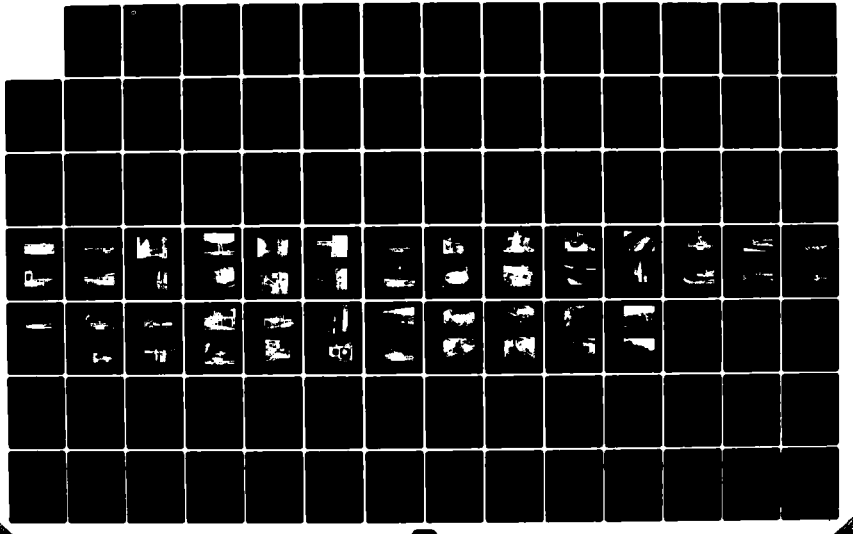
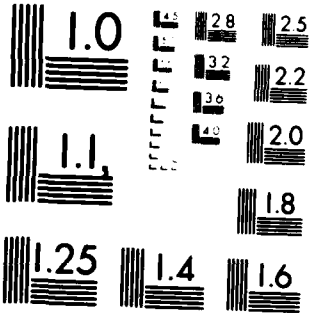
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NORFORK LAKE HIGHWAY BRIDGES
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WHITE RIVER AND TRIBUTARIES
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FOUNDATION REPORT

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Geology	Underwater T.V. inspection	"Cotton rock"
Rock socket	Core hole	Abutment
piles	Overburden	
pier	Excavation	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes the foundation conditions and unique methods utilized in constructing the foundations for two large highway bridges over Lake Norfork, Arkansas, to replace two ferry crossings on U.S. Highway 62 and Arkansas State Highway 101.

Twenty-two of the two-columned piers were constructed in water up to 170 feet deep, with each column installed on 8' 4" diameter rock socket footings drilled a minimum of 20 feet into competent rock. Each drilled socket was

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inspected, logged, and mapped by means of a specially designed underwater television camera and monitoring screen.

The founding dolomite rock was for the most part sound, with occasional close to moderate fractures. Solution cavities, typical in dolomite, were encountered in several of the rock sockets. Special design criteria were established in plans and specifications to handle questionable rock conditions, and are explained in the report.

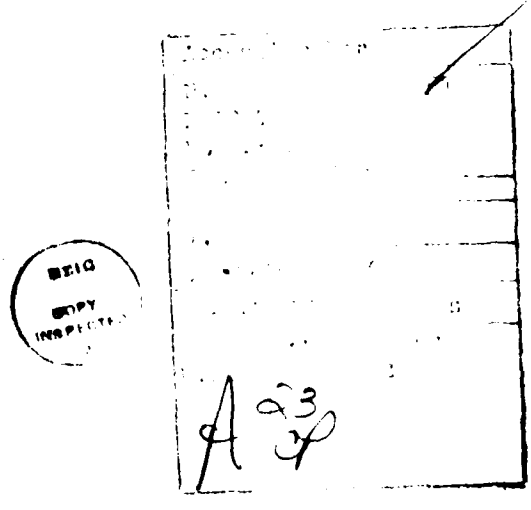
Since the majority of this work was performed in an existing fresh water lake it was a requirement to collect, separate, and dispose of drill water and cuttings without disturbing the ecological balance in the lake. The drill water was filtered through two barriers of Bidum C-42 fabric and cuttings were barged to land disposal sites.

The bridge abutments were founded on both piles and spread footings.

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

FOUNDATION REPORT
Norfork Lake Highway Bridges
U.S. Highway 62 and Arkansas Highway 101

June 1983



FOUNDATION REPORT
Norfork Lake Highway Bridges
U.S. Highway 62 and Arkansas Highway 101

TABLE OF CONTENTS

		Page
PART I:	INTRODUCTION	
1-01.	Location and Description of Project	1
1-02.	Construction Authority	1
1-03.	Purpose of Report	1
1-04.	Contractor and Contract Supervision	1
1-05.	References	2
PART II:	FOUNDATION EXPLORATIONS	
2-01.	Investigations Prior to Construction	2
2-02.	Investigations During Construction	3
PART III:	GEOLOGY	
3-01.	Regional Geology	4
3-02.	Formations	4
3-03.	Solution Features	4
3-04.	Structure	5
3-05.	Seismicity	5
3-06.	Bedrock Geology for Highway 62 Bridge	5
3-07.	Overburden for Highway 62 Bridge	6
3-08.	Bedrock Geology for Highway 101 Bridge	6
3-09.	Overburden for Highway 101 Bridge	7
3-10.	Engineering Characteristics of Bedrock	8
3-11.	Engineering Characteristics of Overburden	8
PART IV:	SPECIAL DESIGN CONSIDERATIONS	9
PART V:	EXCAVATION PROCEDURES	
5-01.	Overburden Excavation	11
5-02.	Rock Excavation	11
PART VI:	PILE INSTALLATIONS	
6-01.	Piles for East Abutment, Highway 62	13
6-02.	Piles for West Abutment, Highway 62	13
6-03.	Piles for Pier No. 11, Highway 101	13
6-04.	Piles for North Abutment, Highway 101	13
6-05.	Piles for South Abutment, Highway 101	13
PART VII:	CHARACTER OF FOUNDATION	
7-01.	North Socket, Pier 2, Highway 62	15
7-02.	South Socket, Pier 2, Highway 62	15
7-03.	North Socket, Pier 3, Highway 62	15
7-04.	South Socket, Pier 3, Highway 62	15

PART VII: CHARACTER OF FOUNDATION (Continued) Page

7-05. North Socket, Pier 4, Highway 62 16
7-06. South Socket, Pier 4, Highway 62 16
7-07. North Socket, Pier 5, Highway 62 16
7-08. South Socket, Pier 5, Highway 62 16
7-09. North Socket, Pier 6, Highway 62 16
7-10. South Socket, Pier 6, Highway 62 17
7-11. North Socket, Pier 7, Highway 62 17
7-12. South Socket, Pier 7, Highway 62 17
7-13. North Socket, Pier 8, Highway 62 17
7-14. South Socket, Pier 8, Highway 62 17
7-15. North Socket, Pier 9, Highway 62 17
7-16. South Socket, Pier 9, Highway 62 18
7-17. North Socket, Pier 10, Highway 62 18
7-18. South Socket, Pier 10, Highway 62 18
7-19. North Socket, Pier 11, Highway 62 18
7-20. South Socket, Pier 11, Highway 62 18
7-21. North Socket, Pier 12, Highway 62 19
7-22. South Socket, Pier 12, Highway 62 19
7-23. North Socket, Pier 13, Highway 62 19
7-24. South Socket, Pier 13, Highway 62 19
7-25. West Socket, Pier 1, Highway 101 19
7-26. East Socket, Pier 1, Highway 101 19
7-27. West Socket, Pier 2, Highway 101 20
7-28. East Socket, Pier 2, Highway 101 20
7-29. West Socket, Pier 3, Highway 101 20
7-30. East Socket, Pier 3, Highway 101 20
7-31. West Socket, Pier 4, Highway 101 20
7-32. East Socket, Pier 4, Highway 101 20
7-33. West Socket, Pier 5, Highway 101 21
7-34. East Socket, Pier 5, Highway 101 21
7-35. West Socket, Pier 6, Highway 101 21
7-36. East Socket, Pier 6, Highway 101 21
7-37. West Socket, Pier 7, Highway 101 21
7-38. East Socket, Pier 7, Highway 101 21
7-39. West Socket, Pier 8, Highway 101 22
7-40. East Socket, Pier 8, Highway 101 22
7-41. West Socket, Pier 9, Highway 101 22
7-42. East Socket, Pier 9, Highway 101 22
7-43. West Socket, Pier 10, Highway 101 22
7-44. East Socket, Pier 10, Highway 101 22

PART VIII: CONSTRUCTION MATERIALS 23

PART IX: FOUNDATION PROBLEM AREAS 24

PART X: FOUNDATION INSPECTION AND APPROVAL

10-01. Inspection Equipment 25

PART X: FOUNDATION INSPECTION AND APPROVAL (Continued)

	Page
10-02. Rock Socket Inspection	25
10-03. Core Hole Inspection	25
10-04. Inspection Dates and Times	26

APPENDIXES

APPENDIX A Photographs
APPENDIX B Rock Socket Drilling Logs
APPENDIX C Core Hole Drilling Logs
APPENDIX D Plates

PART I
INTRODUCTION

1-01. Location and Description of Project. The Norfork Bridges Project is located in Township 20 North, Range 12 West in Baxter County, Arkansas, where United States Highway 62 and Arkansas State Highway 101 cross Norfork Lake. The project consists of two drilled shaft bridges of concrete and steel to replace ferry crossings on each of the two highways.

The Highway 62 bridge has a 44-foot-wide roadway which extends 3,460 feet from west to east in the SE1/4 of Section 27 and the SW1/4 of Section 26. The bridge has 13 piers with 8-foot-diameter columns spaced 40 feet apart from center to center. There are 12 piers built in water which are based on 8-foot-4-inch-diameter rock sockets that extend a minimum of 20 feet into sound rock formation. However, Pier 1 is land based on the west abutment with a spread footing. The girders connecting the piers are of 1/2-inch-thick steel in 13-foot-high "I" beams. The longest span is 255 feet, and the tallest pier is 198 feet. The greatest depth of a pier beneath water is about 153 feet.

The Highway 101 bridge has a 32-foot-wide roadway which extends 2,880 feet from southwest to northeast in the E1/2 of Section 22. The bridge has 11 piers with 8-foot-diameter columns spaced 28 feet apart from center to center. There are 10 piers built in water which are based on 8-foot-4-inch-diameter rock sockets that extend a minimum of 20 feet into sound rock formation. However, Pier 11 is land based on the northeast abutment with a spread footing. The girders, like those of Highway 62, are of 1/2-inch-thick steel in 13-foot-high "I" beams. The longest span is 310 feet and the tallest pier is 213 feet. The greatest depth of a pier beneath water is about 170 feet.

1.02. Construction Authority. The Norfork Bridges Project is authorized by Public Law 93-251, Section 15, which was enacted by the 93d Congress on 7 March 1974.

1.03. Purpose of Report. The objective of this report is to describe the foundation conditions encountered during the construction of both highway bridges, the methods of construction applied to these conditions, and be a consolidated record of the foundation-related construction operations. It is intended to provide information for evaluating any future structure problems or studies which may relate to foundation conditions, planning future foundation treatment (if needed), and be a part of the permanent project engineering and construction record.

1.04. Contractor and Contract Supervision. Massman Construction Company, of Kansas City, Missouri, was the principal contractor for all of the projects' foundation work under Contract No. DACW03-79-B-0019, dated 5 April 1979. Joyner-Cranford and Burke, of Little Rock, Arkansas, was the subcontractor for the foundation work on the bridges' abutments. McClelland Engineering Company, of Kansas City, Missouri, was subcontracted to drill seven core holes on the south abutment of the Highway 101 bridge. Hayes Drilling Company, of Kansas City, Missouri, was subcontracted to drill the pile holes in the Highway 101 South abutment.

The contractor was required to establish and maintain an effective quality control system consisting of plans, procedures, and organization to insure the contract requirements in materials, equipment, workmanship, fabrication, and construction operations. A quality control system manager from within the contractor's organization was required to be at the work site with responsibility for the regulation of all quality control matters. A fully qualified staff was required under this system manager with the proper experience and technical training to perform all quality control activities. Records and tests of the contractor's quality control for all construction operations were furnished to the Government as directed by the Contracting Officer. The entire work was subject to inspection and test by the Government at all reasonable times and at all places prior to acceptance. In addition, the project was required to be accessible at any time for inspection by personnel of the Arkansas State Highway and Transportation Department and the Federal Highway Administration.

1.05. References.

a. Design Memorandum No. 3, Norfork Lake Highway Bridges, dated December 1976.

b. Geotechnical Engineering Report, Norfork Lake Highway Bridges, Howard, Needles, Tammen and Bergendoff, dated December 1977.

c. Natural Gamma-Ray and Caliper Logging, Norfork Lake Bridge Project, (Warren George, Inc.), Weston Geophysical Corp., dated July 1979.

PART II
FOUNDATION EXPLORATIONS

2.01. Investigation Prior to Construction. Prior to the 1976 Design Memorandum No. 3, several alternatives for the proposed bridge sites were studied. Local geology, water well data, physical properties, and stress behavior characteristics of typical foundation rocks were studied in detail. Side wall slopes and rock outcroppings at the sites were examined before the reservoir was filled. A geophysical survey was performed across the lake portion of the proposed bridge sites. The survey consisted of high resolution subbottom profile with an electro-mechanical profiler, fathometer readings to obtain an accurate vertical profile of the lake bed, and side scan sonar to provide a plan view of the lake bottom.

The final design and preparation of plans and specifications were contracted to the Kansas City, Missouri architect-engineering firm of Howard, Needles, Tammen and Bergendoff under Contract No. DACW03-77-C-0051, dated 13 July 1977, which in turn subcontracted subsurface investigations to National Soil Services, Inc. of Houston, Texas. These investigations included laboratory soil tests determining the Unified Soil Classification, Natural Water Content, and Grain Size Analysis; Uniaxial Compression Tests on approximately 100 rock core samples; Standard Penetration Tests and Pocket Penetrometer Shearing Tests of soil in the field; Mohs Hardness and Schmidt Hardness field tests of rock samples, and a total of 39 drill holes for both bridge sites.

The 39 drill holes were distributed to investigate overburden and rock conditions at each pier site and on all four bridge abutments. The sites for Pier 1, Highway 62 and Pier 11, Highway 101 were located on dry land and drilled at each end of the long dimension for the designed spread footings. One boring was drilled at each water pier site, alternating in the right and left drilled shaft positions. However, the first 3 pier locations of Highway 101 required additional drill holes to better define more complex subsurface conditions. The drilling methods used a 6-inch helical auger, a tri-cone roller bit, and coring as applicable to overburden and rock.

Additional subsurface explorations were conducted from January to March of 1979 by Warren George, Inc. of Jersey City, New Jersey, under Contract No. DACW03-79-C-0011, dated 5 December 1978. These explorations consisted of 36 core holes at sites for Piers 2 through 13 on Highway 62 and for Piers 2 through 10 on Highway 101. The holes were drilled at the socket locations not covered by the previous explorations of National Soil Services, Inc. and at locations of suspected solution features between Piers 2 and 5 of Highway 101. Downhole geophysical gamma and caliper logs were conducted in these borings. (See references.)

