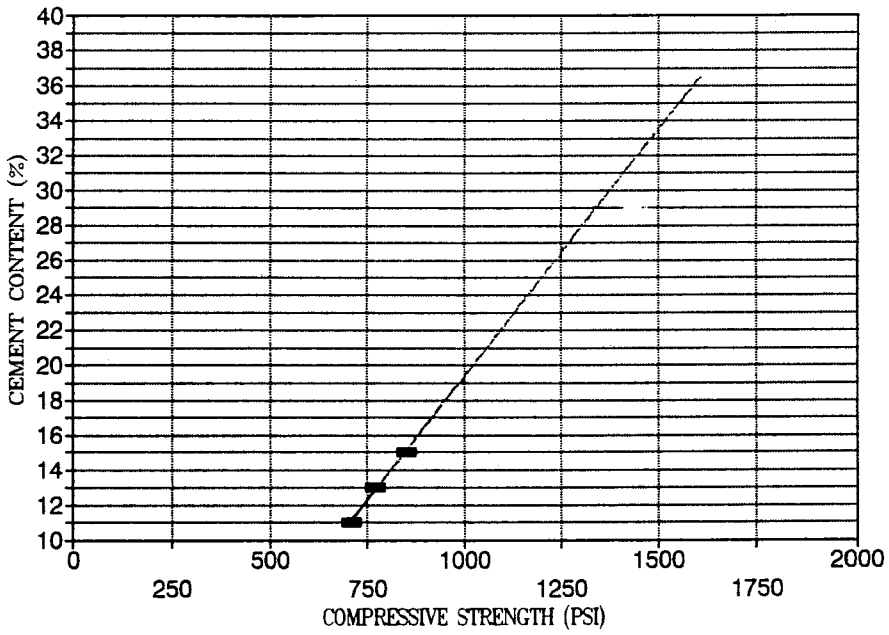


AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	9/11
SAMPLE SOURCE	TP4 @ 0-2' & TP5 @ 0-3'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	33.5	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	35.5	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	9/11
SAMPLE SOURCE:	TP4 @ 0-2' & TP5 @ 0-3'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

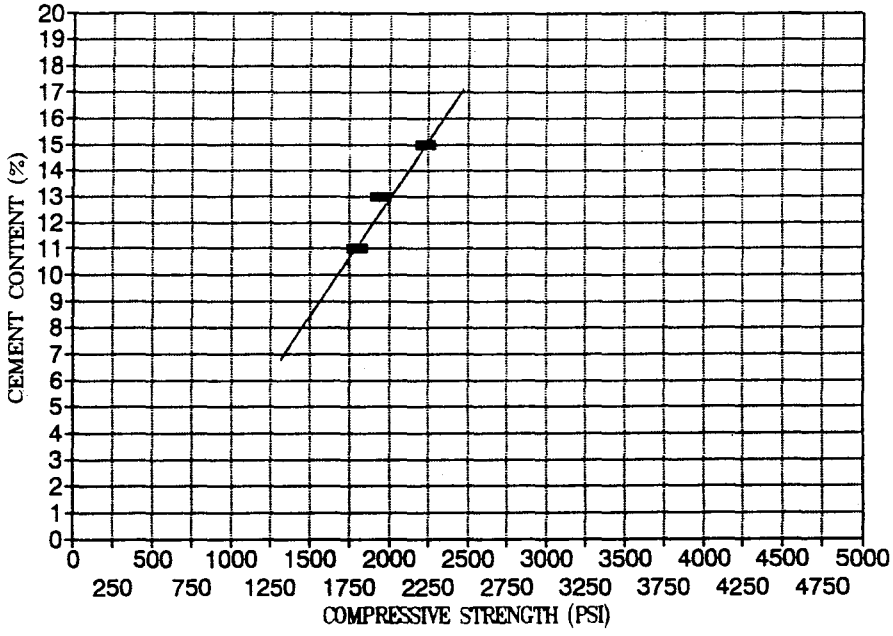
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
25	2038	9.4	123.2	3.98	11.0	9810	789		
26	2020	9.1	122.5	3.99	11.0	7930	634	711	710
27	1988	9.2	120.4	3.99	13.0	9690	775		
28	2009	9.2	121.7	3.99	13.0	9610	769	772	770
29	2005	9.1	121.5	3.99	15.0	10876	870		
30	2007	9.4	121.3	3.99	15.0	10480	838	854	850

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	14/15
SAMPLE SOURCE	TP7 @ 2-9' & TP8 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	8.5	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	10.5	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	14/15
SAMPLE SOURCE:	TP7 @ 2-9', TP8 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
61	2194	7.5	135.0	3.90	11.0	19538	1636		
62	2205	7.5	135.7	3.90	11.0	23543	1971	1803	1800
63	2201	7.7	135.2	3.90	13.0	22207	1859		
64	2206	7.2	136.1	3.90	13.0	24363	2039	1949	1950
65	2174	7.0	134.4	4.00	15.0	26400	2101		
66	2205	7.2	136.0	3.90	15.0	28120	2354	2227	2230

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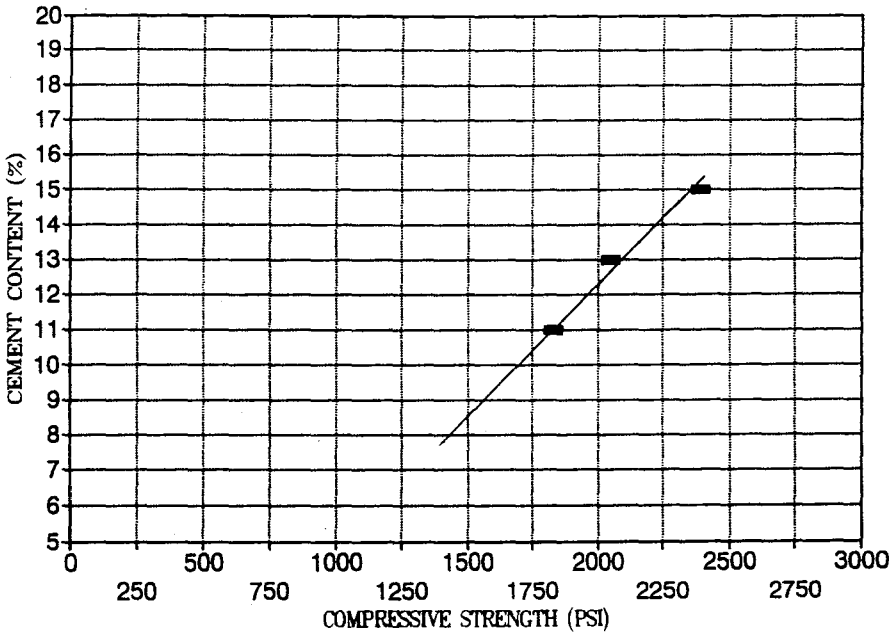
PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	14/16
SAMPLE SOURCE	TP7 @ 2-9' & TP9 @ 1-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	8.8	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	10.8	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	14/16
SAMPLE SOURCE:	TP7 @ 2-9' & TP9 @ 1-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

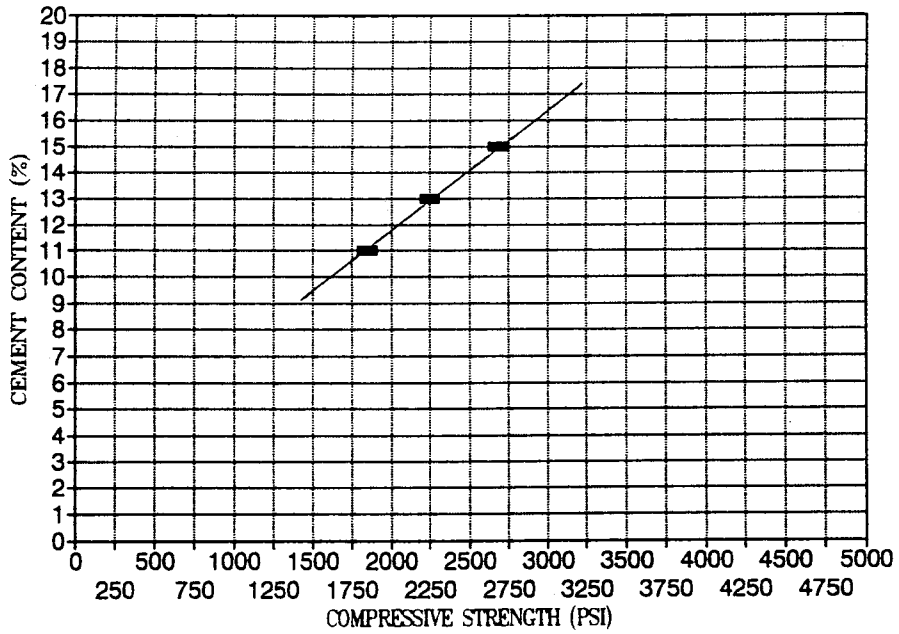
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
19	2190	7.6	134.6	3.99	11.0	23493	1879		
20	2172	7.9	133.1	3.98	11.0	22267	1790	1834	1830
21	2200	7.4	135.5	4.00	13.0	25589	2036		
22	2213	7.4	136.3	3.99	13.0	25826	2065	2051	2050
23	2190	7.8	134.4	4.00	15.0	29465	2345		
24	2166	7.3	133.5	4.00	15.0	30493	2427	2386	2390

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	15/16
SAMPLE SOURCE	TP8 @ 0-8' & TP9 @ 1-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	9.3	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	11.3	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	15/16
SAMPLE SOURCE:	TP8 @ 0-8' & TP9 @ 1-9'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

