REPORT FOR:

REPORT

GEOTECHNICAL STUDY

LOT 3, MAGIC VIEW HOMES SUBDIVISION

SALT LAKE COUNTY, UTAH

SALT LAKE COUNTY PROJECT NO. PL-72-1430

Prepared For:

Sun Tree Development

c/o Mr. Clayne Ricks

2565 Lambourne Drive

Salt Lake City, Utah 84109

SHB AGRA Job No. E92-2494

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AGRA
Earth & Environmental Group

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December 11, 1992

Sun Tree Development
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SHB AGRA Job No. E92-2494

Attention: Mr. Clayne Ricks

Re: Report
Geotechnical Study
Lot 3, Magic View Homes Subdivision
Salt Lake County, Utah
Salt Lake County Project No. PL-72-1430

Gentlemen:

1. INTRODUCTION

1.1. General

This report presents the results of our geotechnical study of Lot 3 of the Magic View Homes Subdivision in Salt Lake County, Utah. The subdivision is located off Magic Hill Circle (7430 South 3455 East) in Salt Lake County, Utah.

This service was requested verbally by Mr. Clayne Ricks, who also authorized our services. During the course of this study, many of the conclusions and recommendations summarized herein, were transmitted verbally to Mr. Ricks. It should be noted that this service was performed to satisfy the requirements as stated in Salt Lake County's Memorandum letter referenced PL-72-1430, dated December 1, 1992.

1.2. Professional Statements

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical

properties of the soils encountered in site excavations, projected groundwater conditions, and the layout and design data discussed in Section 2, Project Development, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, SHB AGRA must be informed so that our recommendations can be reviewed, if necessary.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices at this time.

2. PROPOSED DEVELOPMENT

A single-family residential structure is proposed to be constructed on Lot 3 of the Magic View Homes Subdivision. A home is presently under construction on Lot 2. The proposed home will be two to three and possibly four levels in total height. The lower level will probably extend approximately 6 to 10 feet below grade on the higher south side of the lot. At the lower north portion of the lot, the lower level of the home will probably walk out to the final grade.

The below-grade portion of the structure will be of reinforced concrete construction. Above grade, the structure will be of wood frame construction with possibly some stone, brick, or stucco veneer. Structural loads will be transmitted through bearing walls and columns to the supporting foundations. We project that the maximum wall loads will be on the order of 1 to 2 kips per lineal foot, with maximum column loads being on the order of 15 to 20 kips. Floor slab loads will be light. A possible configuration of the home is presented on the attached Site Plan.

3. FIELD PROGRAM

In order to observe the general configuration and slope of Lot 3, the site was visited by Mr. Bill Gordon of SHB AGRA, Inc. At the time of our site visit, it was obvious that a moderate amount of earthwork had taken place in the general area of the proposed home. The earthwork consisted of excavating somewhat into the higher south portion

of the site and filling of the north-northeast area. Maximum cuts at the time of our site visit appeared to be no more than two to three feet. Maximum fills could be as much as 10 to 12 feet.

The remaining portion of the lot is open, undeveloped, and covered by sparse to moderately sparse growth of short grasses and weeds, natural vegetation. There was no evidence of past or imminent slope instability in the natural areas.

4. SITE CONDITIONS

4.1. Surface

The site is open and undeveloped, except for the recent earthwork in the general area of the proposed home. Downward slopes to the north and northeast are at approximately 1.75 to 2.25 horizontal to 1.0 vertical. Overall height of the slope is over 100 feet. Steepest portions of the slopes are associated with the recent filling in the area of the proposed home. These cross-sections are attached. The natural slopes are covered with a sparse to moderately sparse growth of grasses and weeds.

To the south, the site is bounded by the back-lot lines of the residential development. To the immediate west, the site is bounded by Lots 1 and 2 of the Magic View Homes Subdivision. As previously discussed, a residential home is being constructed on Lot 2.

4.2. Subsurface Soil and Groundwater

The soils exposed in the excavations on and immediately adjacent to the proposed building site are all granular, and consist predominantly of fine to medium sand, with trace to some silts, and occasional zones and layers of sands and gravels. Soils are part of the alluvial/lacustrine Lake Bonneville deposits in and around the mouth of Big Cottonwood Canyon. These soils will exhibit relatively high strengths and low compressibility characteristics when undisturbed, and are non-moisture sensitive. Studies which we have performed at the base of the slope indicate that similar granular soils are present throughout the 100-foot-plus slope.