NOTE: Boring logs of the 75 borings drilled prior to construction are not included in this report. These are included in the Geotechnical Report, reference 1-05b above, as well as the plans and specifications.

2-02. Investigations During Construction. During construction an HQ (3.790-in. dia.) core hole was drilled in the bottom of each rock socket. This was to determine whether a stable foundation existed for a minimum depth of 10 feet immediately below the socket. Most of the sockets required only one 10-foot-deep core hole, but there were a few exceptions, as follows:

a. Due to a cavity in the east socket of Pier 1, Highway 101, it was decided to lower the socket 8.0 feet below the designed bottom. Therefore, a core hole was drilled 18.0 feet into the designed bottom before the socket was deepened, to investigate the 8.0 additional feet of socket to be drilled and the 10.0 feet of rock which would be beneath the final bottom of socket.

b. Two core holes of 16.5 feet and 16.6 feet respective depths were drilled in the bottom of the west socket of Pier 5, Highway 101. These holes were drilled to confirm a cavity at about 16 feet below the designed bottom of socket as indicated by previous exploratory holes.

c. Two core holes of 11.2 feet and 10.2 feet respective depths were drilled in the bottom of the east socket of Pier 6, Highway 101. These holes were drilled to determine the extent of a small clay-filled cavity discovered in the socket floor during the underwater television inspection.

d. Two core holes were drilled in the bottom of the north socket of Pier 11, Highway 62. The first hole had to be abandoned before completion when the drill stem broke off in the hole near the 8.0-foot depth. A replacement hole was then drilled to a depth of 10.08 feet.

e. In some cases several attempts were made in starting the core hole, due to bowing problems with the extremely long drill stem and casing. The flexing drill stem and casing, reaching as much as 187 feet in length, would occasionally bind against each other or cause the drill hole to start at an angle. After drilling a short distance, these attempted holes would have to be abandoned, the casing would have to be reset, and another hole would have to be attempted until the required 10.0 vertical feet of core could be recovered.

Seven core holes were drilled at the Highway 101 south abutment to determine the top of rock for pile installations. Five holes in the footing area found the top of rock at depths ranging from 2.5 to 10 feet. Two holes at the wing wall footer sites indicated top of rock at 17 and 21 feet respectively. Boring logs of the core holes drilled during construction are included in Appendix C of this report.

PART III
GEOLOGY

3-01. Regional Geology. The Norfork Bridges Project lies within the Salem Plateau on the southern flank of the Ozark Uplift. The uplift is formed by an elongated, asymmetric dome trending southwest across most of southern Missouri and into northern Arkansas as well as parts of northeastern Oklahoma. The dome has been slowly uplifted through geologic time, and subsequent erosion has created a maturely dissected terrain with closely spaced, steepsided valleys between upland remnants of the Salem Plateau. The slight regional dip of formations in the Salem Plateau is normally radial outward from the apex of the dome which is located in the Precambrian St. Francois Mountains of southeast Missouri. The formations are near horizontal with an average dip between 20 and 50 feet per mile and are cherty Ordovician dolomites, which cover most of the Salem Plateau from the project area in north-central Arkansas northward to the Missouri River.

3.02. Formations. The only rock formations encountered in the project area were the undifferentiated Cotter-Jefferson City Dolomites of the lower Ordovician Period. These two similar formations account for up to 800 feet of the stratigraphic column. They are lithologically undistinguishable and consist mostly of crystalline, sometimes siliceous, thin to massive bedded, moderately hard to hard, gray to buff, occasionally sandy or slightly shaly, cherty, and sometimes vuggy or drusy dolomite. Occasionally, thin layers of sandstone or shale are interbedded with the dolomite.

3.03. Solution Features. Dolomite is a calcium and magnesium carbonate which is soluble in groundwater; therefore, geologic solution features are common in the project area as well as throughout the Salem Plateau. The solution activity is accelerated by the relatively high, near-surface, groundwater flow rates caused by the appreciable topographic relief of the Ozarks. Solution creates channels and cavities along bedding planes, fractures, and joints, and enlarges some open vertical fractures and joints to form deep chasms in the subsurface. Differential solution creates highly irregular bedrock surfaces in some areas, and pinnacles may develop having several tens-of-feet of relief. In places, considerable sections of dolomite rock appear to have been separated by solution from the in-situ formation to create large blocks of float in the overburden. These bedrock irregularities are generally concealed beneath a mantel of residual soil which was also formed by solution from the parent carbonate rock. The dolomite is usually an impure rock containing far less soluble inclusions of clay, sand, and chert. As the bedrock surface is reduced by groundwater solution, these less soluble materials are left to accumulate in a residue above the rock. This has formed the typical red sandy and often cherty clay overburden of the project area.

3.04. Structure. Structurally, the project lies within the rather stable Mid-Continent Area. The local formations dip up to about 100 feet per mile to the south, which is somewhat steeper than the average regional dip. There were no apparent faults in the bridge foundations. Occasionally, high angle, normal faults of small vertical displacement are found in the general project area, but they have no indication of movement in recent geologic time. The nearest large faults occur at the Norfork Dam about 8.3 miles to the south. The dam is built on a grabened fault block between two major northeast trending faults with vertical displacements ranging from 40 to 200 feet.

3.05. Seismicity. The project area is in a Seismic Risk Zone I (minor damage expected) and within about 50 miles of a Seismic Risk Zone II (moderate damage expected). This Seismic Risk Zone II is roughly concentric about a Seismic Risk Zone III (major damage expected) at the New Madrid-Rough Creek Fault area in southeast Missouri. The 1811 and 1812 New Madrid earthquakes which reached Intensity XII on the Modified Mercalli Scale were centered about 150 to 200 miles from the project. Only earthquakes of minor intensity have occurred within a 100-mile radius of the project in the last 100 years. Recently, on 20 January 1982, an earthquake occurred with an epicenter near Naylor, Arkansas about 85 miles south of the bridges. It registered 4.5 on the Richter Scale and was barely felt by some people in the project area. The bridge piers were designed to meet the seismic conditions of the area.

3.06. Bedrock Geology for Highway 62 Bridge. The undifferentiated Cotter and Jefferson City Dolomites of the lower Ordovician Period were the formations encountered throughout the Highway 62 Bridge foundation. The dolomite was generallly thin to massive bedded, moderately hard to hard, gray to buff, moderately fractured and jointed with zones of frequent fracturing. Fracture and joint planes were often coated with iron or calcite deposits which indicated considerable healing. No slickensides or other signs of faulting were noted throughout the foundation. The dolomite was occasionally sandy, gradational to dolomitic limestone, or interbedded with thin layers of shale, siltstone, mudstone, or clay. A white, hard, tightly cemented quartizitic sandstone found in exploration borings for Piers No. 3 and 11 was also encountered in sockets for Piers Nos. 2, 3, 4, and 12. It appeared to be in lenticular deposits which varied in thickness from less than a foot to 3.9 feet. Chert and flint were relatively common and occurred in both nodules and layered strata. Vugs and druses often occurred in zones and were usually lined with crystals of quartz, calcite, or dolomite. Solution cavities occupied several square feet in some of the socket walls, but none were large enough to create problems. Although many of the cavities were open, some were clay filled, especially those near the top of rock. Weathering at the top of rock was generally slight to moderate.

3-07. Overburden for Highway 62 Bridge. Overburden consisted primarily of residual and colluvial soils along the valley slopes and alluvial soils over the valley bottom. However, the soil beneath the reservoir level is undoubtedly reworked in places by the lake water to form new lacustrine deposits. The residual soil consists of a red clay containing sand and chert fragments which has been derived from the bedrock by solution and other weathering processes. Colluvium is formed along the valley slopes by residual materials moving downslope under the influence of slopewash and mass-wasting such as soil creep. The alluvial soils consist of sorted or semi-sorted deposits of clay, silt, sand, and gravel which comprises most of the valley fill.

The depth of overburden at the pier foundations ranged from 2.0 feet at Pier No. 13 on the east valley slope to 30.3 feet at Pier No. 8 in the valley fill. The residual and colluvial soils on the east valley slope ranged in depth from 2.0 feet at Pier No. 13 to 4.8 feet at Pier No. 12. However, the deposits on the west valley slope were considerably thicker and ranged in depth from 4.2 feet at Pier No. 1 to 27.7 feet at Pier No. 4. The deepest overburden was 30.3 feet in the alluvium at Pier No. 8, but Pier No. 9 had only 2.7 feet to 3.7 feet of alluvium. Otherwise, the shallowest alluvium was 17.1 feet at Pier No. 10 and depths usually ranged around 25 feet $\pm$.

The depth of overburden was relatively shallow on both bridge abutments. On the east abutment overburden ranged from 3.5 to 17.5 feet deep, and on the west abutment it ranged from 0.5 to 9.5 feet in depth.

3-08. Bedrock Geology for Highway 101 Bridge. The bedrock of the bridge foundation on Highway 101 was generally similar to that on Highway 62. However, there were a few exceptions due to local formation variations, degree of fracturing, and solution effects.

The bedrock encountered throughout the foundation was the undifferentiated Cotter and Jefferson City Dolomites of the lower Ordovician Period. It was generally a thin to massive bedded, moderately hard to hard, gray to buff, moderately fractured and jointed dolomite which was occasionally sandy, gradational to dolomitic limestone, or interbedded with thin layers of shale. Hard, tightly cemented, white quartzitic sandstone was encountered in Piers Nos. 1 and 2. These appeared to be lenticular deposits which varied in thickness from less than a foot to 6.58 feet. Both nodules and layers of chert and flint were relatively common. Vugs and druses often occurred in zones and were usually lined with crystals of quartz, calcite, or dolomite. For the most part, weathering was slight to moderate except in extremely fractured and jointed areas.

Although there were zones of frequent fracturing throughout the foundation, the sockets for Piers No. 2 through 5 were the most intensely fractured. Weathering in this area was evidenced by considerable iron staining. Otherwise, fractures and joints were often healed with silica, carbonate, or iron oxide cement. No slickensides or fault displacements were noted in any of the fractures.

The first five piers contained several zones of a soft, porous, sometimes friable, yellow to buff to tan rock which was initially called siltstone. However, some of the material encountered in these soft rock zones appeared to be soft, weathered dolomite with the same structure as the surrounding formations. It has been noted that R. L. Heller (1954) described the Jefferson City Dolomite as commonly containing a "very fine-grained, thin to massive bedded, argillaceous to silty, gray to buff cotton rock". "Cotton rock" is defined by the American Geological Institute's Glossary of Geology (1974) as "a term used in Missouri for a soft, fine-grained, siliceous, white to slightly gray or buff magnesian limestone having a chalky or porous appearance that is suggestive of cotton". This definition closely fits the soft, porous rock which was described as siltstone in the field logs and previous reports on the Highway 101 Bridge foundation. The occurrence of this rock in the most fractured and jointed area of either bridge foundation suggests that the cherty, often siliceous dolomite was subjected to intense solution activity giving it the altered cotton rock appearance. An x-ray diffraction analysis was conducted on a small sample taken from soft rock zone in the west socket of Pier 5. The analysis indicated that the sample was high in silica with small amounts of dolomite, mica, and iron. This could be interpreted as a weathered chert or a highly siliceous dolomite having most of the soluble dolomite leached away. In any case, the soft rock appears to be the product of solution weathering rather than a siltstone deposit.

There were both clay-filled and open cavities which varied in size, but only Piers Nos. 1 and 5 had any large enough to require design adjustments. The east socket of Pier No. 1 was deepened 8 feet due to a clay-filled cavity which had a deep pocket covering abot 80 square feet of the socket wall. At Pier No. 5 the top of socket was raised 14 feet above design elevation due to deep recesses which occurred in the lower west socket. However, drilling action, time, and cuttings indicated that the recesses were probably caved-in areas of soft rock rather than solution cavities.

3-09. Overburden for Highway 101 Bridge. The general soils types and descriptions are the same for the overburden at the Highway 101 Bridge as for that at the Highway 62 Bridge. The valley slopes are covered with residual and colluvial deposits of red sandy and cherty clay. The valley fill consists mostly of alluvial deposits of clay, silt, sand, and gravel.

The depth of overburden at the pier foundations ranged from 2.9 feet at Pier No. 5 on the valley bottom to 52.2 feet at Pier No. 10 on the north valley slope. The overburden was thinnest near the center of the valley and thickened progressively toward the valley sides. Depth of overburden was no greater than 11.0 feet through Piers Nos. 4, 5, 6, and 7. Overburden on the south valley bottom was 16.3 feet to 26.5 feet thick at Pier No. 2. On the north valley bottom it was 22.2 feet to 23.0 feet thick at Pier No. 8. Overburden on the south valley slope was 18.7 to 19.5 feet thick at Pier No. 1. On the north valley slope it ranged from 24.4 feet thick at Pier No. 9 to 52.2 feet thick at Pier No. 10.

The depth of overburden varied considerably on both bridge abutments, but particularly on the south abutment where solution weathered pinnacles apparently existed. The depth of overburden on the south abutment ranged from 2.5 to 21.0 feet and on the north abutment it ranged from 15.0 and 27.5 feet.

3-10. Engineering Characteristics of Bedrock. The Unconfined Compressive Strength and the Modulus of Elasticity were considered the two most important and reliable parameters of the bedrock foundation. The Modulus of Elasticity was based on the slope of the stress-strain curve at a point equal to 50 percent of the ultimate unconfined compressive strength which tends to represent a linear stress-strain relationship. From laboratory tests on rock cores and other data obtained from the subsurface investigations, the Modulus of Elasticity was found to range from 112,000 TSF (tons per square foot) to 400,000 TSF. A general Modulus of Elasticity of 125,000 TSF was considered reasonably applicable for both bridge foundations with a Maximum Allowable End Bearing of 35 TSF at the socket bottom. However, no side friction was included in developing the axial capacity, and considerable support would actually be developed by the concrete-bedrock interaction throughout the socket depth.

3-11. Engineering Characteristics of Overburden. The bridge foundations are primarily dependent on the physical characteristics of the bedrock rather than the overburden. Therefore, no strength tests such as Unconfined Compression, Triaxial Shear, or Direct Shear tests were performed on the overburden material. However, general overburden characteristics were defined according to the Unified Soil Classification, the Pocket Penetrometer Test which gives an approximate soil shearing strength, and the Standard Penetration Test which gives the penetration resistance and consistency of cohesive soils. This information was recorded on the exploratory boring logs.