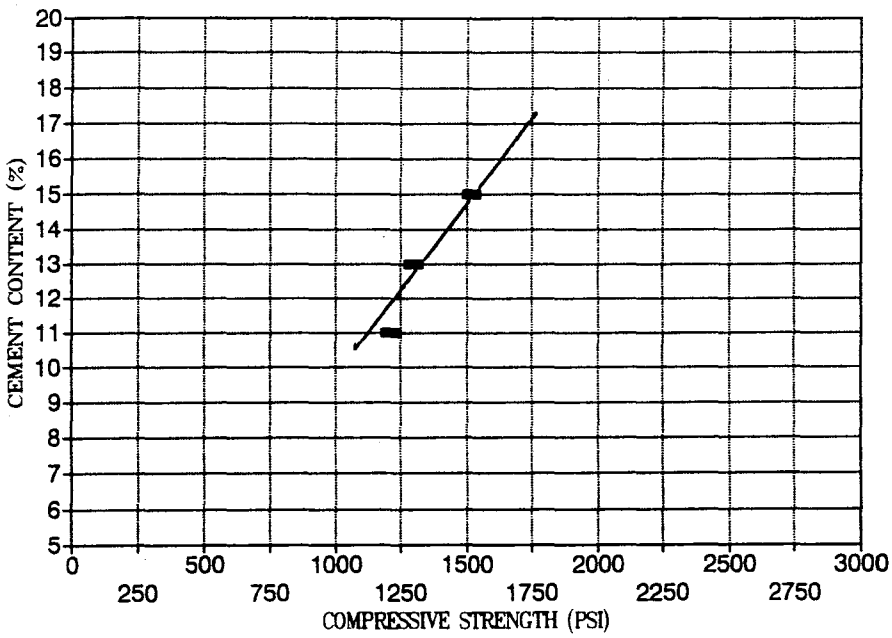
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
31	2206	7.8	135.3	3.90	11.0	21120	1768		
32	2201	8.4	134.3	3.90	11.0	23137	1937	1852	1850
33	2195	8.0	134.4	3.90	13.0	26894	2251		
34	2205	8.8	134.0	3.90	13.0	26815	2245	2248	2250
35	2207	8.0	135.2	4.00	15.0	32823	2612		
36	2206	7.4	135.9	3.90	15.0	32708	2738	2675	2680

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	17/18
SAMPLE SOURCE	TP10 @ 0-8' & TP11 @ 0-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	14.9	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	16.9	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	17/18
SAMPLE SOURCE:	TP10 @ 0-8' & TP11 @ 0-9'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

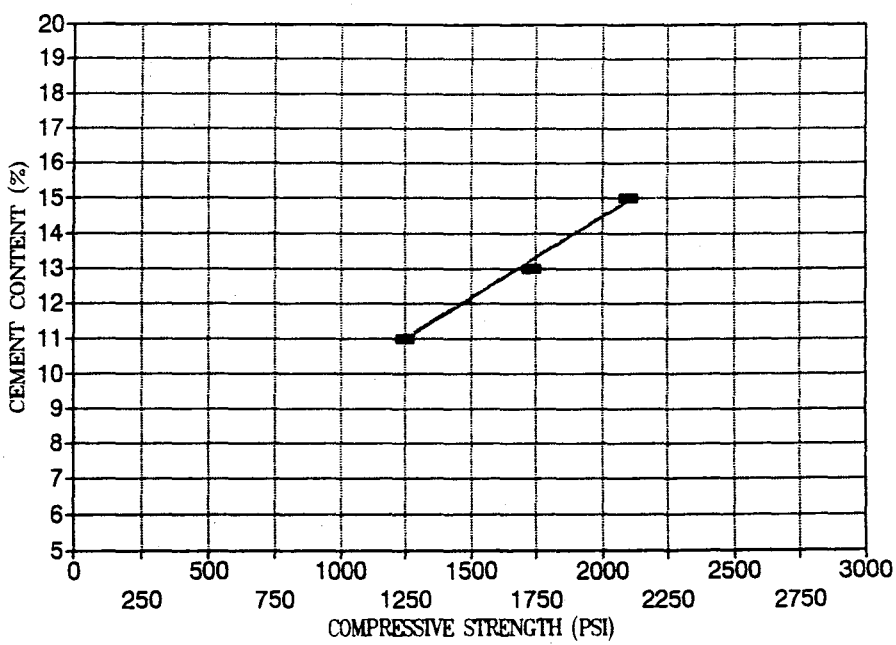
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
13	2114	7.3	130.3	3.99	11.0	15642	1251		
14	2148	7.1	132.7	3.98	11.0	14475	1163	1207	1210
15	2087	7.4	128.5	3.99	13.0	16797	1343		
16	2083	7.0	128.8	3.99	13.0	15800	1264	1304	1300
17	2086	7.3	128.6	3.99	15.0	18916	1513		
18	2085	7.4	128.4	3.98	15.0	19004	1528	1520	1520

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	18/19
SAMPLE SOURCE	TP11 @ 0-9' & TP12 @ 0-7'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	12.1	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.1	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	18/19
SAMPLE SOURCE:	TP11 @ 0-9' & TP12 @ 0-7'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

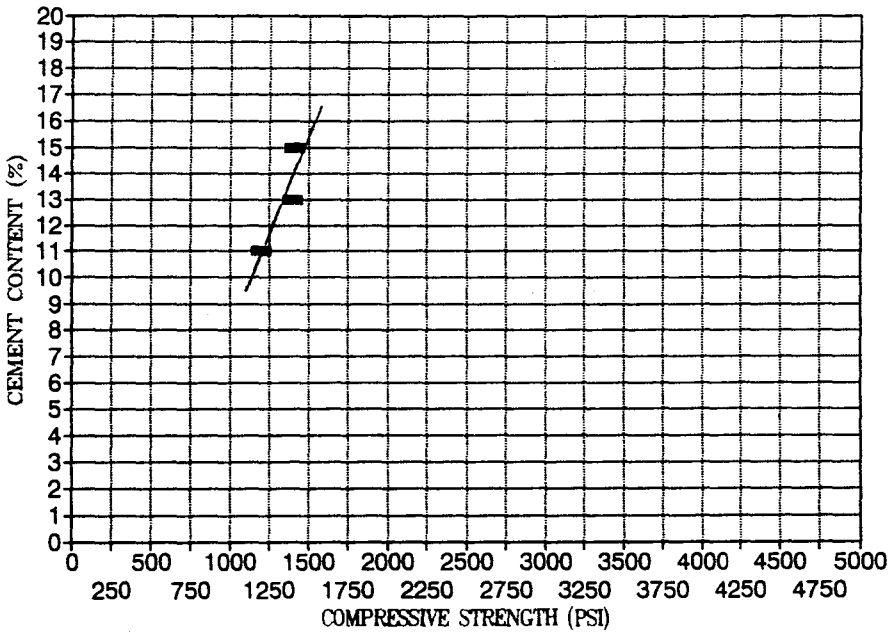
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
7	2205	9.0	133.8	3.99	11.0	16393	1311		
8	2164	8.7	131.7	4.00	11.0	14969	1191	1251	1250
9	2191	8.5	133.6	4.00	13.0	21416	1704		
10	2211	9.1	134.0	4.02	13.0	22267	1754	1729	1730
11	2220	8.9	134.8	3.99	15.0	27250	2179		
12	2231	9.0	135.4	4.02	15.0	25708	2025	2102	2100

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	20/23
SAMPLE SOURCE	TP13 @ 2-5' & TP15 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	15.4	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	17.4	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	20/23
SAMPLE SOURCE:	TP13 @ 2-5' & TP15 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

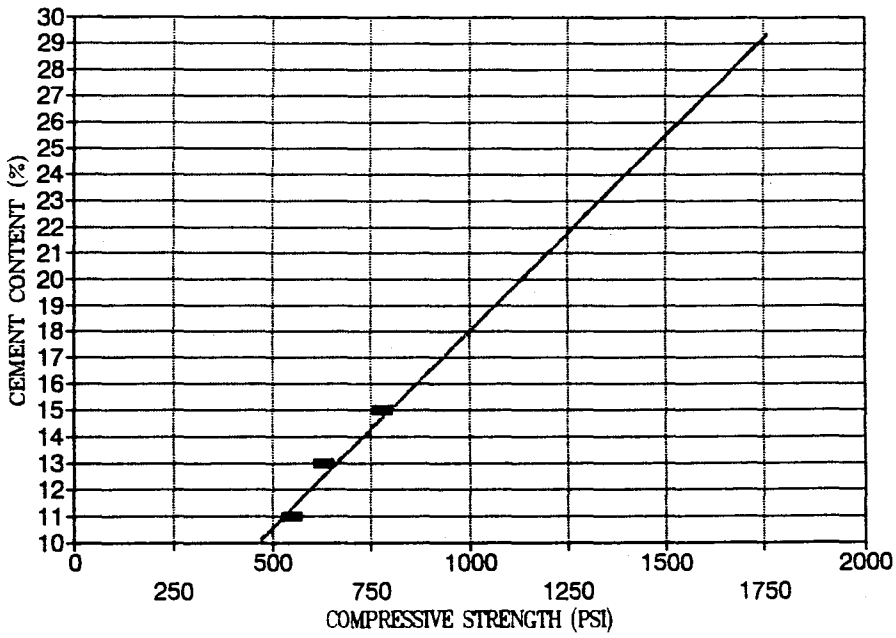
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
79	2131	7.7	130.9	3.99	11.0	15879	1270		
80	2112	7.8	129.6	3.99	11.0	14238	1139	1204	1200
81	2137	7.5	131.5	3.97	13.0	17323	1399		
82	2120	8.0	129.8	3.99	13.0	17580	1406	1403	1400
83	2097	7.4	129.1	3.99	15.0	17916	1433		
84	2100	7.5	129.2	3.99	15.0	17362	1389	1411	1410

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	15/16
SAMPLE SOURCE	TP13 @ 6-8' & TP16 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	27.3	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	29.3	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	21/24
SAMPLE SOURCE:	TP13 @ 6-8' & TP16 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