The true static groundwater table is at moderate depth below the base of the slope. Perched groundwater conditions have not previously been encountered in the slope face.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1. Discussion of Findings

The geotechnical concerns regarding Lot 3 are 1) the dynamic stability of the moderately steep slopes on the north and northeast sides of the limits of the proposed residential structure and 2) the non-engineered fill in the general area of the proposed home.

Under static loading, the slopes will exhibit a relatively high factor of safety. Observations of the site and review of aerial photographs show no evidence of past or imminent slope instability. Under major earthquake loading, the natural slopes will be relatively stable. The steep fill slopes would most likely be unstable.

The home can be supported over undisturbed natural granular soils and/or granular structural fill extending to suitable natural soils.

In the following sections, detailed discussions pertaining to the stability of the slopes, recommendations for conventional spread and continuous wall foundations, and other geotechnical or geoseismic parameters which would affect design construction or performance of the proposed structure are presented.

5.2. Slope Stability

Over the years, this writer has performed numerous detailed analyses of the stability of the moderately steep slopes, common in the area of the mouth of Big Cottonwood Canyon. All previous studies have shown that the soils within the slopes are granular, predominantly fine to medium sands with trace to some silt. Because of the cohesion provided by the moisture within the sands and some very slight cementation, these soils, when excavated at very steep slopes, will remain reasonably stable. With time, the

steeper slopes will "ravel" to the angle of repose slope of approximately 1.3 horizontal to 1.0 vertical. No groundwater has been encountered in previous studies in the immediate area, or was observed in the immediate area of this site.

In determining or projecting the factor of safety of the existing slopes under both static and dynamic loading, we have made the following conservative assumptions: 1) the soil is clean and granular, and 2) the soil exhibits no cohesion. Yet from past experiences, we know that the soils exhibit apparent cohesion.

Because the soils are non-saturated and granular, infinite slope analyses have been performed. In our analyses, a friction angle of 37 has been used. With this value the factors of safety for 1.75 horizontal to 1.0 vertical slope and a 2.0 horizontal to 1.0 vertical slopes would be 1.3 and 1.5, respectively. When accelerations are imposed upon the infinite slope model, which would occur in conjunction with a design earthquake the calculated factor for a two horizontal to one vertical slope is determined to be slightly in excess of one. It must again be noted that the factors of safety above assume very conservative conditions. When cohesion values of only 150 to 250 pounds per square foot are included in the analyses, the calculated factors of safety for both static and dynamic conditions are significantly higher.

Based upon our analyses, it is our opinion that the proposed residential structure can be constructed at the site. We do, however, recommend that the base of the foundations supporting the proposed structure be installed below an imaginary line extending upward at a two horizontal to one vertical slope from the lower point of the slope where it becomes steeper than two horizontal to one vertical. It should be noted that during a major seismic event that some of the soils in the portions of the slope steeper than two horizontal to one vertical could experience some "slump"-type failures. These failures, however, should in no way affect the structural integrity of the proposed residential structure.

5.3. Spread and Continuous Wall Foundations

The proposed structure may be supported upon conventional spread and continuous wall foundations established upon undisturbed natural soils, exclusive of topsoil, and/or upon granular structural fill extending to suitable natural soils. Under no circumstances should the home including footings, floor slabs, and outside flat work be established over non-engineered fill. Foundations installed in this manner may be designed utilizing the following parameters:

Minimum Recommended Depth of Embedment for Frost Protection	-	30 inches
Minimum Recommended Depth of Embedment for Nonfrost Conditions	-	15 inches
Recommended Minimum Width for Continuous Wall Footings	-	18 inches
Minimum Recommended Width for Isolated Spread Footings	-	24 inches
Recommended Net Bearing Pressure for Real Load Conditions	-	2000 pounds per square foot
Bearing Pressure Increase for Seismic Loading	-	50 percent

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grace. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total loads include all dead and live loads, including seismic and wind.

5.4. Earthwork

The most significant earthwork aspect of the site will be the possible utilization of the on-site granular soils as structural fill. These soils, if properly placed and compacted,

will provide excellent support. All structural fill should be free of sod, rubbish, frozen soils, construction debris, and other deleterious materials.

The fill should be placed in lifts not exceeding 8 inches in loose thickness and compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria.