PART IV
SPECIAL DESIGN CONSIDERATIONS

The sockets were analyzed for stresses due to design bending moments and design shears, assuming a rock modulus of 125,000 TSF. The results of this analysis indicated the following conclusions:

a. The maximum lateral pressure on the surrounding rock would be approximately 90 kips. Any local yielding of the rock would result in significantly lower lateral pressure.

b. Calculated maximum shears vary depending on the rock modulus assumed. Unit shear stresses cannot be calculated because the shear acts on both the concrete and the rock. The maximum unit shear stress occurs at the top of socket and is approximately 20 p.s.i.

c. There would not be a significant increase in bending moment from that at the top of socket, regardless of local yielding.

d. Bending moments would be reduced to the level that the socket without reinforcing steel could adequately resist the moment at any point 10 feet or more below the top of socket.

e. Local yielding of the top of socket would not significantly increase bending moments in the columns. Maximum deflection at the top of socket due to local yeilding would be 0.002 feet.

f. The surrounding rock within the top 10 feet of socket could be somewhat broken, thus permitting localized yielding; however, the average joint-fracture spacing for the top 10 feet increment should be no closer than 1-1/2 inch. The bottom 10 feet of surrounding rock should have minimum of broken rock. The average joint-fracture spacing for the lower 10 feet of socket should be no closer than 6 inches.

g. If the bottom of the socket would be lowered by less than 10 feet, it would not be necessary to extend the reinforcing steel cage if it could be adequately supported during placement of tremie concrete.

The point of fixity was assumed for design at 1 foot below the top of rock socket for determining the equivalent column length in the longitudinal frame analysis for earthquake forces. It was determined that the top of rock socket elevations could be lowered 5 feet without a significant effect on the bridge design analysis.

The sockets were designed for bearing at the bottom of the socket at 20 TSF. However, significant side friction in the constructed sockets would reduce the end bearing too much less than 20 TSF. Therefore, it was considered that up to 25 percent of the socket bottom did not have to be sound rock, but at least 10 vertical feet of solid rock should be immediately below the bottom of the socket.

If a clay and/or cavity zone occurred continuously around a socket wall with a total thickness greater than 1.0 foot, the design recommendation was that the bottom of the rock socket should be lowered 1.0 foot for each 1.0 foot of the zone's thickness.

If cavities occurred which extend over more than 10 square feet of a socket wall, the design recommendation was that the bottom of the rock socket should be lowered 1.0 foot for each 10.0 square feet of the cavity area.

PART V
EXCAVATION PROCEDURES

5-01. Overburden Excavation. Overburden was excavated to bedrock at the east abutment of Highway 62 and at Pier No. 1 of Highway 62. Otherwise, there was little to no overburden excavation on the other abutments of the bridges, since embankment was placed essentially on the ground surface. However, the ground surface was stripped and scarified as required for foundation preparation. Also, benching was required for any ground surface which sloped greater than 1 vertical to 3 horizontal. Most of the overburden excavation on land was conducted with 977 L loaders, but a backhoe was used for the spread footing excavations at Pier No. 1, Highway 62 and Pier No. 11, Highway 101.

Overburden was excavated at each rock socket location by a crane equipped with a clam shell bucket. The uneven and weathered bedrock surface was loosened by repeatedly dropping a large chisel-pointed chopping bar over the excavation area. Upon removal of the loosened rock with the overburden, the socket bedrock surface was left reasonably level in most cases. The overburden excavation and disposal was kept entirely underwater and near the lake bottom to avoid turbidity problems.

5-02. Rock Excavation. The majority of the rock excavation was by drilling of rock sockets for the 22 piers located in water. The procedure began by stationing a two-holed template barge over the drill site with four steel anchors. Two 10-foot-diameter casings equipped with ripping teeth were then lowered to the lake bottom through the template holes. Each casing was connected to the kelly and turned with the drill rig until the ripping teeth had cut a firm seat into the rock formation. In some cases sand and/or grout were poured on the top of rock to provide a smoother starting surface. Finally, the 8-foot-4-inch drill bit was lowered through the casing and drilling began.

Reverse rotary was the primary method of drilling except at a couple of locations where straight rotary was used. In reverse rotary drilling the cuttings were lifted to the surface by air pressure through an 8-inch pipe in the center of the kelly-drill stem and then were forced through a hose into a disposal barge. The cuttings were lifted in a mixture of about 50-percent air and 50-percent water with a flow of approximately 2,000 gal/min. The disposal barge filtered the drill water through two barriers of Bidum C-42 fabric before releasing it into the bottom of the lake through a 6-foot-diameter pipe. The cuttings were retained in the barge to be emptied at a designated spoil pit on land. However, it was necessary for the depth of water to equal approximately two-thirds of the height of the drill stem for the reverse rotary system to have enough lift pressure to remove the cuttings properly. Therefore, due to shallow water at Pier No. 13 on Highway 62 and Pier No. 1 on Highway 101, the reverse rotary system was converted to straight rotary with air pressure assistance. In straight rotary the drill cuttings rose to the surface with the drill water which flowed upward through the annular space on the outside of the kelly-drill stem. The cuttings and drill water then flowed out of the casing through slots just above the lake surface. Since both of these piers were located within a few feet of dry land, the drill water and cuttings were separated from the open lake by a tarp curtain which was spread from the drill barge to the shore.

The socket drill was designed and constructed by the Steven M. Hain Company, Inc. of Garland, Texas, and was operated on a Manitowoc 4100 crane. The drill bit assembly was 8 feet 4 inches in diameter and consisted of 14 roller-cone, carbide tipped bits arranged in concentric pattern on a circular connecting plate. Several steel plates were added above the drill bits to give a total assembly weight of 120,000 pounds. The bit was designed to operate with a crushing action assisted by water jetting, and it appeared to perform best in hard, brittle material which was characteristic of much of the local dolomite.

The only rock excavation other than drilling was on Highway 62 at the east bridge abutment and at the spread footing foundation of Pier No. 1. These excavations were relatively small and were accomplished with an air percussion hammer operated on a backhoe.

PART VI
PILE INSTALLATIONS

Both vertical and battered piles were installed at all four bridge abutments and at Pier No. 11, Highway 101. All of the piles were HP12X53 in size and had a maximum bearing per pile of 55 tons. The piles were driven by Massman Construction Company using a Vulcan 50C hammer. Refusal for this hammer was defined by the Contracting Officer as five blows for the last one-quarter inch of driving, or when damage to the top of the piling occurred as judged by the Contracting Officer's representative.

6-01. Piles for East Abutment, Highway 62. The Highway 62 east abutment was primarily founded on bedrock, but four piles were driven in the wingwall foundations. There was a vertical pile and a battered pile for each of the two wingwalls, and the battered piles sloped at 4 inches per foot. The pile tip elevations at the north wingwall were 587.4 for the battered pile and 587.6 for the vertical pile with a penetration of 9.9 feet and 9.1 feet respectively. The pile tip elevations at the south wingwall were 592.1 for the battered pile and 591.3 for the vertical pile with a penetration of 9.1 feet and 9.4 feet respectively.

6-02. Piles for West Abutment, Highway 62. There were 13 vertical piles and 16 battered piles driven in the west abutment of Highway 62. The battered piles had a slope of 4 inches per foot. The pile tip elevations were estimated in the plans to be about 584 for the abutment proper and 588 for the wingwalls; the actual elevations ranged from 583.90 to 592.32. Penetration ranged from 19.10 feet to 31.45 feet for the vertical piles and from 22.1 feet to 34.07 feet for the battered piles.

6-03. Piles for Pier No. 11, Highway 101. There were 20 vertical piles and 20 battered piles driven at Pier No. 11, Highway 101. Each spread footing had 10 vertical piles, 5 piles battered to the north, and 5 piles battered to the south. The battered piles had a slope of 3 inches per foot. The pile tip elevations were estimated in the plans to be at about 515 for the west footing and 529 for the east footing; the actual elevations ranged from 514.7 to 543.9. Penetration ranged from 19.3 feet to 39.4 feet for the vertical piles and from 11.8 feet to 42.6 feet for the battered piles.

6-04. Piles for North Abutment, Highway 101. There were 11 vertical piles and 12 battered piles driven in the north abutment of Highway 101. The battered piles had a slope of 4 inches per foot. The pile tip elevations were estimated in the plans to be from 568 to 578 for the abutment proper, 560 for the west wingwall, and 607 for the east wingwall; the actual elevations ranged from 578.56 to 593.77. Penetration ranged from 19.5 feet to 33.8 feet for the vertical piles and from 21.3 feet to 36.3 feet for the battered piles.

6-05. Piles for South Abutment, Highway 101. There were 4 vertical piles and 3 battered piles driven in the south abutment of Highway 101. A vertical pile and a battered pile were driven at each wingwall, and the other 3 piles were driven in the abutment proper. The battered piles had a slope of 4 inches per foot. The pile tip elevations ranged from 579.35 to 584.60 for

the wingwalls and from 575.85 to 577.45 for the abutment proper. Penetration ranged from 11.9 feet to 19.5 feet for the vertical piles and from 13.0 feet to 20.1 feet for the battered piles.

Bedrock was too high in most places for the piles to be driven to a suitable depth in the south abutment; therefore, 16 additional piles were concreted in drilled holes. These holes were 18 inches in diameter and consisted of 7 vertical holes and 9 battered holes sloping at 30 degrees from vertical. The vertical holes were drilled at least 2.0 feet into sound rock and ranged in depth from 5.1 feet to 12.9 feet. The battered holes extended from an approximate ground elevation of 588 to elevation 577 and encountered sound rock at a depth of 4.7 feet and above. In each hole concrete was poured around a pile and vibrated into place.

PART VII
CHARACTER OF FOUNDATION

The foundation proved to be quite good for both bridges. Most solution cavities encountered were relatively small, fracturing was usually moderate with most of the intense fracturing in restricted zones, and there was no evidence of faulting. There were zones of soft, weathered dolomite and chert in the first five pier foundations of Highway 101, but most of the rock beneath both bridges was a hard, blocky to massive dolomite that was easily drilled. Although the contract bidding schedule for each bridge allowed 50 additional linear feet of rock excavation to replace poor socket conditions, the only such extended excavation was 8 linear feet in the east socket of Pier 1, Highway 101. Rock socket drilling logs are included in Appendix B of this report.

The following is a summary of the foundation conditions encountered in each rock socket: (Sheets 6 through 52 of the attached drawings are detailed geologic maps of each drilled rock socket.)

7-01. North Socket, Pier 2, Highway 62 (elev. 482.27 to 503.30). The rock surface was relatively smooth with no cavities. There were a few blocky areas, but the rock was mostly massive. Vertical fractures were most prominent in the lower portion of the socket, and horizontal fractures were more prevalent in the upper portion. The drilled rock was moderately hard to hard dolomite with a trace of shale and clay. There was a 4.5-foot-thick bed of quartzitic sandstone or orthoquartzite at elevation 489.10.

7-02. South Socket, Pier 2, Highway 62 (elev. 482.56 to 503.30). The rock surface was relatively smooth but somewhat more fractured than the adjacent north socket. Nearly vertical to diagonal fractures were prominent in the lower three-fourths of the socket. Horizontal fractures were prevalent in three zones which occured in the lower, middle, and upper socket. There were no major cavities but some occasional vugs. The drilled rock was moderately hard to hard dolomite with traces of shale and chert. There was a 3.9-foot-thick quartzitic sandstone bed at elevation 488.37.

7-03. North Socket, Pier 3, Highway 62 (elev. 451.00 to 471.00). This socket had a noticeable cavity which was apparently derived by the solution weathering of a vertical joint. The cavity covered approximately 6.0 square feet of socket surface area between elevations 463 and 471. However, it was not large enough to require any remedial action. There were also a few smaller cavities and vugs. There was a prominent 11-foot-long horizontal ledge at elevation 468.3 which may have been part of a cavity floor. The rock was broken to blocky near the rock ledge, but otherwise blocky to massive. The predominant fracturing was nearly vertical throughout the socket. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of green mudstone.

7-04. South Socket, Pier 3, Highway 62 (elev. 451.00 to 471.00). The rock surface was blocky to massive and relatively smooth with a few small cavities and vugs. Most fractures were nearly vertical, but three closely spaced horizontal fractures were conspicuous in the eastern half of the socket

at about elevation 466. The drilled rock was moderately hard to hard dolomite with a 1.4-foot-thick bed of quartzitic sandstone at elevation 456.9 and an 0.2-foot-thick layer of claystone at elevation 458.6.

7-05. North Socket, Pier 4, Highway 62 (elev. 426.85 to 448.00). There was a zone of cavities near elevation 439 and another near elevation 448. However, many of the cavities were shallow, and none occupied over a few square feet of the socket wall. The area between these cavity zones contained occasional vugs and small cavities. Otherwise, the rock surface was relatively smooth. There were a number of minor diagonal fractures, but the most prominent fracturing was horizontal, especially below elevation 437. The drilled rock was moderately hard to hard dolomite with traces of shale, some clay in cavities, a 1.2-foot- thick seam of chert at elevation 441.59, occasional chert nodules, and a 1.6-foot-thick bed of quartzitic sandstone at elevation 442.79.

7-06. South Socket, Pier 4, Highway 62 (elev. 426.87 to 448.00). The rock surface of this socket was very similar to that of the adjacent north socket. There were two cavity zones, one near elevation 442 and another near elevation 448 with a few vugs and small cavities scattered among and between the two zones. Many of the cavities were only shallow recesses, and none occupied over a few square feet of the socket wall. However, some of the cavities at the 448 elevation were deep and extended considerably above the top of socket. There was no need to drill the socket deeper, but the inner concrete forms had to be set at about elevation 447 to avoid the cavities at the top of socket. The rock surface between the two cavity zones was somewhat blocky. Below elevation 439 the rock surface was relatively smooth, there were no cavities, and horizontal fracturing appeared particularly prominent. The drilled rock was moderately hard to hard dolomite with traces of shale and chert, an 0.5-foot quartzitic sandstone bed at elevation 444.21, and a 2.4-foot quartzitic sandstone bed at elevation 441.24.

7-07. North Socket, Pier 5, Highway 62 (elev. 406.75 to 427.30). The rock surface was generally smooth and massive for the most part. There were a few vugs but no large cavities. Horizontal fractures and numerous small irregular fractures occurred intermittently throughout the socket. The drilled rock consisted of moderately hard to hard dolomite with occasional shale and traces of siltstone and chert.

7-08. South Socket, Pier 5, Highway 62 (elev. 406.91 to 427.30). The rock surface was relatively smooth and varied from massive to blocky. There was a zone of small shallow cavities along a horizontal joint at elevation 419.20. Horizontal fractures and numerous small irregular fractures were prevalent throughout the socket. The drilled rock was moderately hard to hard dolomite with a few thin sandstone and shale layers.

7-09. North Socket, Pier 6, Highway 62 (elev. 408.75 to 429.00). The rock surface was generally smooth except for a vuggy zone with intermittent small shallow cavities between elevations 415 and 419. Diagonal to vertical fractures were most numerous below elevation 418, but horizontal fractures were prominent throughout the socket. The drilled rock was moderately hard to hard dolomite with a few chert nodules and occasional thin layers of shale. Some clay occurred in small cavities.