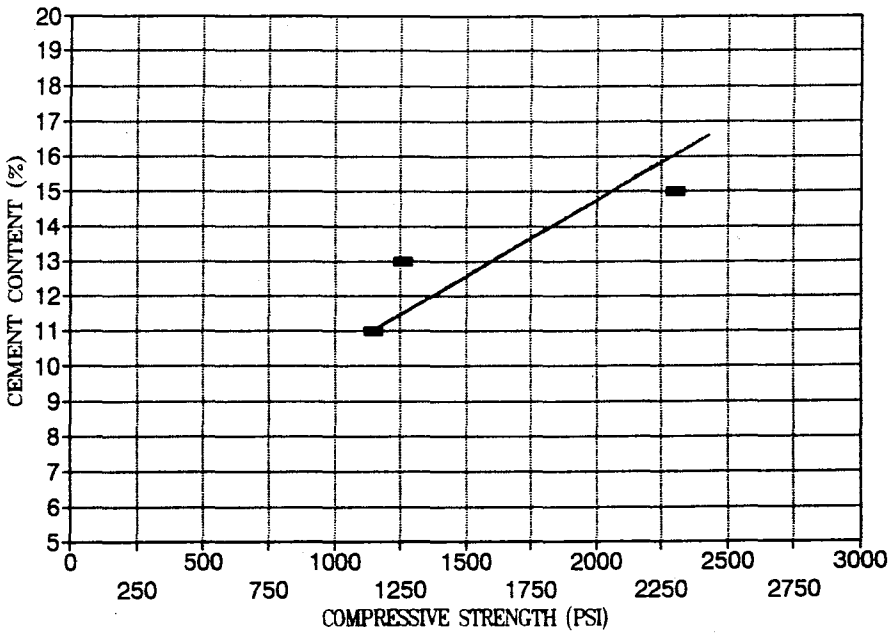
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
103	2029	4.9	127.9	3.97	11.0	6860	554		
104	2026	5.1	127.5	3.98	11.0	6740	542	548	550
105	2046	5.5	128.3	3.98	13.0	7970	641		
106	2065	6.5	128.2	3.98	13.0	7615	612	626	630
107	2055	5.5	128.8	3.98	15.0	10401	836		
108	2053	5.5	128.7	3.97	15.0	8880	717	777	780

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	22/23/24
SAMPLE SOURCE	TP14 @ 0-4',TP15 @ 0-8'&TP16 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	**PSI**
CORRESPONDING CEMENT CONTENT:	12.8	**%**
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.8	**%**



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	22/23/24
SAMPLE SOURCE:	TP14 @ 0-4', TP15 @ 0-8' & TP16 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

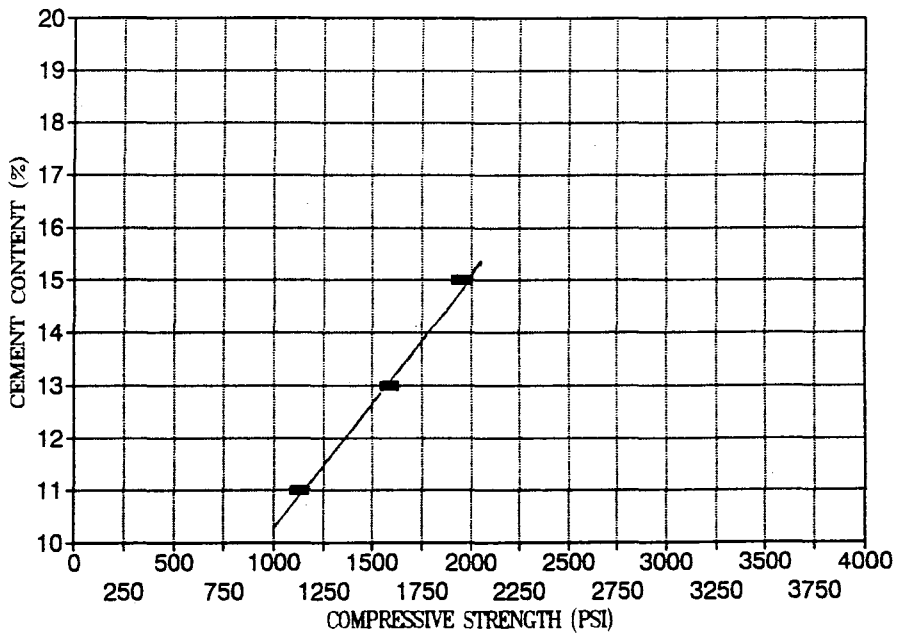
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
1	2136	7.1	131.9	3.99	11.0	14337	1147		
2	2146	7.3	132.3	3.98	11.0	14337	1152	1150	1150
3	2144	7.3	132.2	3.99	13.0	15325	1226		
4	2147	7.4	132.2	3.98	13.0	16116	1295	1261	1260
5	2113	6.9	130.7	3.99	15.0	18687	1495		
6	2127	7.3	131.1	4.10	15.0	18470	1399	1447	2300

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	22/26
SAMPLE SOURCE	TP14 @ 0-4' & TP18 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	**PSI**
CORRESPONDING CEMENT CONTENT:	12.7	**%**
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.7	**%**



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	22/26
SAMPLE SOURCE:	TP14 @ 0-4' & TP18 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

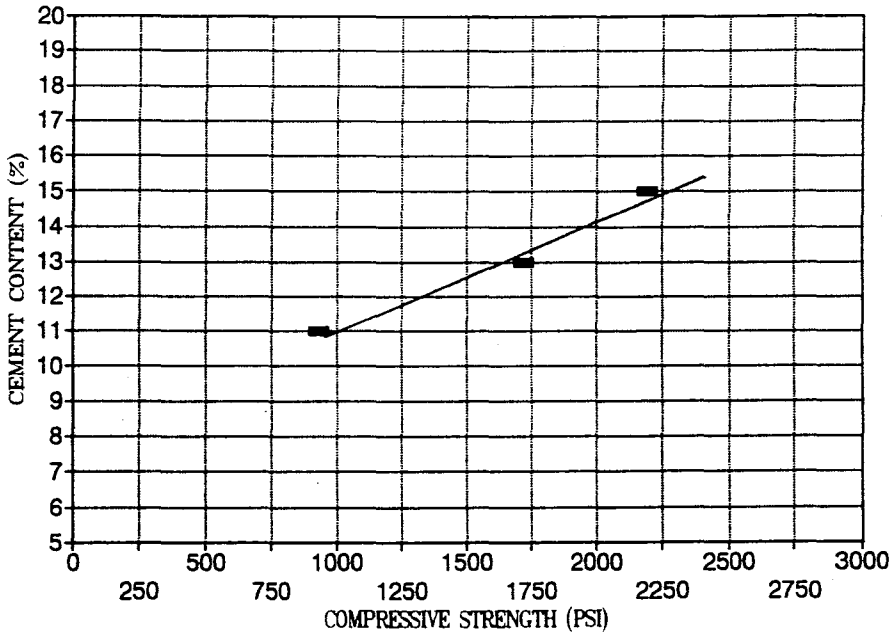
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
49	2100	8.4	128.1	3.98	11.0	14139	1136		
50	2109	8.6	128.4	3.98	11.0	14000	1125	1131	1130
51	2156	8.1	131.9	3.98	13.0	19854	1596		
52	2138	8.4	130.4	3.99	13.0	19772	1581	1589	1590
53	2184	8.4	133.3	3.99	15.0	22425	1793		
54	2197	8.4	134.0	3.99	15.0	26204	2096	1945	1950

AGRA Earth & En :ronmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	25
SAMPLE SOURCE	TP17 @ 0-8' & TP18 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	12.6	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.6	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	25
SAMPLE SOURCE:	TP17 @ 0-8' & TP18 @ 0-8'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

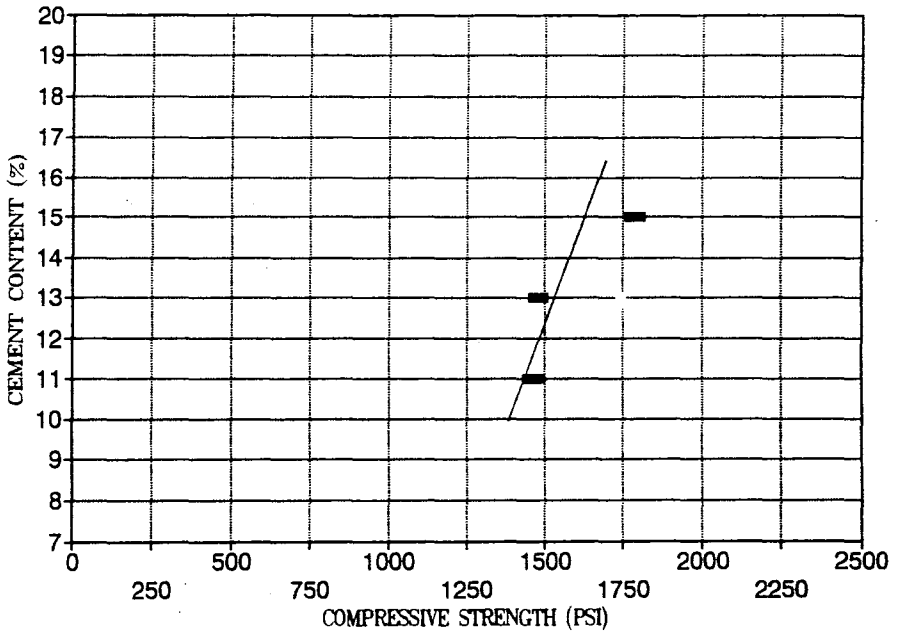
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
109	2138	8.4	130.4	3.98	11.0	12003	965		
110	2119	9.0	128.6	3.99	11.0	11173	894	929	930
111	2193	9.0	133.1	3.98	13.0	21583	1735		
112	2200	8.5	134.1	3.98	13.0	21137	1699	1717	1720
113	2217	9.0	134.5	3.99	15.0	26775	2141		
114	2205	8.2	134.8	4.00	15.0	28001	2228	2185	2190