5.5. Geoseismic Conditions

5.5.1. General

The proposed construction site is located within a "Zone 3 Area" as defined by the Seismic Risk Map of the United States in the Uniform Building Code (UBC) 1991 edition. The "Zone 3 Area" is defined as follows: "Major damage which corresponds to Intensity VIII on the Modified Mercalli Scale of 1931." As a minimum, the criteria stated within the UBC for Zone 3 Seismic Areas should be incorporated into the design of the proposed structure.

5.5.2. Faulting

The nearest known active fault associated with the Wasatch fault zone is located at least 2,000 feet east of the site.

5.5.3. Liquefaction

Even though the soils are granular, no established true static water table is present within the upper 30 to 40 feet. Therefore, it is our opinion that liquefaction of these soils will not occur even during a major seismic event.

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[1] American Association of State Highway and Transportation Officials

[2] American Society for Testing and Materials

We appreciate the opportunity of providing this service for you. If you have any questions concerning this report or require additional information, please do not hesitate to contact the undersigned.

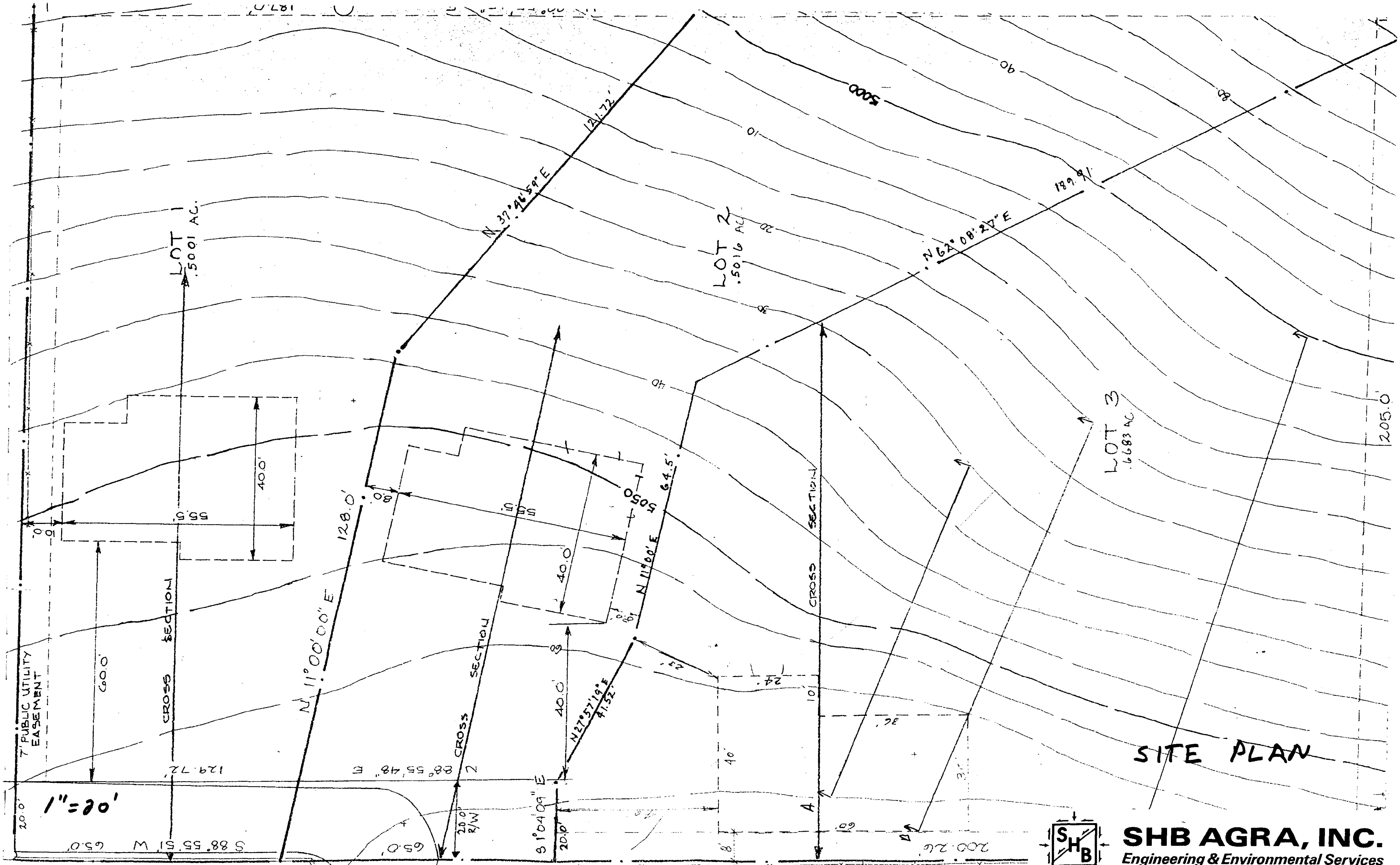
Respectfully submitted,
SHB AGRA, Inc.