7-10. South Socket, Pier 6, Highway 62 (elev. 408.10 to 429.00). This socket was very similar to the adjacent north socket. The rock surface was generally smooth except for a vuggy zone with intermittent small shallow cavities between elevations 416 and 418.50. Diagonal to vertical fractures were most numerous below elevation 417, but horizontal fractures were prominent throughout the socket. The drilled rock was moderately hard to hard dolomite with some chert and occasional thin shale layers. Some clay occurred in small cavities.

7-11. North Socket, Pier 7, Highway 62 (elev. 409.52 to 428.90). The rock surface was generally smooth, but there were several cavities scattered throughout the socket with the largest covering an area of about 2 square feet. There were two zones of horizontal fractures, one between elevations 415.5 and 418.5 and another above 428.6. Otherwise, the fractures were generally small and irregular ranging from diagonal to vertical. The drilled rock was moderately hard dolomite with occasional chert nodules. There was some clay in a few of the cavities.

7-12. South Socket, Pier 7, Highway 62 (elev. 408.79 to 428.90). The rock surface was smooth and massive for the most part. A couple of shallow recesses occurred between elevations 428 and 430. There were occasional small diagonal to vertical fractures, but the most prominent fractures were horizontal. The drilled rock was moderately hard dolomite with some chert and traces of shale.

7-13. North Socket, Pier 8, Highway 62 (elev. 405.53 to 426.80). The rock surface was generally smooth. There were no cavities. Horizontal fractures occurred intermittently throughout the socket, and there were a few small diagonal to vertical fractures between elevations 412 and 420. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams.

7-14. South Socket, Pier 8, Highway 62 (elev. 405.66 to 426.80). The rock surface was generally smooth. There were no cavities, but a few vugs occurred below elevation 407. There were occasional small diagonal to vertical fractures, but horizontal fractures were predominant throughout the socket. The drilled rock was moderately hard to hard dolomite with a few thin shale seams and traces of chert.

7-15. North Socket, Pier 9, Highway 62 (elev. 403.00 to 424.20). There was a zone of cavities in this socket between elevations 412 and 414.5. The cavities appeared deep in places and the largest covered a surface area of about 17 square feet. Since there was a 1.2-foot overdrill in the socket depth, there was no need to deepen the socket due to the cavity. Otherwise, the rock surface was relatively smooth. The most prominent fractures were horizontal, but diagonal to vertical fractures were scattered throughout the socket. A zone of diagonal fractures occurred just below the cavities between elevations 408 and 412. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams and chert nodules.

7-16. South Socket, Pier 9, Highway 62 (elev. 403.04 to 424.20). A zone of cavities also occurred in this socket, but they were at a slightly lower elevation than in the adjacent north socket. The cavity zone was between elevations 408 and 412. These cavities appeared deep in places, but the largest, which covered a surface area of about 15 square feet, was shallow for the most part. The large cavity was too shallow to require drilling the socket deeper; however, there was a 1.16-foot overdrill in the socket depth. The rock surface was otherwise blocky to massive. There were numerous diagonal fractures throughout the socket, but they were especially prevalent in the south half. Horizontal fractures were prominent above the cavity zone. The drilled rock consisted of moderately hard to hard dolomite with occasional chert, thin shale seams, and a trace of soft claystone.

7-17. North Socket, Pier 10, Highway 62 (elev. 402.48 to 424.50). There was a zone of shallow cavities between elevations 411 and 412 which correlated with the cavity zones in the Pier 9 sockets. However, the cavities were evidently not continuous between piers since they were relatively shallow at Pier 10. Otherwise, the rock surface was generally smooth and massive for the most part. Horizontal fractures occurred intermittently throughout the socket. There was a zone of prominent diagonal fractures below the cavities to elevation 407. The drilled rock was moderately hard to hard dolomite with occasional thin shale seams.

7-18. South Socket, Pier 10, Highway 62 (elev. 403.36 to 424.50). There was also a zone of shallow cavities in this socket between elevations 411 and 412, but these cavities were generally smaller than those in the adjacent north socket. The rock surface was relatively smooth but somewhat more fractured than the north socket. There was a zone of diagonal fractures below the cavities to about elevation 405, and horizontal fractures were prominent throughout the socket. The drilled rock was mostly a moderately hard to hard dolomite with occasional chert and thin shale seams.

7-19. North Socket, Pier 11, Highway 62 (elev. 404.77 to 426.00). There was a zone of small shallow cavities and vugs between elevations 414 and 416. Otherwise, the rock surface was relatively smooth with horizontal fractures prevalent throughout most of the socket. There was a zone of diagonal fractures below the cavities to about elevation 407. Although at a slightly higher elevation, this zone of cavities and the underlying diagonal fractures correlated with similar zones in Piers 9 and 10. The drilled rock was moderately hard to hard dolomite with occasional chert and thin layers of shale.

7-20. South Socket, Pier 11, Highway 62 (elev. 404.90 to 426.00). There was a zone of numerous vugs with a few small shallow cavities between elevations 414.5 and 418. This zone was similar to the cavity zone in the adjacent north socket, but it was more vuggy. The rock surface was otherwise relatively smooth although it was frequently fractured. Diagonal fractures were prominent beneath the cavity zone, and horizontal fractures persisted throughout the socket. The drilled rock consisted of moderately hard to hard dolomite with occasional thin shale layers and a trace of siltstone.

7-21. North Socket, Pier 12, Highway 62 (elev. 403.02 to 450.70). The rock surface was generally blocky with several shallow cavities and recesses scattered throughout the socket between elevations 434 and 435. Horizontal fractures were prominent below elevation 434 and above elevation 443. Small diagonal to vertical fractures occurred throughout the socket. The drilled rock was mostly a moderately hard to hard dolomite with traces of siltstone and clay. Quartzitic sandstone occurred between elevations 441.78 and 435.48 interbedded with hard siliceous dolomite.

7-22. South Socket, Pier 12, Highway 62 (elev. 429.71 to 450.70). The rock surface was blocky for the most part except for massive areas in the upper and lower 4 feet of the socket. There were several shallow cavities and recesses scattered through the central part of the socket between elevations 437 and 448. Numerous small irregular fractures occurred in the blocky cavity area, but otherwise, horizontal fractures were prominent. Part of an exploratory core hole was observed in the western wall of the socket. The drilled rock was moderately hard dolomite with interbedded quartzitic sandstone from elevation 443.47 and 438.07.

7-23. North Socket, Pier 13, Highway 62 (elev. 513.70 to 534.70). The rock surface was relatively smooth with no cavities. There were numerous horizontal fractures throughout the socket and a few diagonal to vertical fractures. Part of an exploratory core hole was exposed in the socket's west wall. The drilled rock was moderately hard to hard dolomite with occasional chert, thin layers of shale, and a trace of sandstone.

7-24. South Socket, Pier 13, Highway 62 (elev. 513.70 to 534.70). The rock surface was relatively smooth with no cavities. There were numerous horizontal fractures throughout the socket and occasional diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with a trace of chert and shale.

7-25. West Socket, Pier 1, Highway 101 (elev. 497.57 to 517.90). The rock surface was generally smooth for the most part with a few small cavities and shallow recesses below elevation 507. Horizontal fractures occurred intermittently throughout most of the socket, but were particularly prevalent below elevation 501. There were several scattered vertical to diagonal fractures, but they were most prevalent in the upper northeast section of the socket. The drilled rock was moderately hard to hard dolomite with occasional clay; there was interbedded quartzite from elevation 503.98 to the bottom of the socket.

7-26. East Socket, Pier 1, Highway 101 (elev. 489.62 to 517.90). This socket had a cavity around about 8/9 of the wall of the hole from elevation 503.1 to 510.5. The upper part of the cavity was shallow, but the lower portion was deep and involved about 80 square feet of the socket wall. Therefore, the socket was lowered 8 feet below the designed bottom, allowing 1 foot additional depth for each 10 square feet of the deep cavity area. There was another cavity zone between elevations 499.4 and 502 which amounted to only two shallow recesses about 1 foot thick extending parallel around about two-thirds of the socket wall; these cavities required no remedial action. There was also a shallow recess from elevation 496 to 498.2, and another from about elevation 515 to 518.

Otherwise, the rock surface was mostly blocky with some massive, smooth areas above elevation 512. Horizontal fractures were prominent below elevation 500. There were numerous diagonal to vertical fractures throughout the socket, but they were particularly prominent below elevation 493 and in the northen half of the socket above elevation 511.40. The drilled rock was moderately hard to hard dolomite with clay in cavities and a trace of siltstone or weathered dolomite. There were intermittent, thin quartzitic sandstone beds from elevation 502.63 to 500.53 and from elevation 497.83 to the bottom of the socket.

7-27. West Socket, Pier 2, Highway 101 (elev. 411.68 to 432.00). The rock surface was smooth and massive above elevation 422.5, but it was blocky below that elevation. There were prominent horizontal fractures and numerous small diagonal to vertical fractures in the blocky area. There were no cavities, but several small shallow recesses and vugs. The drilled rock was moderately hard to hard dolomite with occasional chert and thin beds of quartzitic sandstone at elevation 417.60 and 414.00.

7-28. East Socket, Pier 2, Highway 101 (elev. 411.60 to 432.00). The rock surface was generally smooth with only one small shallow cavity at elevation 422. The socket was moderately fractured with a nearly equal amount of horizontal and vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert. There was a quartzitic sandstone bed of 0.5-foot thickness at elevation 418.58.

7-29. West Socket, Pier 3, Highway 101 (elev. 384.46 to 405.00). A vertical joint in the south wall was apparently enlarged by solution into a 3-foot-wide shallow cavity at about elevation 400. Otherwise, the rock surface was blocky to massive and smooth. Fractures were predominantly horizontal to slightly dipped from horizontal with occasional minor vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional areas of soft weathered dolomite and some chert.

7-30. East Socket, Pier 3, Highway 101 (elev. 384.89 to 405.00). The rock surface was blocky with no cavities, but there was a recessed ledge extending around most of the socket at about elevation 404.5. Fractures were predominantly horizontal, but there were also numerous short, diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional soft, weathered dolomite, chert, and traces of shale.

7-31. West Socket, Pier 4, Highway 101 (elev. 399.64 to 420.00). There was a prominent, somewhat enlarged vertical joint which crossed through the southwest and northeast quadrants of the socket. The rest of the fractures were mostly horizontal, but several were nearly vertical and relatively short. The rock surface was blocky to massive and smooth, particularly in the southeast quadrant. There were no cavities. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-32. East Socket, Pier 4, Highway 101 (elev. 399.60 to 420.00). There was a cavity which covered about 7 square feet of the socket's southwest wall from elevation 413.3 to 415.8. The rock surface was mostly blocky, although it

somewhat more massive and smooth in the northeast wall. The blocky surface with frequent fracturing was most prominent in the cavity area between elevations 412 and 417. Vertical fracturing was prevalent in the southeast wall. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-33. West Socket, Pier 5, Highway 101 (elev. 396.10 to 430.00). There was a large, deeply recessed area in the bottom portion of this socket from elevation 396.10 to 405.00. Therefore, the top of the rock socket was raised from a planned elevation of 416.00 to 430.00 to compensate for lost surface area in the socket wall. There were other shallow recesses and small cavities throughout the socket, but none of any consequence. The rock surface was blocky for the most part to occasionally broken, and the prominent jointing appeared to dip at about 5 degrees to 30 degrees from horizontal. The drilled rock was moderately hard to hard dolomite with a trace of chert and areas of soft weathered dolomite which appeared somewhat similar to a soft siltstone.

7-34. East Socket, Pier 5, Highway 101 (elev. 395.75 to 430.00). This socket was generally similar to the adjacent west socket, but there were no deep, extensive recesses or cavities. However, the top of socket was raised to elevation 430.00 to match the top of socket elevation for the west socket. There were several shallow recesses and small cavities throughout the socket, but none that would cause any problems. The rock surface was mostly blocky to occasionally broken with frequent fractures of various attitudes. The drilled rock was moderately hard to hard dolomite for the most part with areas of soft weathered dolomite, a 1.5-foot-thick sandstone bed at elevation 408.51 and occasional chert.

7-35. West Socket, Pier 6, Highway 101 (elev. 419.02 to 439.70). The rock surface was relatively smooth with no cavities. Horizontal fractures were predominant throughout the socket with occasional diagonal to vertical fractures. The drilled rock was moderately hard to hard dolomite with some interbedded chert and traces of shale.

7-36. East Socket, Pier 6, Highway 101 (elev. 419.25 to 439.70). There was a large vertical joint which crossed through the southwest and northeast quadrants of the socket. There were sections along the joint enlarged into shallow recesses by solution. Also, a shallow recessed ledge extended around the top of the socket at about elevation 439.60. Otherwise, the rock surface was relatively smooth. Fractures were predominantly horizontal. The diagonal to vertical fractures were most prevalent in the northwest wall. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-37. West Socket, Pier 7, Highway 101 (elev. 430.22 to 450.60). The rock surface was relatively smooth and massive to occasionally blocky. There were no cavities. The predominant fracturing was horizontal with intermittent vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-38. East Socket, Pier 7, Highway 101 (elev. 430.00 to 450.60). The rock surface was generally smooth and massive with no cavities, although there were a few vugs. Fracturing was low to moderate intensity with intermittent horizontal and short, nearly vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-39. West Socket, Pier 8, Highway 101 (elev. 434.40 to 454.50). The rock surface was blocky to massive and smooth with no cavities. Fracturing was relatively moderate in the lower portion of the socket and became more frequent above elevation 448 where the rock became more blocky. The fractures ranged from horizontal to nearly vertical. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of shale.

7-40. East Socket, Pier 8, Highway 101 (elev. 434.24 to 454.50). The rock surface was relatively smooth except for a shallow cavity or recess around about half of the socket between elevations 452.4 and 455. Fractures were predominantly horizontal below elevation 444 and nearly vertical for the most part above elevation 444. The rock was massive with practically no fracturing below elevation 439. The drilled rock was moderately hard to hard dolomite with occasional chert and traces of shale.

7-41. West Socket, Pier 9, Highway 101 (elev. 434.31 to 455.50). The rock surface was blocky to massive with a vuggy zone between elevations 446.3 and 449.3. There were also a few small cavities and shallow recesses. Fracturing was mostly of slight to moderate intensity, although it was frequent in a few blocky areas and in isolated zones of numerous short, vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert and a trace of shale.

7-42. East Socket, Pier 9, Highway 101 (elev. 434.41 to 455.50). The rock surface was blocky to massive and smooth. There were several small cavities, shallow recesses, and vuggy zones. Fracturing was frequent in occasional blocky areas and otherwise slight to moderate. There were also a few zones of numerous short, vertical fractures. The drilled rock was moderately hard to hard dolomite with occasional chert.

7-43. West Socket, Pier 10, Highway 101 (elev. 462.15 to 482.70). The rock surface was relatively smooth except for several shallow recesses. The recesses occurred mostly along vertical joints in the northeast and southwest socket wall. Other than these joints, the fracturing was mostly horizontal throughout the socket. The drilled rock was moderately hard to hard dolomite with occasional chert and traces of shale.