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	27/29
SAMPLE SOURCE	TP19 @ 0-7' & TP20 @ 5-7'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	12.3	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.3	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	27-29
SAMPLE SOURCE:	TP19 @ 0-7' & TP20 @ 5-7'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

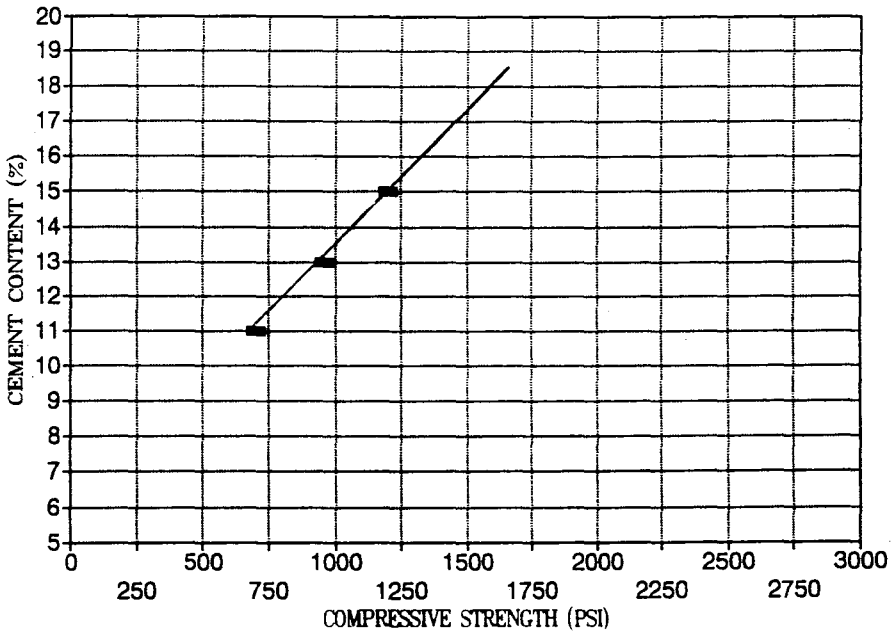
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
37	2173	9.1	131.7	3.90	11.0	17758	1487		
38	2173	8.9	132.0	4.00	11.0	17936	1427	1457	1460
39	2152	9.8	129.6	4.00	13.0	19142	1523		
40	2174	9.6	131.2	4.00	13.0	18040	1436	1479	1480
41	2153	9.3	130.3	3.90	15.0	21317	1784		
42	2151	8.8	130.8	3.90	15.0	21535	1803	1794	1790

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENB	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSD	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	28/30
SAMPLE SOURCE	TP20 @ 0-2' & TP21 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	17.4	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	19.4	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	28/30
SAMPLE SOURCE:	TP20 @ 0-2' & TP21 @ 0-8'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
43	2034	8.0	124.6	3.90	11.0	8130	681		
44	2008	7.8	123.2	3.90	11.0	8580	718	699	700
45	2099	8.9	127.5	3.90	13.0	11252	942		
46	2116	9.2	128.2	3.90	13.0	11608	972	957	960
47	2116	9.1	128.3	3.90	15.0	14653	1227		
48	2114	8.8	128.5	3.90	15.0	14080	1179	1203	1200

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	30/31/32
SAMPLE SOURCE:	TP21 @ 0-8'. TP22 @ 0-2'& TP22 @ 8-9'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

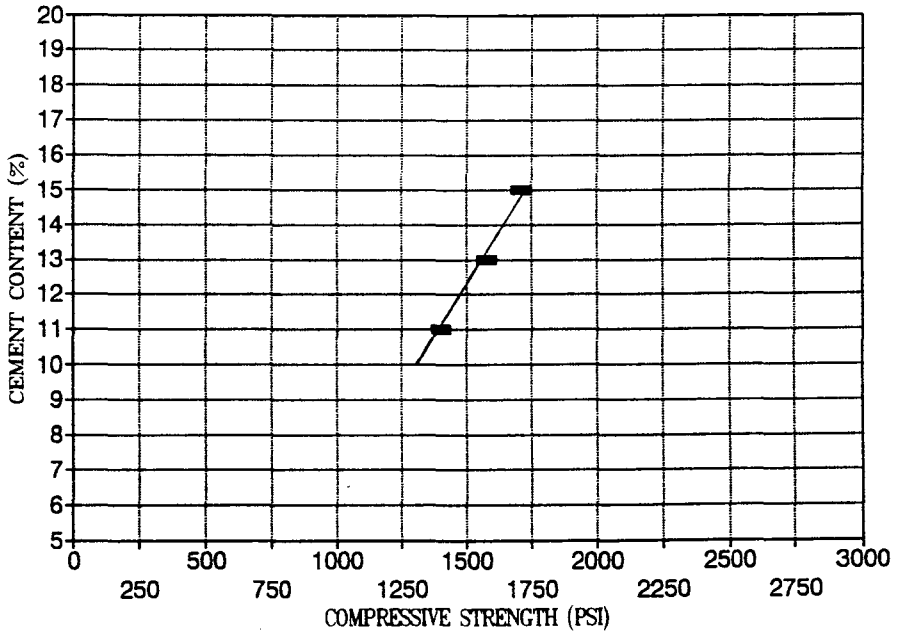
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
91	2180	8.5	132.9	3.98	11.0	17636	1418		
92	2159	8.8	131.2	3.99	11.0	17184	1374	1396	1400
93	2167	8.8	131.7	3.99	13.0	18944	1515		
94	2167	8.8	131.7	3.98	13.0	20348	1636	1575	1580
95	2159	8.5	131.6	3.98	15.0	21337	1715		
96	2162	9.2	130.9	3.97	15.0	21021	1698	1707	1710

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	30/31/32
SAMPLE SOURCE	TP21 @ 0-8', TP22 @ 0-2'& TP22 @ 8-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	12.2	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	14.2	%



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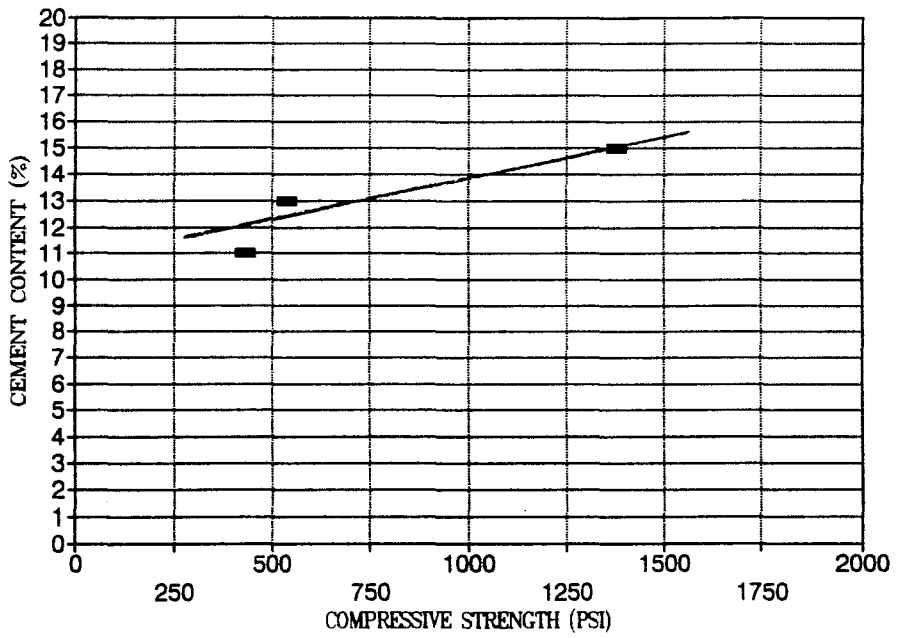
PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	30/33
SAMPLE SOURCE	TP21 @ 0-8' & TP23 @ 1-4'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	15.5	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	17.5	%



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PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	30/33
SAMPLE SOURCE:	TP21 @ 0-8' & TP23 @ 1-4'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

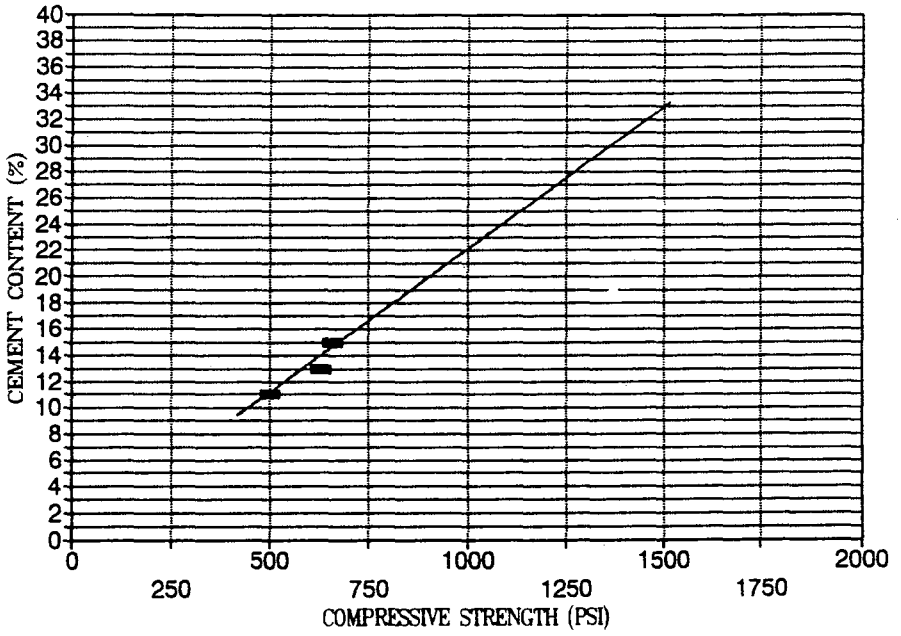
SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
97	2155	8.2	131.7	3.98	11.0	5120	412		
98	2156	7.3	132.9	3.99	11.0	5660	453	432	430
99	2150	8.2	131.4	3.99	13.0	7495	599		
100	2160	8.2	132.0	3.98	13.0	6071	488	544	540
101	1981	7.5	121.9	3.98	15.0	16749	1346		
102	1956	7.4	120.5	3.99	15.0	17560	1404	1375	1380