By _____
William J. Gordon
Professional Engineer No. 3457
State of Utah

WJG/sp (92-12-6)

Copies: Addressee (3)

Attachments: Site Plan
Cross-Sections



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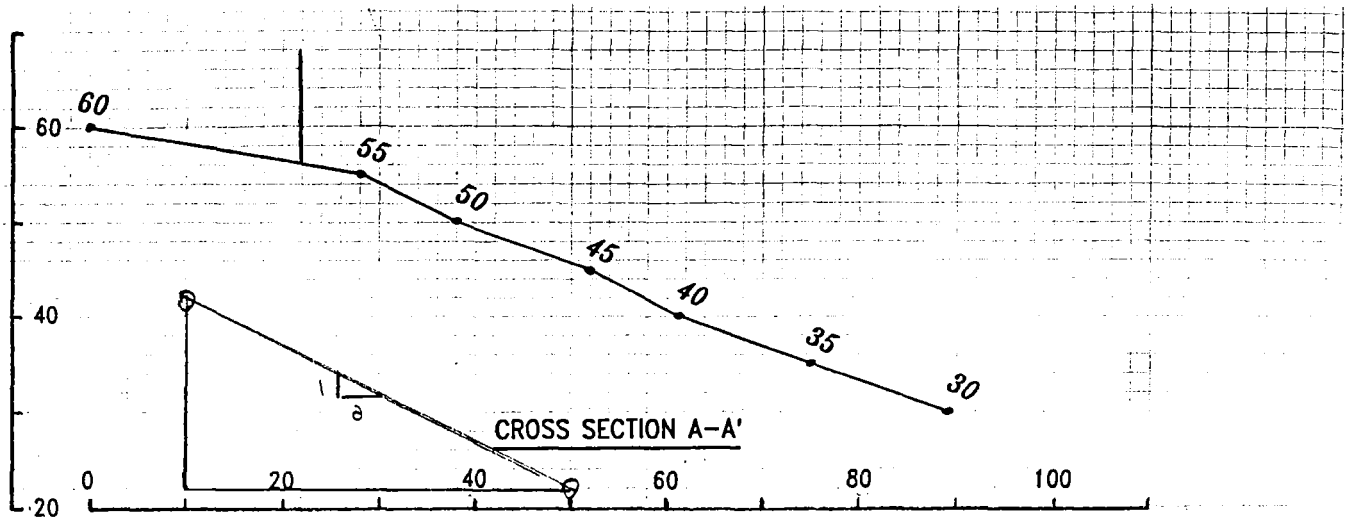