7-44. East Socket, Pier 10, Highway 101 (elev. 462.75 to 482.70). The rock surface was relatively smooth with no cavities. Horizontal fractures were prominent throughout the socket with occasional nearly vertical to irregular fractures. There was a zone of short, nearly vertical fractures between elevations 470.6 and 472. The drilled rock was moderately hard to hard dolomite with traces of shale and chert. There was a small amount of soft, weathered dolomite at elevation 474.62.

PART VIII
CONSTRUCTION MATERIALS

The earth materials used in the bridge construction consisted of riprap, filter coarse stone, rock fill, concerte aggregate, and fine blend sand, which were supplied to the contractor by Guy King and Sons of Mountain Home, Arkansas. The riprap, filter coarse stone, and rock fill were dolomite obtained from Lee's Mountain Quarry, which is located in Marion County, about 2 miles west of Flippin, Arkansas. This quarry supplied the stone used in the construction of Bull Shoals Dam. The concrete aggregate was fluvial gravel obtained from areas leased on Crooked Creek between the towns of Flippin and Yellville, Arkansas. The fine blend sand was obtained from Silica Products Company, Inc. of Guion, Arkansas. Samples of these materials were tested by the Southwestern Division Laboratory in Dallas, Texas, and were approved for use in the bridge construction.

PART IX
FOUNDATION PROBLEM AREAS

The foundation for both of the highway bridges proved to be quite competent, and no future problems are anticipated. The formation rock was generally sound with relatively few cavities. The one large cavity encountered in the east socket of Pier 1, Highway 101 required deepening of the socket 8 additional feet in accordance to design criteria. The cavity was backfilled with concrete to stabilize the foundation and also provide additional pier support. Although a few zones of soft, weathered dolomite were encountered, particularly at Pier 5, Highway 101, they were overcompensated by the overall soundness of the surrounding rock, and by raising the top of socket an additional 14 feet into the rock above the original planned socket. There were no major deficiencies noted in any of the other rock sockets. There were no serious problems in the foundation of either bridge and, therefore, no significant variances or modifications to design criteria were required because of foundation conditions.

PART X
FOUNDATION INSPECTION AND APPROVAL

10-01. Inspection Equipment. The underwater inspections of rock sockets and core holes were accomplished with equipment supplied by Hydro Products, a Tetra Tech Company with offices in Houston, Texas and San Diego, California. The principal equipment consisted of a Model TC-125 Miniature Underwater Television Camera, a Model LT-7 Underwater Thallium Iodide Light Assembly, a Model SC-303 Television System Control Unit with pan and tilt option, a Model SLD-320 Sony Betamax Videocassette Recorder, a Model RP-5 Underwater Pan and Tilt Unit, Cable Model C101-P, and a Borehole Camera Light Mounting Bracket.

The required equipment was mounted on a steel platform which was set over the 10-foot-diamater casing for each socket inspection. The underwater television camera was contained in an open, steel-frame cage which was suspended beneath the platform by winch cables. A measuring tape was attached to the electrical television cable so that the depth or vertical positioning of the camera could be controlled. The camera cage was suspended from a wheeled table on the inspection platform which could be rotated 360 degrees around a hole in the floor of the platform; this provided the horizontal positioning of the camera. Therefore, the position of the camera could be effectively controlled, and the pan and tilt mechanism allowed the camera to scan the socket wall at any location.

10-02. Rock Socket Inspection. The procedure for the rock socket inspections was to first clean the socket by airlifting and then to map the socket while lifting the television camera through a series of revolutions. Debris and turbid water were airlifted from the socket through an 8- to 12-inch pipe while fresh water was usually pumped in from near the lake surface. After airlifting, the inspection platform was set on top of the 10-foot-diameter casing, and a platform elevation was established for a base reference. The television camera and cage were then lowered on two 1/8-inch steel cables using a hand winch to put the camera within 1.5 feet of the bottom of the socket. At this elevation the first tier of the socket wall and the socket floor were inspected as the camera was rotated to positioned stops around the circumference of the socket. Then the camera was raised in succeeding 3-foot intervals in which the rotating process was repeated. The entire socket wall was normally inspected and mapped in 7 such tiers which usually required about 2 to 5 hours.

10-03. Core Hole Inspection. The procedure for the core hole inspections was to first clean the hole by flushing and then to perform the inspection while the television camera with the attached light and mounting bracket were passed through the core hole. Immediately after the core hole was drilled, it was flushed with clean water for 45 to 60 minutes or until the return flow appeared clear. The television camera assembly was then lowered by hand into the core hole through the water-filled 4-inch drill casing. The camera's electrical cable served as its suspension cable. The rock formation was monitored and video taped as the camera was lowered into and withdrawn from the core hole.

10-04. Inspection Dates and Times. The following is a list of the inspection dates and duration times for each socket:

Socket Location Highway 62	Aproval-Inspection Date	Duration of Inspection	Comments
Pier 2, North	4 Dec 1980	3 hr. 45 min.	recorder problems
Pier 2, South	3 Dec 1980	4 hr. 17 min.	equipment problems
Pier 3, North	24 Jul 1980	5 hr. 45 min.	equipment and visibility problems
Pier 3, South	23 & 24 Jul 1980	8 hr. 5 min	equipment and visibility problems
Pier 4, North	12 Jan 1981	4 hr. 37 min.	----------
Pier 4, South	20 Jan 1981	4 hr. 17 min.	recorder problems
Pier 5, North	25 Aug 1980	5 hr. 18 min.	----------
Pier 5, South	26 & 27 Aug 1980	6 hr. 20 min.	electrical problems
Pier 6, North	3 & 4 Feb 1981	4 hr. 10 min.	electrical problems
Pier 6, South	10 & 12 Feb 1981	3 hr. 40 min.	----------
Pier 7, North	22 Sep 1980	4 hr. 19 min.	----------
Pier 7, South	19 Sep 1980	3 hr. 55 min.	----------
Pier 8, North	27 & 31 Mar 1981	3 hr. 11 min.	----------
Pier 8, South	25 Mar 1981	3 hr. 2 min.	----------
Pier 9, North	18 Nov 1980	6 hr. 17 min.	poor visibility; inspected half sockets
Pier 9, South	12 & 13 Nov 1980	7 hr. 9 min.	poor visibility; inspected half sockets
Pier 10, North	7 & 8 Apr 1981	2 hr. 32 min.	----------
Pier 10, South	7 Apr 1981	3 hr. 10 min.	----------
Pier 11, North	25 Feb 1981	3 hr. 35 min.	----------
Pier 11, South	24 & 25 Feb 1981	5 hr.	visibility and equipment problems
Pier 12, North	27 & 28 Apr 1981	3 hr. 33 min.	----------
Pier 12, South	24 Apr 1981	2 hr. 50 min.	----------

Socket Location Highway 62	Approval-Inspection Date	Duration of Inspection	Comments
Pier 13, North	13 Mar 1981	2 hr. 57 min.	----------
Pier 13, South	13 & 14 Mar 1981	2 hr. 55 min.	----------
Pier 1, East	3 & 10 Aug 1981	4 hr. 52 min.	28 ft. socket
Pier 1, West	12 & 13 Aug 1981	2 hr. 34 min.	----------
Pier 2, East	17 Sep 1981	2 hr. 5 min.	----------
Pier 2, West	16 Sep 1981	1 hr. 57 min.	----------
Pier 3, East	21 & 22 Jul 1981	3 hr. 42 min.	----------
Pier 3, West	18 & 19 Jul 1981	4 hr. 18 min.	trouble with television monitor
Pier 4, East	29 Aug 1981	3 hr. 30 min.	----------
Pier 4, West	29 & 31 Aug 1981	2 hr. 37 min.	----------
Pier 5, East	15, 16 & 17 Jun 1981	11 hr. 33 min.	34 ft. socket; poor visibility
Pier 5, West	10, 12 & 19 Jun 1981	10 hr. 32 min.	34 ft. socket; poor visibility
Pier 6, East	9 Oct 1981	1 hr. 52 min.	----------
Pier 6, West	10 Oct 1981	1 hr. 45 min.	----------
Pier 7, East	14 Nov 1981	1 hr. 59 min.	----------
Pier 7, West	14 & 16 Nov 1981	1 hr. 41 min.	----------
Pier 8, East	31 Oct 1981	1 hr. 45 min.	----------
Pier 8, West	31 Oct & 2 Nov 1981	2 hr. 5 min.	----------
Pier 9, East	10 Dec 1981	3 hr. 15 min.	----------
Pier 9, West	11 & 12 Dec 1981	4 hr. 25 min.	----------
Pier 10, East	5 Oct 1981	1 hr. 55 min.	----------
Pier 10, West	5 Oct 1981	3 hr. 55 min.	visibility problems

The duration of rock socket inspections usually varied according to performance of equipment and visibility conditions. Less time was required for inspections after August 1981 which was due in part to two changes in equipment. First, a wide angle lense was used on the underwater camera which gave a wider viewing range. Second, the wheeled table on the inspection platform was modified so that it could move the suspended camera toward or away from the socket wall to obtain the maximum visibility. However, regardless of equipment, the best inspection times occurred in sockets where the outer casing had been turned tightly into the top of rock. This allowed an effective airlifting operation to remove turbidity from the water without additional overburden sediment sloughing into the socket from under the casing.

The core holes drilled below the rock sockets were television inspected immediately after they were drilled and usually required only about 20 to 30 minutes after the hole was flushed.

APPENDIX A

PHOTOGRAPHS

Pages 000 thru 024

PHOTOGRAPHS

Photograph Number	Title
1	View southeast at general construction on Piers 3, 5, 7, and 9 for Highway 62.
2	View east-northeast at general construction on piers for Highway 62.
3	View west-northwest at completed piers for Highway 62.
4	View southeast at superstructure erection for Highway 62.
5	View of 10-foot-diameter outer casing at Pier 3, Highway 62 site.
6	View of 8-foot-diameter inner casing-concrete forms.
7	View of drilling barge preparing to set outer casings.
8	View of cutting teeth on bottom of outer casings.
9	View at Pier 12, Highway 62, while turning outer casing into rock for the south socket.
10	View northeast at drilling of north rock socket, Pier 2, Highway 62.
11	View north at drilling of south rock socket, Pier 6, Highway 62.
12	View northwest at drilling of north rock socket, Pier 6, Highway 62.
13	View northeast at drilling of north rock socket, Pier 2, Highway 62.
14	View north-northwest at drilling of south rock socket, Pier 6, Highway 62.
15	View of 8-foot-4-inch-diameter drill bit above 10-foot diameter outer casing.
16	View of roller cones on bottom of drill bit.
17	View of drill bit above outer casing. Note wooden stabilizers at top of weight plates on the bit.
18	View of drill bit with wooden stabilizers inside of outer casing.

PHOTOGRAPHS (con.)

Photograph Number	Title
19	View of carbide-tipped roller cone on rock socket drill bit.
20	View of carbide-tipped roller cone showing worn areas.
21	View of drill stem showing damage crack from wear.
22	View of installation of splice plates to strengthen drill stem joints.
23	View northeast at drilling of north rock socket, Pier 8, Highway 62.
24	View of spoil barge while drilling east rock socket, Pier 3, Highway 101.
25	View of drill water and cuttings discharging into spoil barge.
26	View of cutting being sampled from spoil barge.
27	View from left to right of core drill, television inspection, socket drilling, and spoil barge.
28	View northwest at core drilling 10-foot hole in bottom of south rock socket, Pier 9, Highway 62; airlift pipe in north socket.
29	View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62.
30	View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62.
31	View of Longyear HC-150 core drill on drilling platform over the 10-foot-diameter socket casing.
32	View northeast at core drilling in north socket, Pier 6, Highway 62.
33	View northwest at airlifting in south socket and core drilling in north socket of Pier 8, Highway 62.
34	View west-southwest at television inspection in south socket and airlifting in north socket of Pier 5, Highway 62.
35	View of television inspection platform with blue underwater camera cage suspended beneath.

PHOTOGRAPHS (con.)

Photograph Number	Title
36	View of television inspection platform being lowered onto the outer socket casing; core dirll in background.
37	View of television inspection platform with white television monitor box on the right.
38	View of geologist drawing a rock socket map from television monitor in the upper left; north socket, Pier 5, Highway 62.
39	View of television camera with attached light and mounting bracket for core hole inspections.
40	View of television monitor showing camera's view in a core hole.
41	View north of chiseling overburden and top of rock at site for Pier 10, Highway 101; Pier 11 and north abutment in background.
42	View of typical anchor and anchor setting barge.
43	View southwest at drilling of pile holes on south abutment, Highway 101.
44	View of rock bit and vertical pile holes on south abutment, Highway 101.
45	View west at drilling of battered pile holes on south abutment, Highway 101.
46	View west at concrete placement in pile holes on south abutment, Highway 101.
47	View north at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.
48	View south at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.
49	View of spread footing excavation for the south column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.
50	View of spread footing excavation for the north column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.



View southeast at general construction on Piers 3, 5, 7, and 9 for Highway 62.

21 Oct 80 Norfork Bridges Photo No. 1



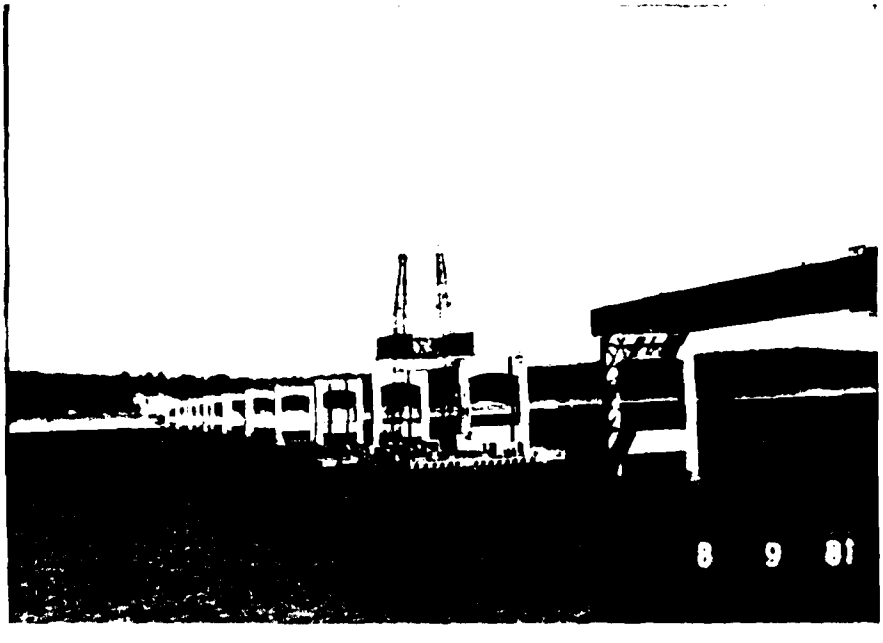
View east-northeast at general construction on piers for Highway 62.