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	**JOB NO:**	6-117-000062
LOCATION:	REATTA PASS WASH CHANELIZATION;SCOTTSDALE AZ	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	15/16
SAMPLE SOURCE	TP23 @ 1-4' & TP24 @ 4-9'	**DATE SAMPLED:**	10-20-97

SOIL CEMENT COMPRESSIVE STRENGTH VERSUS CEMENT CONTENT

MIX DESIGN SOIL CEMENT COMPRESSIVE STRENGTH:	1500	PSI
CORRESPONDING CEMENT CONTENT:	33.0	%
PLUS 2 PERCENT FOR DURABILITY AND MATERIAL VARIATION		
TOTAL CEMENT CONTENT	35.0	%



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AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION-DESERT GREENBELT	JOB NO:	7-117-000062
LOCATION:	REATTA PASS WASH CHANELAZATION:SCOTTSDALE AZ	WORK ORDER NO:	2
MATERIAL:	SOIL CEMENT	LAB NO:	33/35
SAMPLE SOURCE:	TP23 @ 1-4' & TP24 @ 4-9'	DATE SAMPLED:	10-20-97

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
85	2022	6.5	125.6	3.90	11.0	6700	561		
86	2021	7.3	124.6	3.90	11.0	5300	444	502	500
87	2009	6.3	125.0	3.90	13.0	7420	621		
88	2008	6.8	124.4	3.90	13.0	7690	644	632	630
89	2017	6.8	124.9	4.00	15.0	7930	631		
90	2006	6.4	124.7	3.90	15.0	8150	682	657	660

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION DESERT GREENBELT REATTA PASS WASH	**JOB NO:**	7-117-000062
		WORK ORDER NO:	1
LOCATION:		**LAB NO:**	1
MATERIAL:	SOIL CEMENT	**REPORT DATE:**	7-17-97
SAMPLE SOURCE:	HP-2 @ L-1-STRMBED		

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAK
7% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
1	4.90	4.00	12.57	6763	538		
2	4.80	4.00	12.57	8958	713	630	630
3	4.80	4.00	12.57	8029	639		

9% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
4	4.70	4.00	12.57	10619	845		
5	4.80	4.00	12.57	8523	678	746	750
6	4.90	4.00	12.57	8978	714		

11% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
1	4.70	4.00	12.57	18054	1437		
2	4.70	4.00	12.57	17521	1394	1487	1490
3	4.80	4.00	12.57	20487	1630		

AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION DESERT GREENBELT REATTA PASS WASH	**JOB NO:**	7-117-000062
		WORK ORDER NO:	1
LOCATION:		**LAB NO:**	2
MATERIAL:	SOIL CEMENT	**REPORT DATE:**	7-17-97
SAMPLE SOURCE:	HP-1 @ L-6-ALLUM		

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAK
5% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
1	4.80	4.00	12.57	8405	669		
2	4.80	4.00	12.57	7930	631		
3	4.90	4.00	12.57	6823	543	614	610

7% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
4	4.80	4.00	12.57	12933	1029		
5	4.80	4.00	12.57	13427	1068		
6	4.80	4.00	12.57	19973	1589	1229	1230

9% CEMENT

SAMPLE ID	HEIGHT	DIAMETER	AREA	MAX LOAD	PSI	AVERAGE PSI	CORRECTED PSI
1	4.90	4.00	12.57	19973	1589		
2	4.80	4.00	12.57	18925	1506		
3	4.80	4.00	12.57	19874	1582	1559	1560

AGRA Earth & Environmental

PROJECT:	DESERT GREENBELT-PHASE I	**JOB NO:**	6-117-000029
LOCATION:	PIMA RD BTWN BELL & PINNACLE RDS.	**WORK ORDER NO:**	2
MATERIAL:	SOIL CEMENT	**LAB NO:**	9, 16 & 18
SAMPLE SOURCE:	RTP-6B, 2-5'; RTP-14A, 0-5'; RTP-14B, 0-5'	**DATE SAMPLED:**	02-27-96

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
9	2243	8.7	136.5	4.10	11	22445	1698		
9	2250	8.7	136.9	4.09	11	20823	1585		
9	2261	8.7	137.6	[illegible].05	11	24125	1873	1719	1720
16	2264	8.7	137.8	4.05	13	28595	2217		
16	2247	8.7	136.7	4.09	13	31502	2404		
16	2248	8.7	136.8	4.05	13	31601	2453	2335	2340
18	2286	8.7	139.1	4.06	15	32668	2530		
18	2274	8.7	138.4	4.04	15	37157	2899		
18	2285	8.7	139.0	4.06	15	36660	2832	2753	2750

AGRA Earth & Environmental

PROJECT:	DESERT GREENBELT-PHASE I	**JOB NO:**	E95-86
LOCATION:	PIMA RD BTWN BELL & PINNACLE RDS.	**WORK ORDER NO:**	11
MATERIAL:	SOIL CEMENT	**LAB NO:**	252-255
SAMPLE SOURCE:	RTP 12-19	**DATE SAMPLED:**	08-11-95

SOIL CEMENT PLUGS COMPRESSIVE STRENGTH
ARIZONA 241A

7 DAY BREAKS

SAMPLE ID	WET SAMPLE WEIGHT (GR)	MOISTURE (%)	DRY DENSITY (PCF)	DIAMETER (IN)	CEMENT CONTENT (%)	MAX LOAD (LBS)	STRESS (PSI)	AVERAGE STRESS (PSI)	CORRECTED AVERAGE STRESS (PSI)
1	2156	7.9	132.2	4.02	5	9333	735		
2	2141	7.5	131.7	4.03	5	10520	825		
3	2168	8.3	132.4	4.01	5	10362	820	794	790
4	2175	7.7	133.6	4.01	7	12062	955		
5									
6	2167	8.4	132.2	4.00	7	12003	955	955	960
7	2186	7.1	135.0	4.01	9	14040	1112		
8	2191	8.3	133.8	4.00	9	13249	1054		
9	2167	7.6	133.2	4.01	9	12774	1011	1059	1060
10	2151	8.2	131.5	4.00	11	12557	999		
11	2174	7.8	133.4	4.03	11	14066	1103		
12	2171	8.4	132.5	4.00	11	14574	1160	1087	1090

* NOTE: SAMPLE ID #5 WAS DAMAGED

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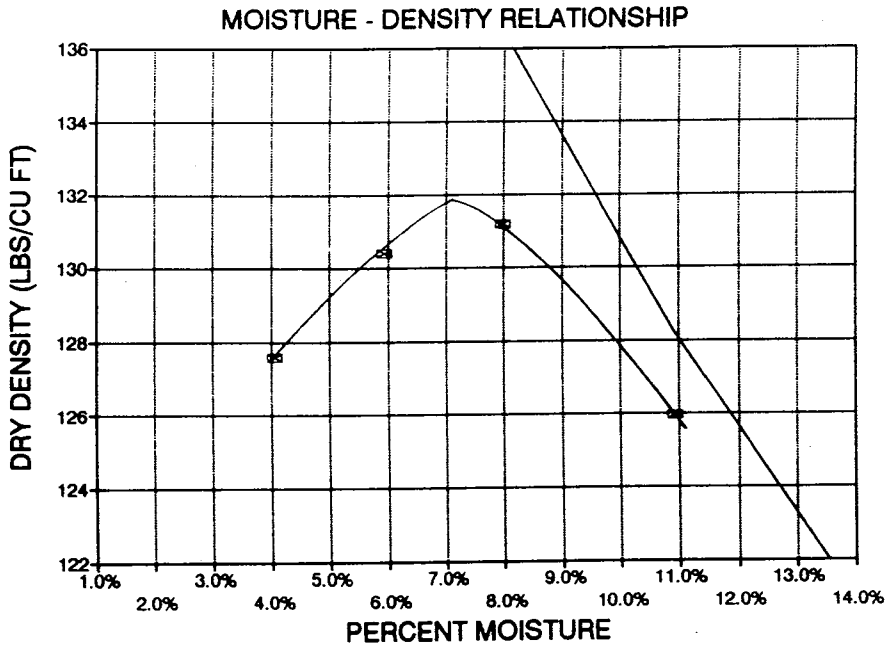
PROJECT:	DESERT GREENBELT PHASE I	**JOB NO:**	6-117-000029
LOCATION:	PIMA RD & DEER VALLEY RD; SCOTTSDALE	**WORK ORDER NO:**	2
MATERIAL:	SM	**LAB NO:**	7
SAMPLE SOURCE:	RTP-6A @ 0.0 - 4.0'	**DATE SAMPLED:**	02-27-96

ASTM D698

MAXIMUM DRY DENSITY	131.9 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	7.3%		