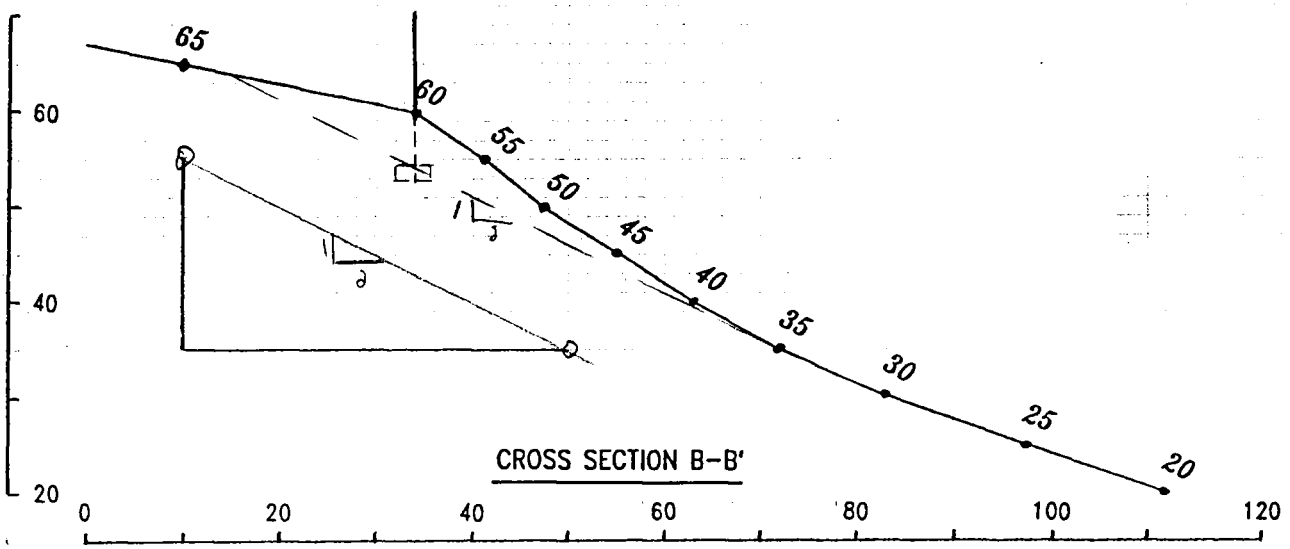

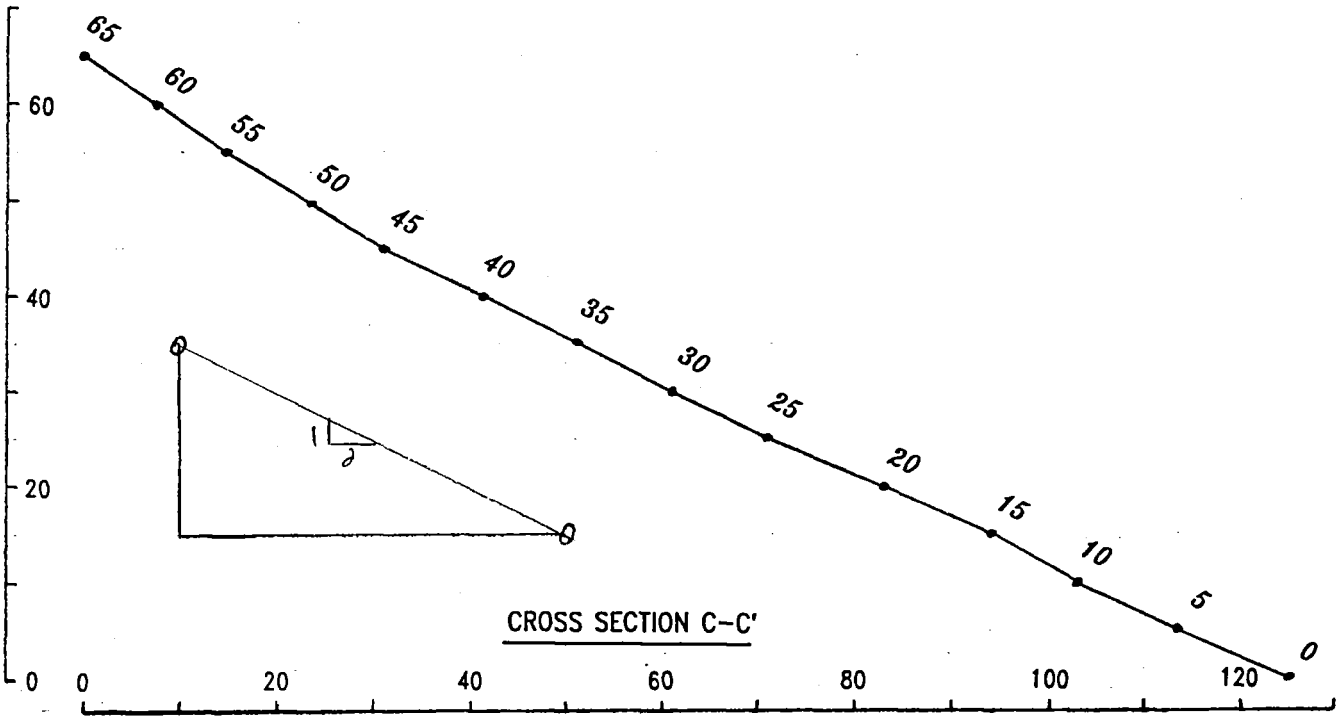

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Job No: E92-249
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