26 Feb 81 Norfork Bridges Photo No. 2



View west-northwest at completed piers for Highway 62.

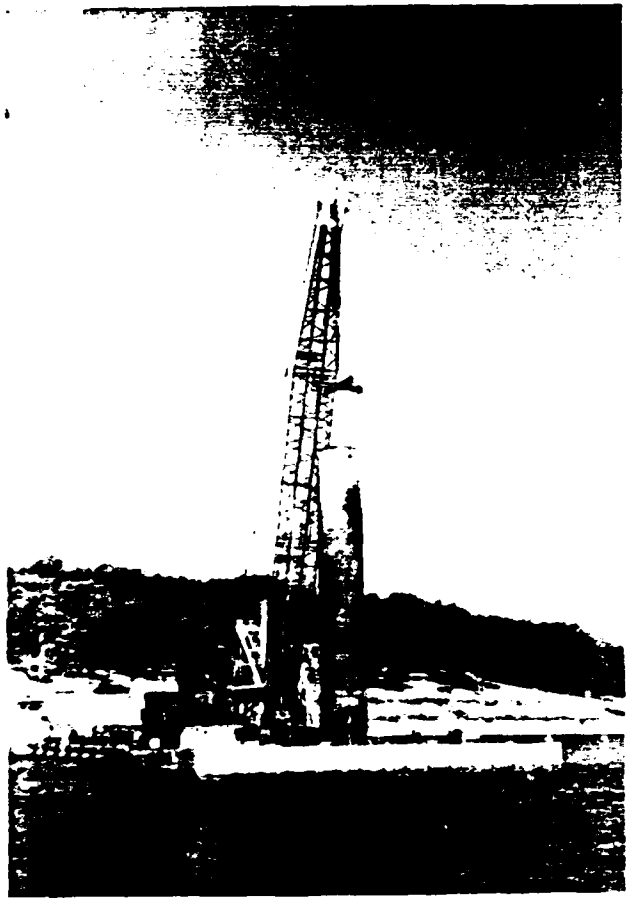
[illegible] Jun 81 Norfork Bridges Photo No. 5



View southeast at superstructure erection for Highway 62.

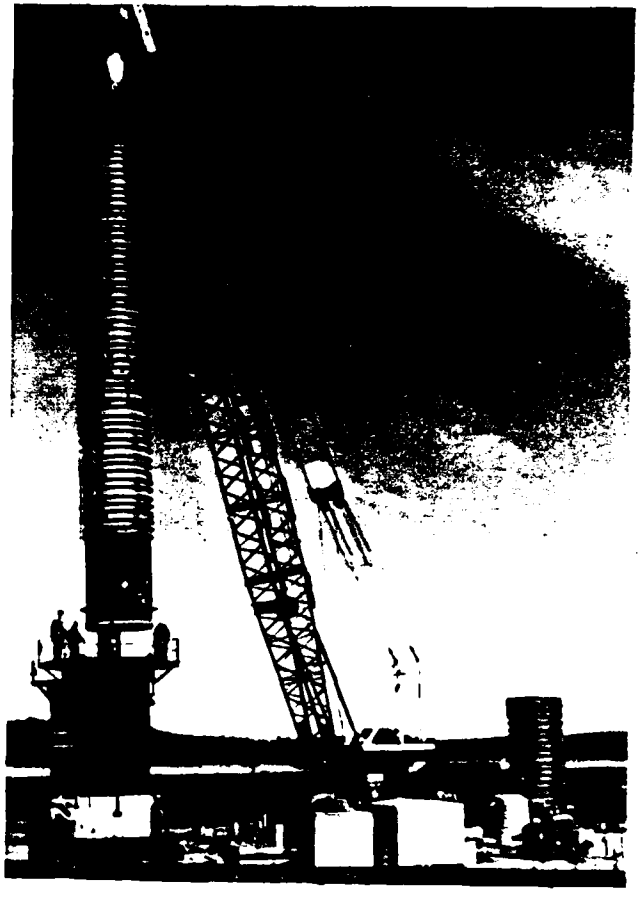
06 Sep 81 Norfork Bridges Photo No. 6

001



View of 10 ft. Dia. outercasing at Pier 3, Highway 62 site.

[illegible] Mar 80 [illegible] Norfork Bridges [illegible]oto No. 5



View of 8 ft. dia. inner casing - concrete forms.

11 Dec 80 Norfork Bridges Photo No. 6



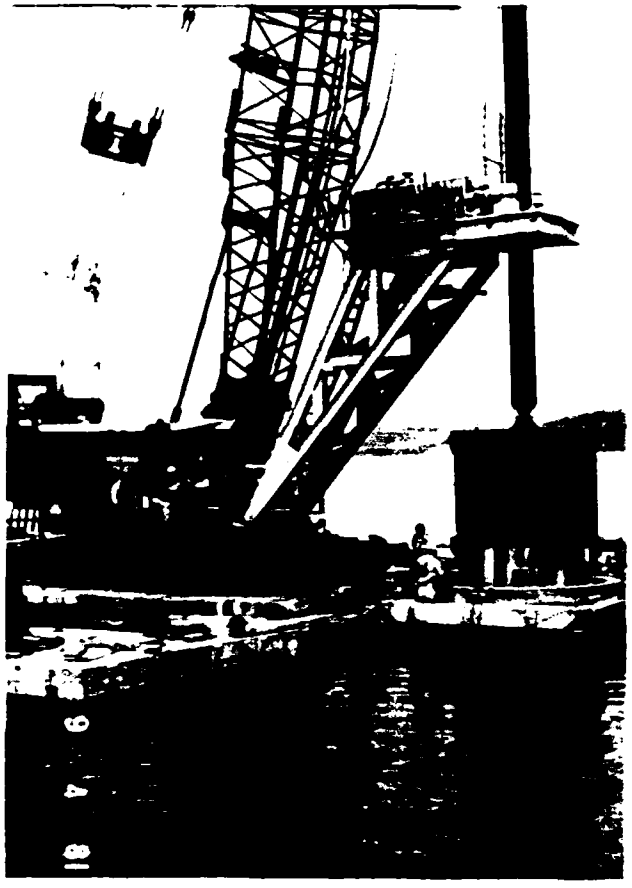
View of drilling barge preparing to set outer casings.

12 Dec 80 Norfork Bridges Photo No. 7



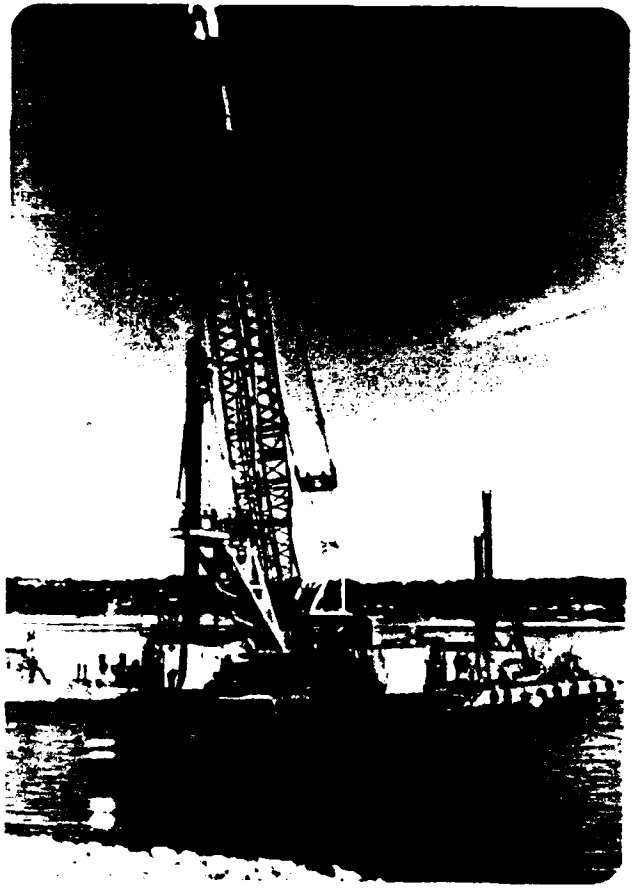
View of cutting teeth on bottom of outer casing.

13 Nov 80 Norfork Bridges Photo No. 8



View at Pier 12, Highway 62 while turning outer casing into rock for the north socket.

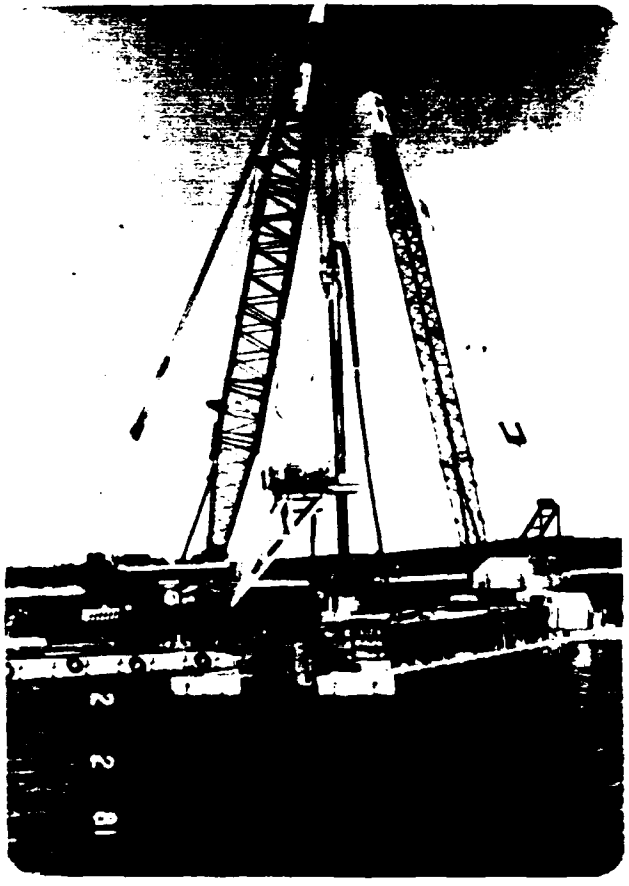
22 Apr 81 Norfork Bridges Photo No. 9



View northeast at drilling of north rock socket, Pier 2, Highway 62.

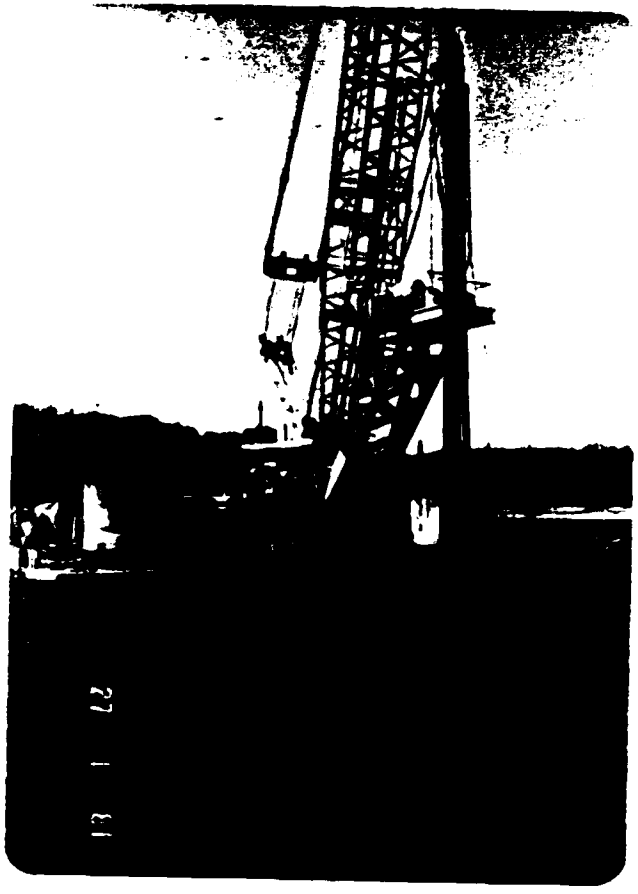
21 Nov 80 Norfork Bridges Photo No. 10

004



View nrt. at drilling of south rock socket, Pier 6, Highway 62.

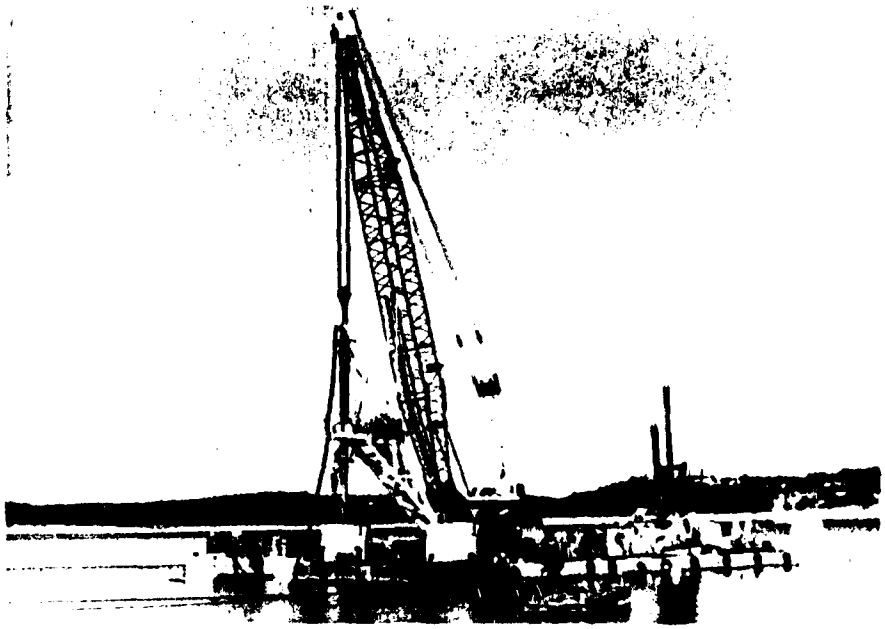
2 Feb 81 Norfork Bridges Photo No. 11



View northwest at drilling of north rock socket, Pier 6, Highway 62.