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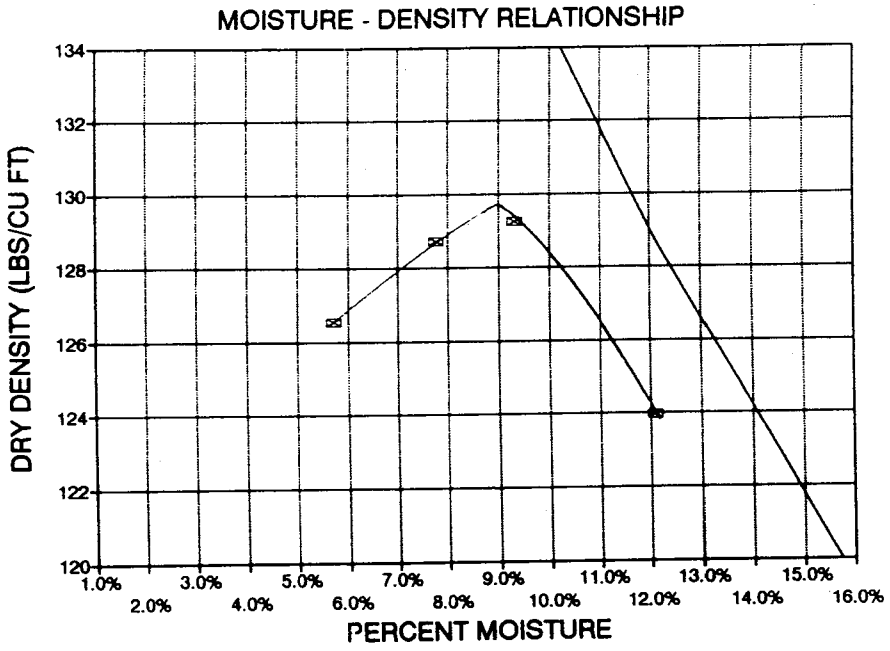
PROJECT:	DESERT GREENBELT PHASE I	**JOB NO:**	6-117-000029
LOCATION:	PIMA RD & DEER VALLEY RD; SCOTTSDALE	**WORK ORDER NO:**	2
MATERIAL:	GP	**LAB NO:**	16
SAMPLE SOURCE:	RTP-14A @ 0.0 - 5.0'	**DATE SAMPLED:**	02-27-96

ASTM D698

MAXIMUM DRY DENSITY	129.8 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	9.0%		



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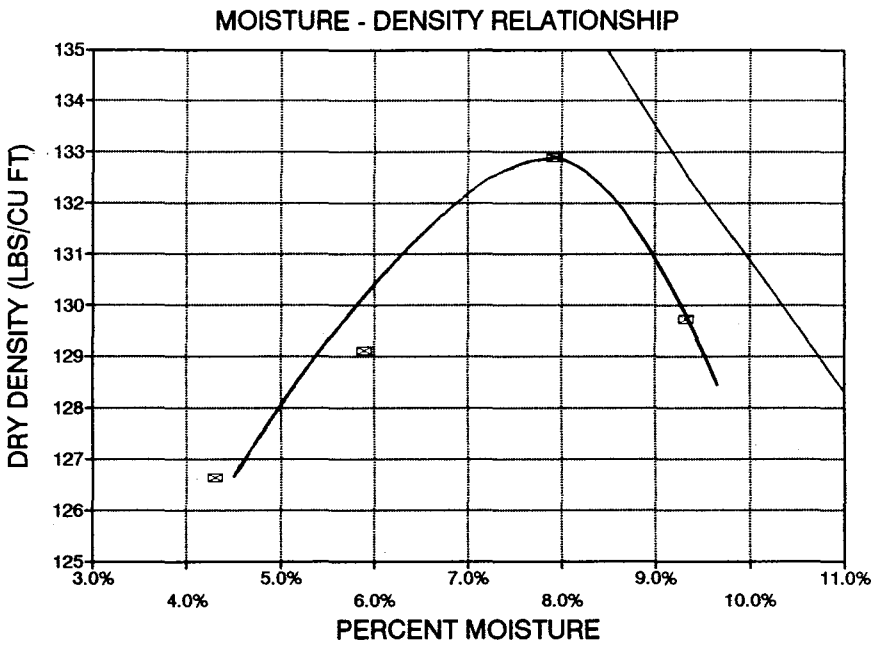
AGRA Earth & Environmental

PROJECT:	ADDITIONAL INVESTIGATION DESERT	**JOB NO:**	7-117-000062
LOCATION:	REATTA PASS	**WORK ORDER NO:**	1
MATERIAL:	SOIL CEMENT	**LAB NO:**	1
SAMPLE SOURCE:	HP-1 @ L-5 ALLUV	**DATE SAMPLED:**	07-07-97

ASTM D698

MAXIMUM DRY DENSITY	132.9 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	7.9%	CURVE	D



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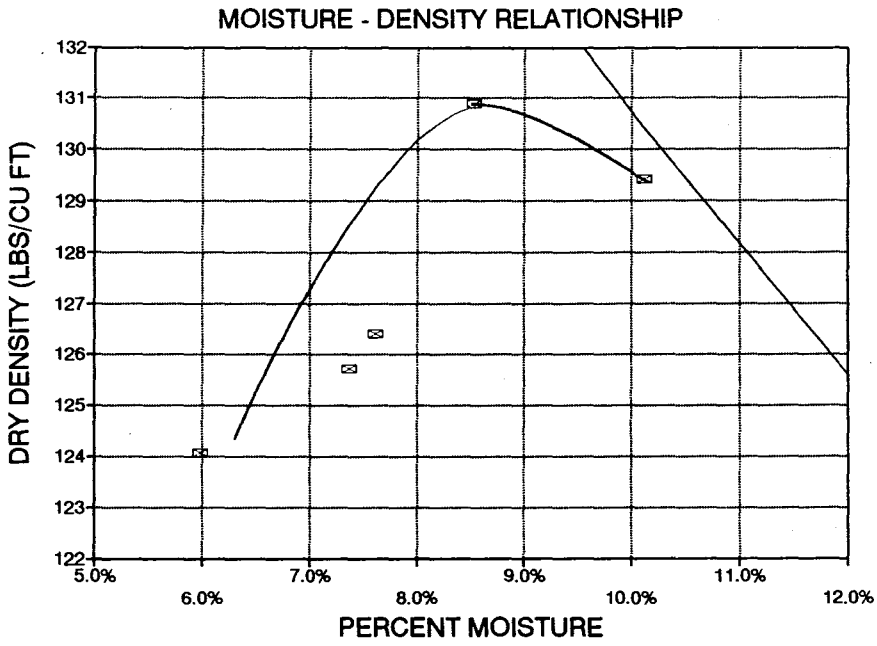
PROJECT:	ADDITIONAL INVESTIGATION DESERT	**JOB NO:**	7-117-000062
LOCATION:	REATTA PASS	**WORK ORDER NO:**	1
MATERIAL:	SOIL CEMENT	**LAB NO:**	2
SAMPLE SOURCE:	HP-2 @ L-1 STRMBED	**DATE SAMPLED:**	07-07-97

ASTM D698

MAXIMUM DRY DENSITY	130.9 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	8.5%	CURVE	D



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APPENDIX C

DESIGN CALCULATIONS

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Desert Greenbelt

Reata Pass Wash

Scottsdale, AZ

Sheet 1 of 3

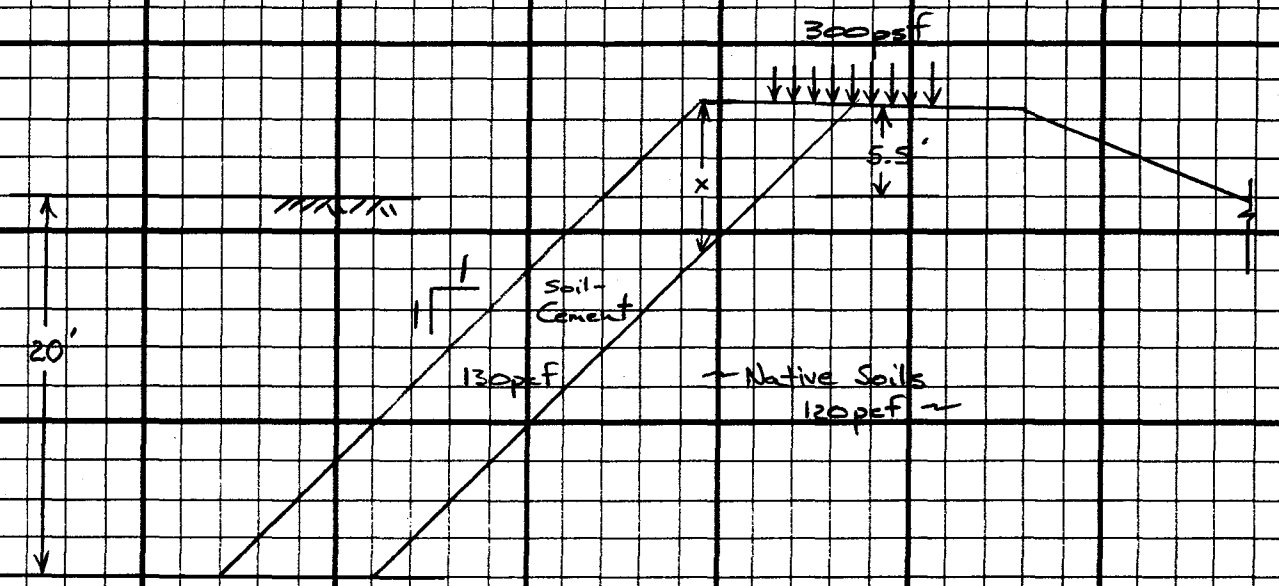
Date: 2/24/98

By: KHD

Ch. By:

Job/Prop. No. 7-117-000062

Settlement Estimates



1. Surcharge Loading (Theoretical Worst Case)

(130pcf − 120pcf) 20ft + (5.5ft)(130pcf) = 915psf
Assuming additional vehicle loading of 300psf
= 1,215psf

2. Surcharge Loading (Actual)

Actual Worst Case is replacement of soil in vertical column w/ soil cement @ upstream crest of embankment

Vert. Dimension X of Soil Cement = 8'

∴ (130pcf − 120pcf) 2.5' + (130pcf)(5.5') = 740psf
Assuming additional Vehicle loading = 300psf
= 1,040psf

Assuming that settlement will occur in elastic mode and be nearly complete at end of construction:

Settlements induced by surcharge loading can be estimated assuming the base of the soil-cement is infinately long footing with surcharge pressure of 915psf

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Desert Greenbelt

Reata Pass Wash

Scottsdale, AZ

Sheet 2 of 3
Date: 2/24/98
By: KHD
Ch. By:
Job/Prop. No. 7-117-000062

Settlement Analysis cont'd.