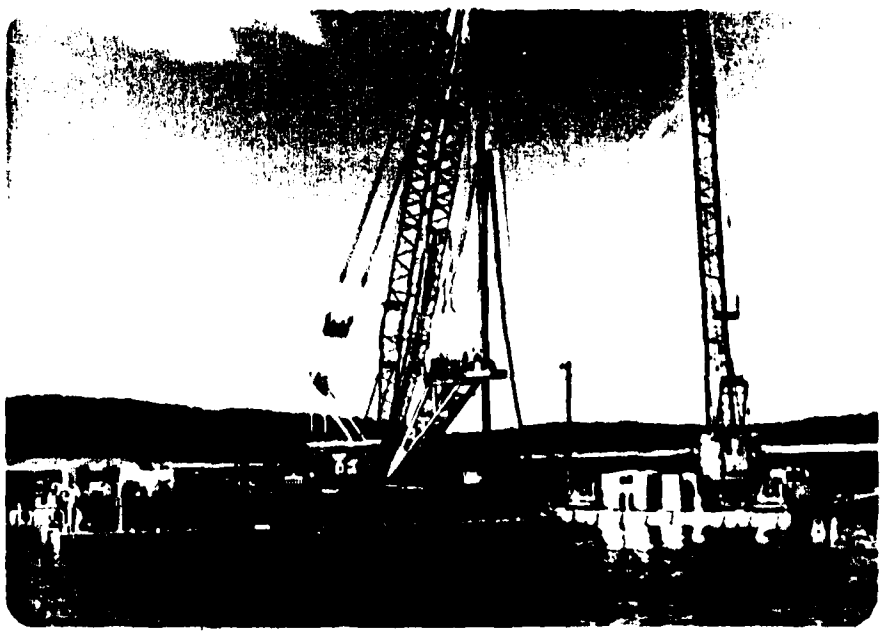
27 Jan 81 Norfork Bridges Photo No. 12

005



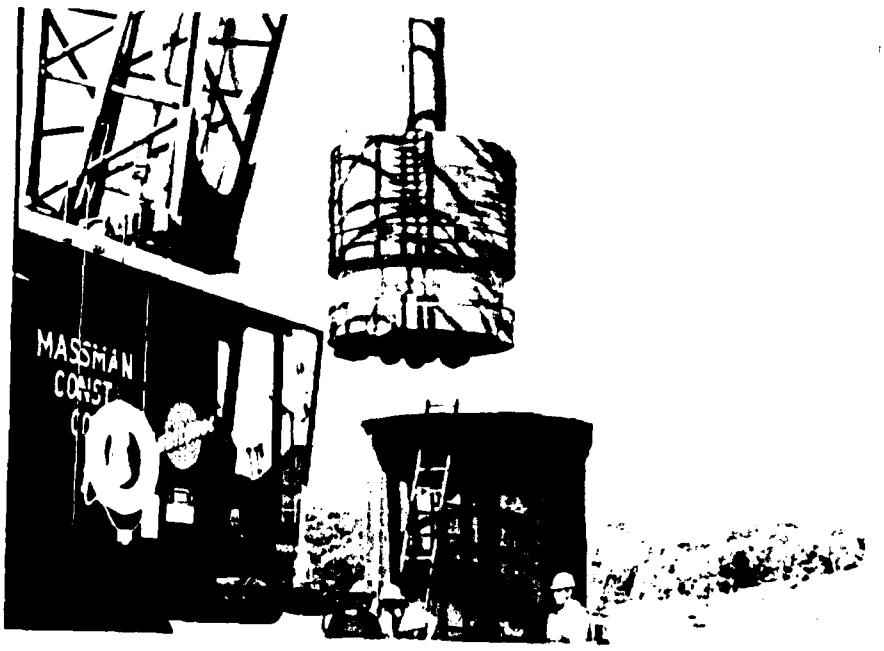
View northeast at drilling of north rock socket, Pier 2, Highway 62.

20 Nov 80 Norfork Bridges Photo No. 13



View northeast at drilling of south rock socket, Pier 1, Highway 62.

20 Nov 80 Norfork Bridges Photo No. 14



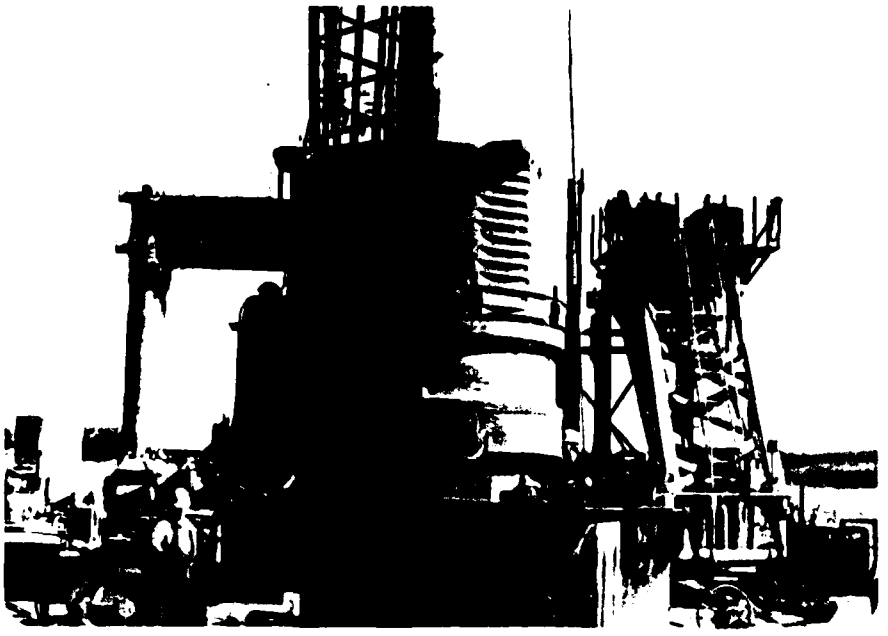
View of 8 ft. 4 in. dia. drill bit above 10 ft. dia. outer casing.

July 30 Norfork Bridges Photo No. 15



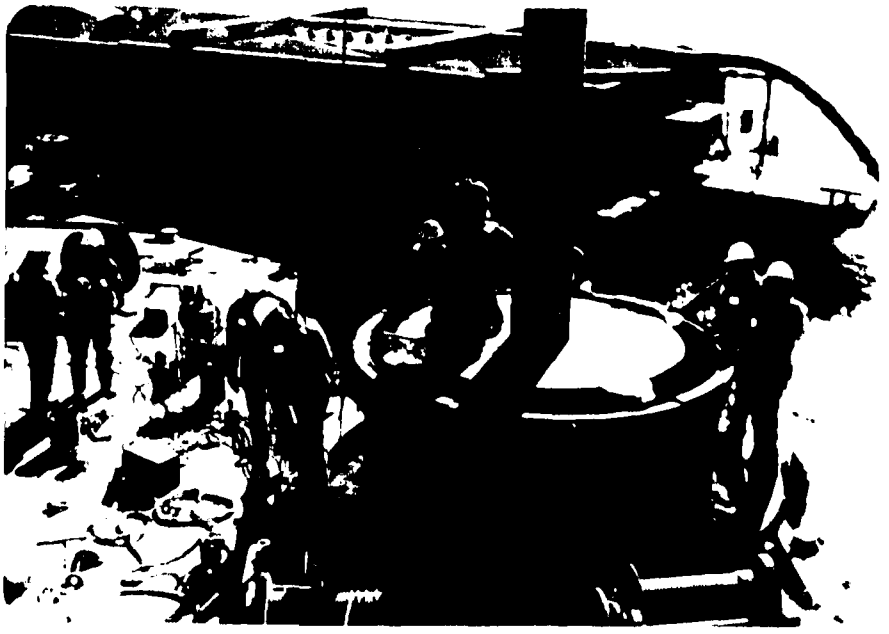
View of roller cone on bottom of drill bit.

July 30 Norfork Bridges Photo No. 16



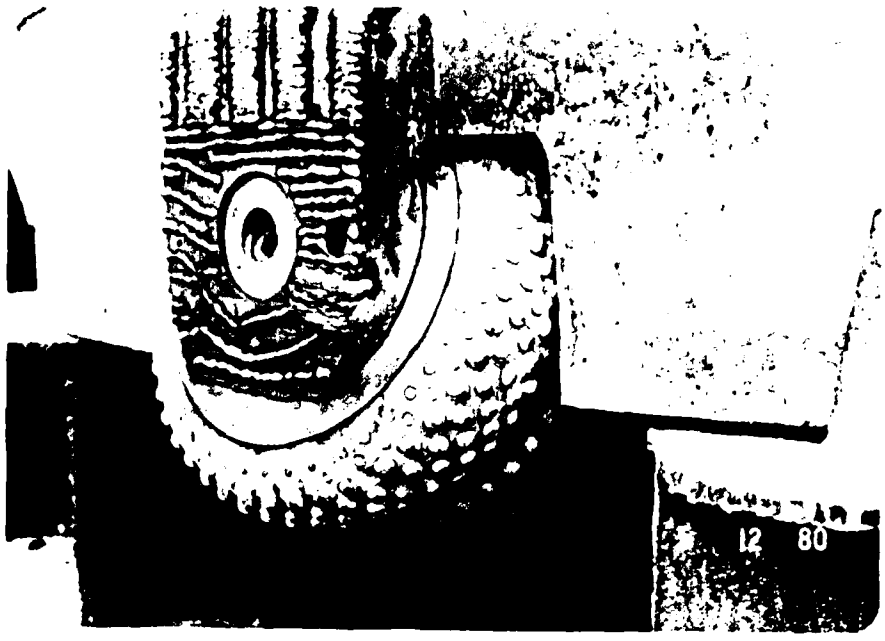
View of drill bit above outer casing. Note wooden stabilizers at top of weight plates on the bit.

13 Jan 61 Norfork Bridges Photo No. 17



View of drill bit with wooden stabilizers inside of outer casing.

13 Jan 61 Norfork Bridges Photo No. 18



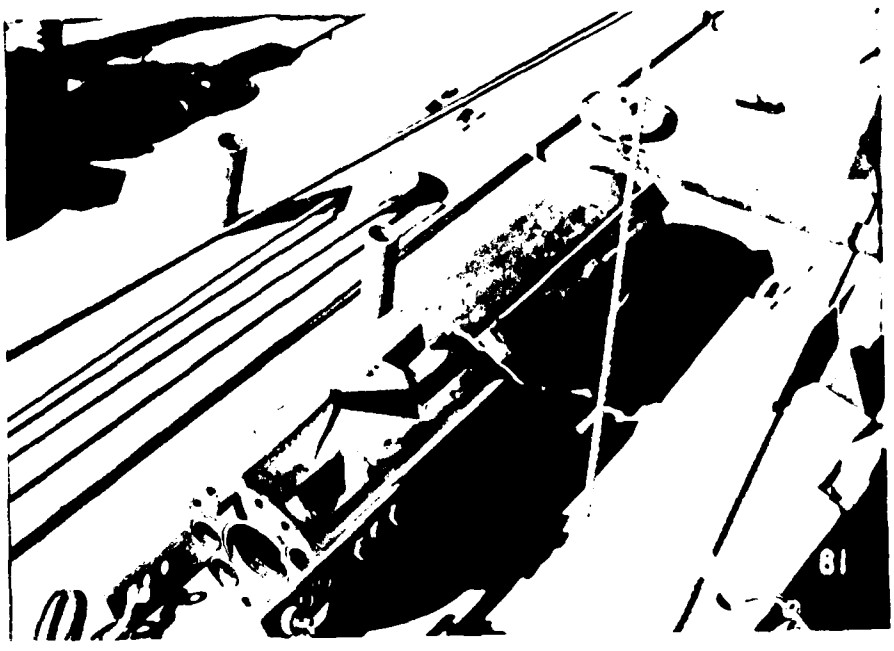
View of carbide-tipped roller cone on rock socket drill bit.

05 Dec 80 Norfork Bridges Photo No. 19



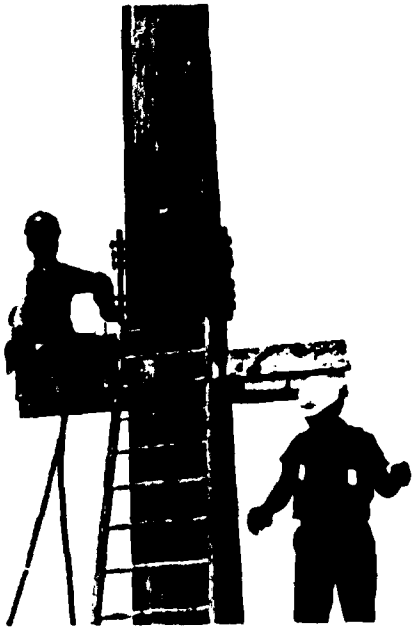
View of carbide-tipped roller cone showing worn [illegible]

[illegible] Norfork Bridges Photo No. 20



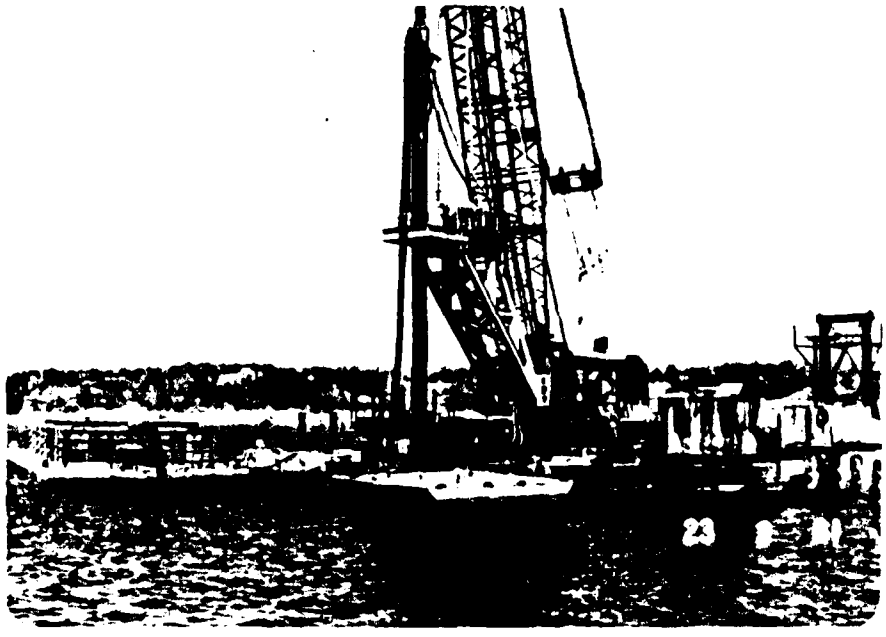
View of drill stem showing damage crack from wear.

29 Oct 81 Norfork Bridges Photo No. 21



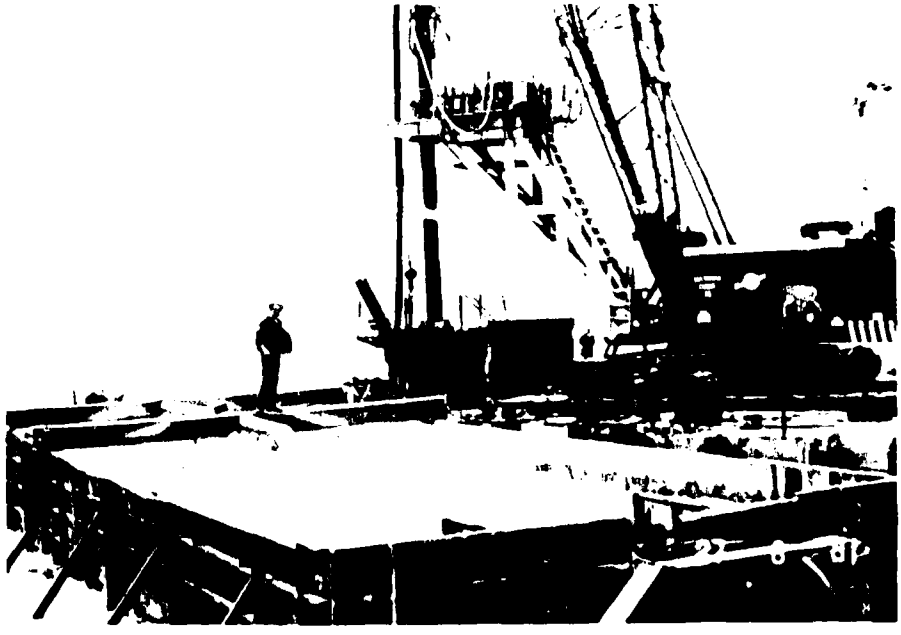
View of installation of splice plates to strengthen drill stem joints.