Ref: Kulhawy, F.H., & Mayne, P.W., Manual on Estimating Soil Properties for Foundation Design, EL-6800, Research Project 1493-6, Final Report, Prepared by Cornell Univ., August, 1990.

- Blowcount data is avail. only from borings drilled at Foothills Drive Bridge. Dense soils (N > 40) were encountered in the 3 test borings F-1, F-2 + F-3 below depths of 20 feet. Dense soil conditions were typically verified throughout remainder of project alignment based on refusal of backhoes (typically at depths of less than 10 feet) and somewhat difficult excavations performed by backhoes.

From Table 5-5 in Kulhawy + Mayne, 1990:

E_s for medium dense sands
= 2,900 to 7,350 psi
= 2.9 to 7.3 ksi

E_s for dense sands
= 7,350 psi to 14,700 psi
= 7.3 to 14.7 ksi

From Fig 5-13 in Kulhawy & Mayne, 1990:

Assuming N = 40 + Normal. Consol. sand

E_s = 8,085 psi = 8.1 ksi ← Use

Estimate of Settlement of Embankment Foundation Soils performed with computer program FT-SETT which employs Bowles-Steinbrenner method as described in the following reference:

- Bowles, J.E., 1987, Elastic Foundation Settlements on Sand Deposits, Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8, August, pp. 846-859.

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Desert Greenbelt

Peata Pass Wash

Scottsdale, AZ

Sheet 3 of 3
Date: 2/24/98
By: KHD
Ch. By:
Job/Prop. No. 7-117-000062

Results of Bowles-Steinbrenner method indicate:

Case No.	Assumed Es (ksi)	Settlement (Inches)
1	8	0.08"
2	6	0.11"
3	4	0.16"

Results indicate that due to small surcharge loads, estimated elastic settlements are minimal.

Further time-related consolidation of the relatively free draining soils is not anticipated.

Settlements of the embankment materials is also anticipated to be low. Settlement within the soil-cement should occur during compaction. Additional settlements are not expected as the cement cures and the material gains strength. Settlement of the embankment foundation soils underlying the maximum 5.5 raised embankment are estimated assuming the upper 18" of native site soils are overexcavated and recompacted.

From Table 5-5 in Kulhawy & Mayne, 1990:

Use E_s = 3.0 ksi to represent near surface soils.

From FT-SETT Foundation Soils settlement expected to be on the order of 0.15 to 0.12 inches. Settlement should occur during construction.

Embankment settlement (compacted fill) estimated at 2% of embankment height

$$(5.5\,ft)(.02) = 0.11' = 1.3''$$

Settlement of embankment dependent on % initial compact. Settlement expected to occur over time as exposed to moisture fluctuations.

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APPENDIX D

FEMA FORMS

FEDERAL EMERGENCY MANAGEMENT AGENCY **LEVEE/FLOODWALL SYSTEM ANALYSES FORM**	O.M.B. Burden No. 3067-0148 Expires July 31, 1997	FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.0 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

Community Name: City of Scottsdale, Arizona

Flooding Source: Reata Pass

Project Name/Identifier: Desert Greenbelt

REACH TO BE REVISED

Downstream limit: 1) South of Bell Road (Levee AE & AW); 2) Station 125+40 (Levee BE & BW)

Upstream limit: 1) Bell Road (Levee AE & AW); 2) Station 147+00W / 133+65E (Levee BE & BW)

This Levee/Floodwall analysis is based on:

__ upgrading of an existing levee/floodwall system
_x_ a newly constructed levee/floodwall system
__ reanalysis of an existing levee/floodwall system

LEVEE/FLOODWALL SYSTEM ELEMENTS

1. Levee elements and locations are:

__ earthen embankment, dike, berm, etc. Station _____ to _____
__ structural floodwall Station _____ to _____
_X_ other (describe): **Soil Cement Levee** Station 13+80 to 44+63
125+40 to 147+00W/133+65E

Structural Type:

__ monolithic cast-in place reinforced concrete
__ reinforced concrete masonry block
__ sheet piling
__ other (describe):

2. Has this levee/floodwall system been certified by a Federal agency to provide protection against the 100-year flood event? __ Yes _X_ No

If yes, by which agency?

If yes, complete only the interior drainage section on pages 7 and 8 of this form and the operation and maintenance section of Revision Requestor and Community Official Form.

LEVEE/FLOODWALL SYSTEM ELEMENTS (Cont'd)

3. Attach certified drawings containing the following information (indicate drawing sheet numbers):

a. Plan of the levee embankment and floodwall structures. Sheet Numbers C8-C11, C15-C17 C67, C68, C70

b. A profile of the levee/floodwall system showing the 100-year water-surface elevation, levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers C8-C11, C15-C17

c. A profile of the 100-year water-surface elevation, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure device. Sheet Numbers SD-02

d. A layout detail for the embankment protection measures. Sheet Numbers SAME AS (A)

e. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers SAME AS (A)

FREEBOARD

1. The minimum freeboard provided above the 100-year water-surface elevation is:

Riverine

3.0 feet or more at the downstream end and throughout — X Yes __ No
3.5 feet or more at the upstream end — X Yes __ No
4.0 feet immediately upstream of all structures and constrictions — X Yes __ No

Coastal N/A

1.0 foot above the height of the one percent wave for the 100-year stillwater surge elevation or maximum wave runup (whichever is greater). __ Yes __ No

2.0 feet above 100-year stillwater surge elevation __ Yes __ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Part 65.10(b)(1)(ii) of the National Flood Insurance Program regulations.

If no is answered to any of the above, please explain where and why:

2. Is there an indication from historical records that ice-jamming can effect the 100-year water-surface elevation? __ Yes __ No If yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

*3. Tabulate the elevations at critical locations (tabulate values at each levee crest grade change)

Station	Location	100-year Water Surface Elevation	Levee Crest	Freeboard (ft.)
	Upper end			
******	*******	*******	*******	*******
	Lower end			

(Extend table on an added sheet as needed and reference)
*** - SEE PLAN SHEETS AND LEVEE FREEBOARD TABLES INCLUDED IN VOLUMES 3 & 4

SEDIMENT TRANSPORT CONSIDERATIONS

1. A. Is there any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year water-surface elevations? X Yes __ No

   B. Based on the conditions (such as geomorphology, vegetative cover, and development of the watershed and stream bed, and bank conditions), is there a potential for debris and sediment transport (including scour and deposition) to affect the 100-year water-surface elevations and/or the freeboard for the levee/floodwall? X Yes __ No

2. If the answer to either 1A or 1B is yes:

   A. What is the estimated sediment (bed material) load?

   VARIES cfs (attach gradation curve)

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition:

   SEDIMENT LOAD CALCULATION WERE INCLUDED WITH THE INITIAL CLOMR SUBMITTAL.
   SEE VOLUMES 1& 2

   B. Will sediment accumulate anywhere along the levee/floodwall (such as along any bends in the channel? X Yes __ No

   If yes, what is the minimum freeboard at these locations? __*__ feet *SEE LEVEE FREEBOARD TABLE

CLOSURES

1. Openings through the levee system:

   X exist __ do not exist

   If openings exist, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device
13+84 (AE-1)	LEFT	36" RCP	1550.11 (u/s of	FLAPGATE
			Concrete ditch)	

(Extend table on an added sheet as needed and reference)

Geotechnical and geologic data: DATA WAS INCLUDED IN VOLUME 1 & 2 OF THE REPORTS SUBMITTED WITH THE CLOMR REQUEST

In addition to the required detail analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following levee system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers EM-1110-2-1906 Form 2086).

EMBANKMENT PROTECTION

1. The maximum levee slope landside is: 3:1

2. The maximum levee slope floodside is: 1:1

3. The range of 100-year riverine flood velocities along the levee? 10.3 (min.) to 14.8 (max.)

4. Embankment material is protected by (describe the kind):
SOIL CEMENT WILL WITHSTAND VELOCITIES. RIPRAP HAS BEEN PLACED WHERE NECESSARY TO PREVENT UNDERMINING OF THE LEVEE.

5. Riprap Design Parameters: (Include references) __ Velocity __ Tractive stress
Riprap design was based on velocities and engineering judgement.

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta 109+70 to end (along BW-1)	1:1	4' (thalweg)	13 fps	straight	36"	22"	3'	
Sta 102+35 to end (along BE-1)	1:1	4' (thalweg)	12 fps	curve	36"	22"	3'	
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference)

6. Has a bedding/filter analysis and design been included? __ Yes X No
No. The bedrock is designed to fill in any scour hole created by the flow. A filter fabric would prevent the rock from falling into the scour hole.
Describe the analysis used for other kinds of protection used (include copies of the design analysis):
None.

Note: Attach engineering analysis to support construction plans.

EMBANKMENT AND FOUNDATION STABILITY

1. Identify locations and describe the basis for selection of critical location for analysis:

__ Overall height: Sta 106+00, height 20.0 to 25.0 ft.

__ Limiting foundation soil strength:

Sta 106+00, depth 2.0 feet below existing grades to 40 feet

strength Ø = 35 degrees, c = 50 psf

__ slope: SS = 1 (h) to 1 (v) (Backslope 3(h) to 1(v)

(Repeat as needed on an added sheet for additional locations)

2. Specify the embankment stability analyses methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
Circular arc using computer program PCSTABL5M (by Purdue University) and Bishop Method of Slices.

3. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction	6.17	1.3
II	Sudden drawdown	1.12	1.0
III	Critical flood stage	1.99	1.4
IV	Steady seepage at flood stage	1.99	1.4
VI	Earthquake (Case I)	1.54	1.0

(Reference: U.S. Army Corps of Engineers EM-1110-2-1913 Table 6-1)

4. Was a seepage analysis for the embankment performed? __ Yes X No

Describe methodology used: A high phreatic surface was assumed to develop through and behind the soil-cement embankment, for the stability analyses. A high phreatic surface is however not anticipated due to the presence of free-draining foundation soils and the relative low permeability of the soil-cement embankment.

5. Was a seepage analysis for the foundation performed: __ Yes X No

Were uplift pressures at the embankment landside toe checked? __ Yes X No
The presence of the soil-cement embankment will negate uplift pressures relative to Global embankment stability. Uplift is not anticipated in free-draining soils.

Were seepage exit gradients checked for piping potential? __ Yes X No
Soil-cement embankment will restrict both inflow and outflow from embankment resulting in mostly vertical seepage in the free draining native soils.

6. The duration of 100-year flood hydrograph against the embankment is 2 Hrs. (in channel)
Hydrograph shown in Volumes 1 & 2 submitted with CLOMR.

Note: Attach engineering analysis to support construction plans.

EMBANKMENT AND FOUNDATION STABILITY

N/A for levee.

1. Describe analysis submittal based on Code:

   __ UBC (1988) or __ Other (specify):

2. Stability analysis submitted provides for:
   __ Overturning __ Sliding; If not, explain:

3. Loading included in the analyses were:

   __ Lateral earth @ P_A = _____ psf; P_p = _____ psf

   __ Surcharge-Slope @ _____, __ surface _____ psf

   __ Wind @ P_w = _____ psf

   __ Seepage (Uplift); _____ __ Earthquake @ P_{eq} = _____ %g

   __ 100-year significant wave height _____ ft.

   __ 100-year significant wave period _____ sec.

4. Summary of Stability Analysis Results: Factors of Safety. Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
	1.5	1.5				
	1.5	1.5				
	1.3	1.3				

(Ref: FEMA 114 Sept 1986; COE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

5. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load	Short Term Load
Computed design maximum	psf	psf
Maximum allowable	psf	psf

6. Foundation scour protection __ is, __ is not provided (describe

Note: Attach engineering analysis to support construction plans.

SETTLEMENT

1. Anticipated potential settlement has been determined and incorporated into the specified construction elevations to maintain the established freeboard margin. X Yes __ No

2. The computed range of settlement is 0.08 ft. to 0.13 ft.

3. Settlement of the levee crest is determined to be primarily from:

   __ Foundation consolidation
   X Embankment compression
   __ Other (describe):

4. Differential settlement of floodwalls

   X has __ has not been accommodated in the structural design and construction.

Note: Attach engineering analysis to support construction plans.

INTERIOR DRAINAGE

1. Specify size of each interior watershed

   Draining to pressure conduit:
   Draining to ponding area:

2. Relationships Established

   Ponding elevation vs. storage __ Yes __ No
   Ponding elevation vs. gravity flow __ Yes __ No
   Differential head vs. gravity flow __ Yes __ No

3. The river flow duration curve is enclosed __ Yes __ No

4. Specify the discharge capacity of the head pressure conduit:

5. Which Flooding Conditions Were Analyzed?

   - Gravity flow (Interior Watershed) __ Yes __ No
   - Common storm (River Watershed) __ Yes __ No
   - Historical ponding probability __ Yes __ No
   - Coastal wave overtopping __ Yes __ No

   If no, explain why:

6. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. __ Yes __ No

   If no, explain why:

7. The rate of seepage through the levee system for the 100-year flood is _____ cfs

INTERIOR DRAINAGE (Cont'd)

1. The length of levee system used to drive this seepage rate is _____ ft.

2. Will a pumping plant(s) be used for interior drainage? __ Yes __ No

   If yes, include the number of pumping plants: _____
   For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operations be automatic? __ Yes __ No
If the pumps are electric, are there backup power sources? __ Yes __ No

(Reference: U.S. Army Corps of Engineers EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Note: Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

OTHER DESIGN CRITERIA

1. The following items have been addressed as stated:

   Liquefaction __ is X is not a problem
   Hydrocompaction __ is X is not a problem
   Heave differential movement due to soils of high shrink/swell __ is X is not a problem

2. For each of these problems, state the basic facts and corrective action taken:

   If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure? __ Yes __ No

Note: Attach supporting documentation

The planned/installed works are in full compliance with NFIP regulations, Section 44 CFR Ch. 1 1.65.10 __ Yes __ No

OPERATIONAL PLAN AND CRITERIA

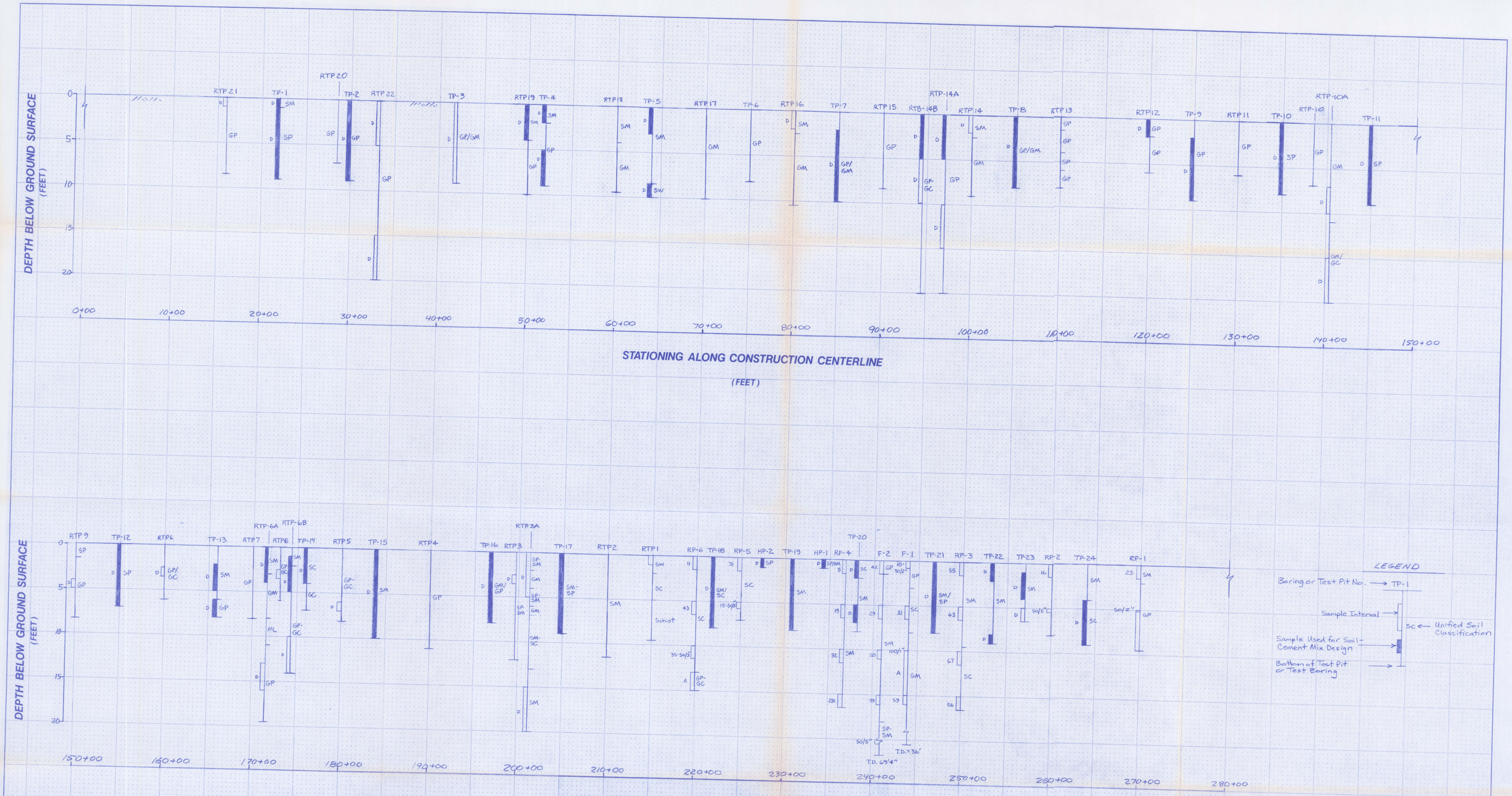
1. The operation plan incorporates all the provisions for closure devices as required in Section 65.10(c)(1), of the NFIP regulations
_ Yes __ No

2. The operation plan incorporates all the provisions for interior drainage as required in Section 65.10(c)(2), of the NFIP regulations
__ Yes __ No

If no to either of the above, please explain:

O&M will be provided with the LOMR submittal.

AGRA Earth & Environmental ENGINEERING GLOBAL SOLUTIONS 3232 West Virginia Avenue Phoenix, Arizona 85009-1932 Tel: (602)272-8646 Fax: (602)272-7558	JOB NO: 7-117-062 DESIGN BY: KHD DRAWN BY: SLB DATE: 12/97 SCALE: 1"=600'	SITE PLAN SHOWING TEST BORING & TEST PIT LOCATIONS REATA PASS WASH - DESERT GREENBELT SCOTTSDALE, ARIZONA



LEGEND

Boring or Test Pit No. → TP-1

Sample Interval →

SC ← Unified Soil Classification

Sample Used for Soil + Cement Mix Design →

Bottom of Test Pit or Test Boring →

GENERAL NOTE:

NOT ALL BORINGS AND TEST PITS SHOWN AT EXACT LOCATIONS DUE TO SPACE CONSTRICTIONS.

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GEOTECHNICAL PROFILE
ALONG REATTA PASS WASH
DESERT GREENBELT, SCOTTSDALE, AZ

KHD	12/16/97	