[illegible] Norfork Bridges Photo No. 22



View northeast at drilling on north rock socket, Pier 8, Highway 64.

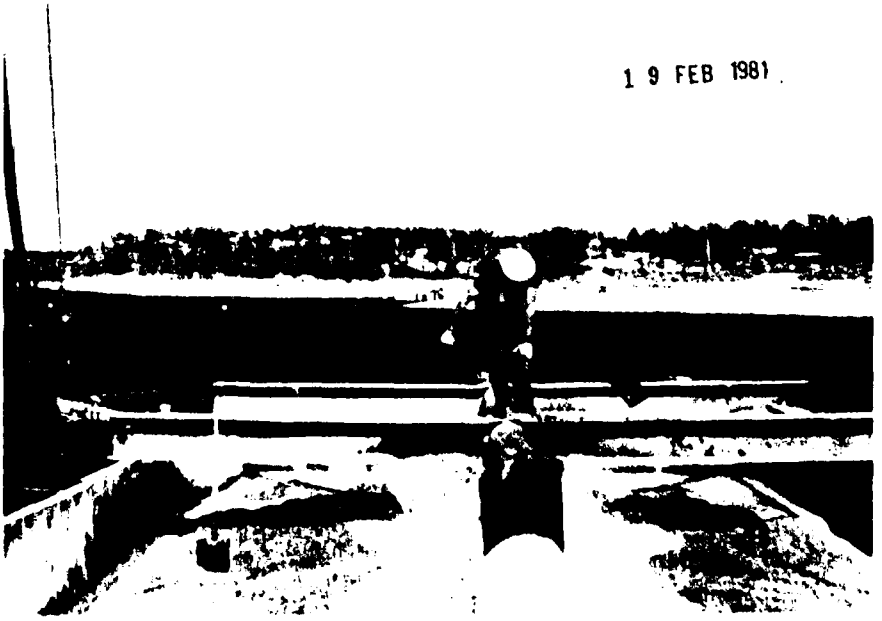
25 Mar 81 Norfork Bridges Photo No. 23



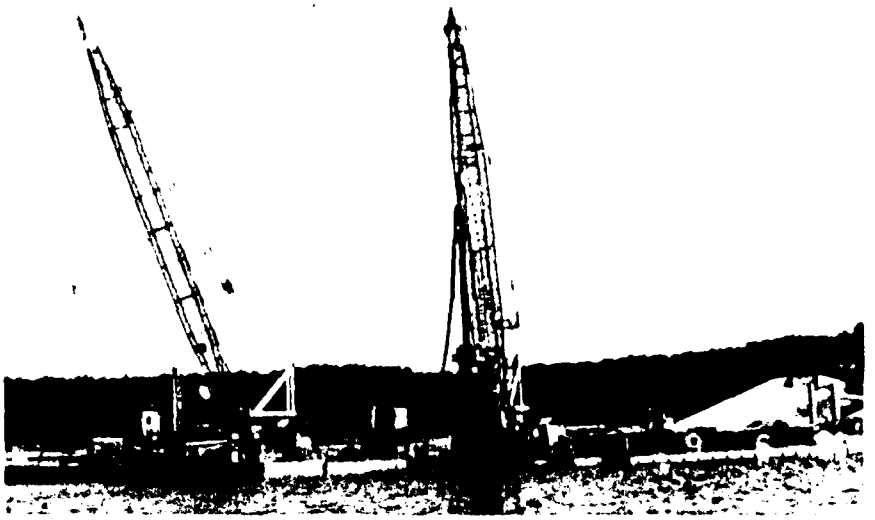
View of spoil barge with drilling east rock socket, Pier 9, Photo No. 24.

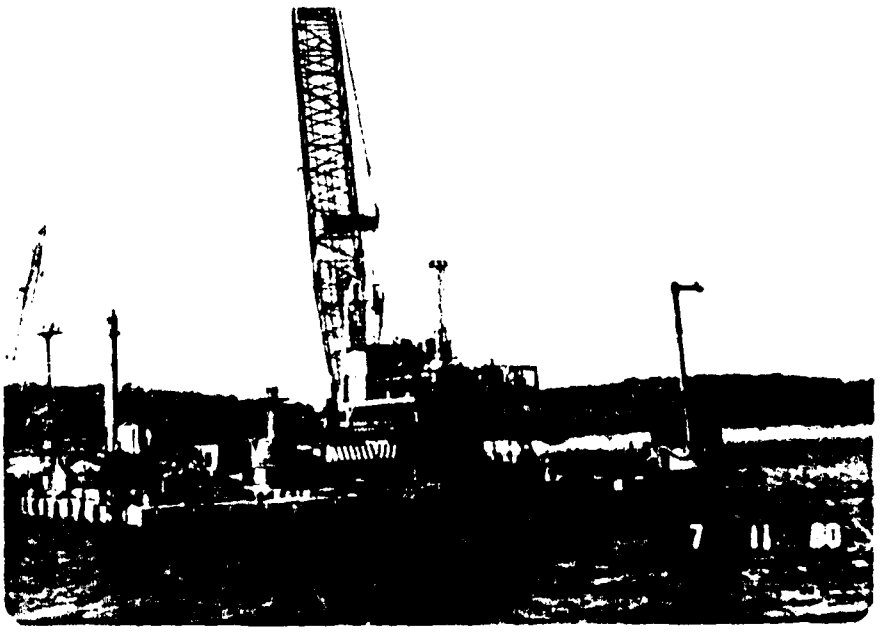
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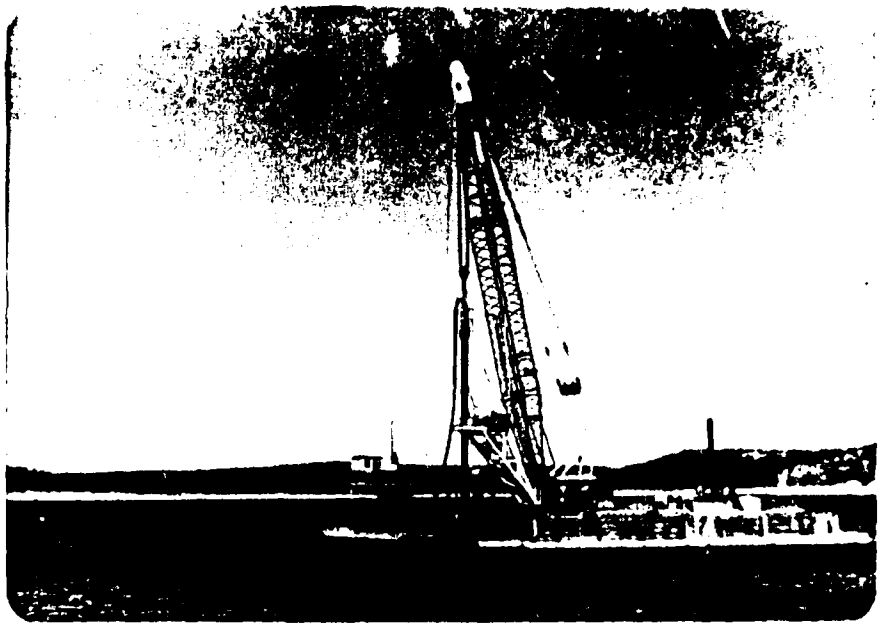




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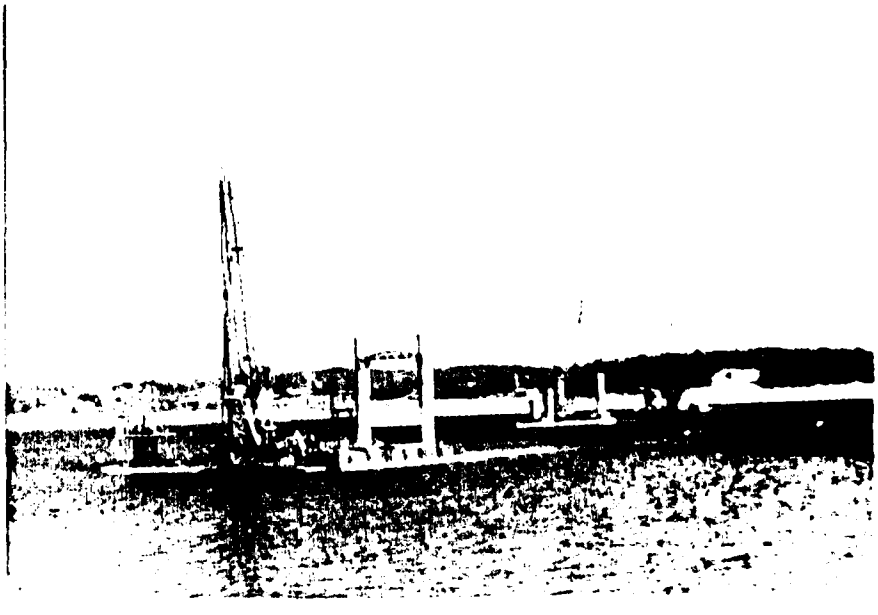



7 11 80



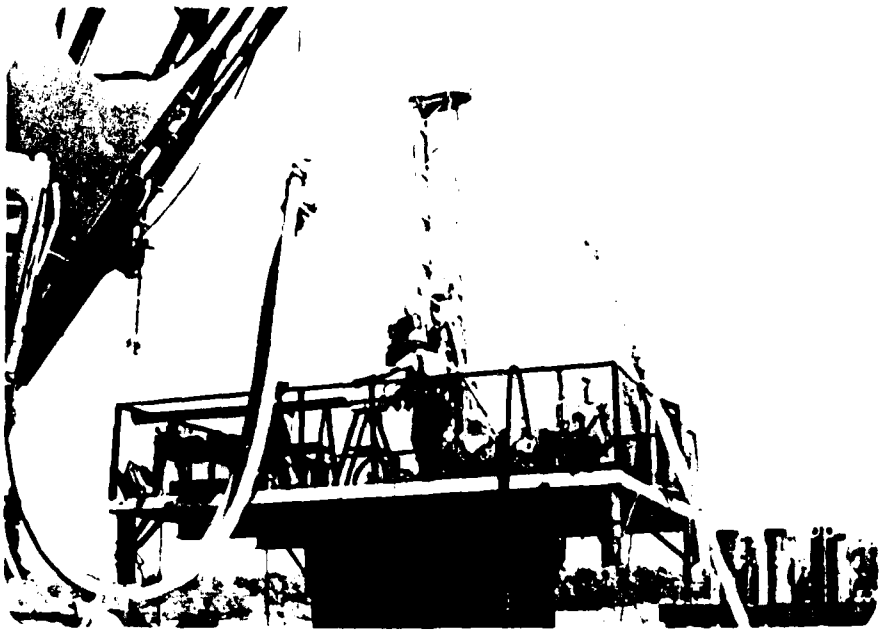
View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62.

14 Jan 81 Norfork Bridges Photo No. 29



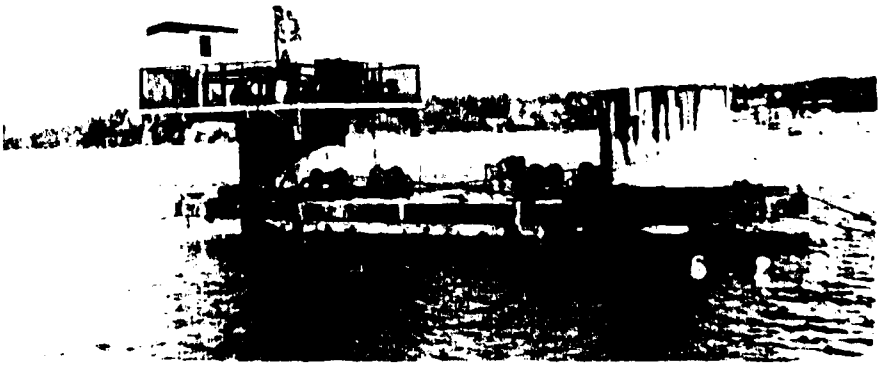
View northeast at core drill on north socket and socket drill on south socket of Pier 4, Highway 62.

14 Jan 81 Norfork Bridges Photo No. 30



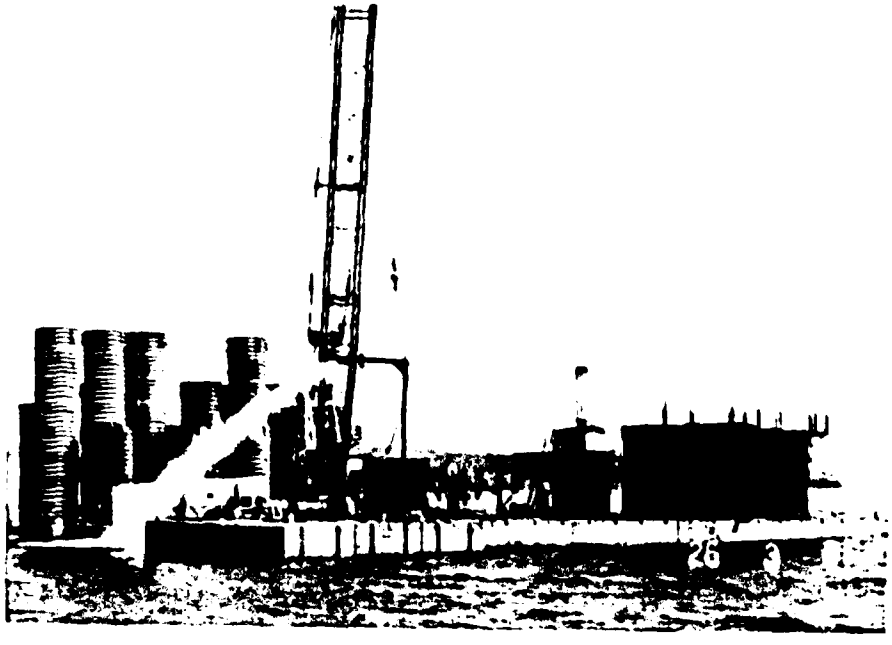
View of Longyear HC-150 core drill on drilling platform over the 10 ft. dia. socket casing.

Sept 80 Norfork Bridges Photo No. 31



View northeast at core drilling in north socket, Pier 6, Highway 62

06 Feb 81 Norfork Bridges Photo No. 32



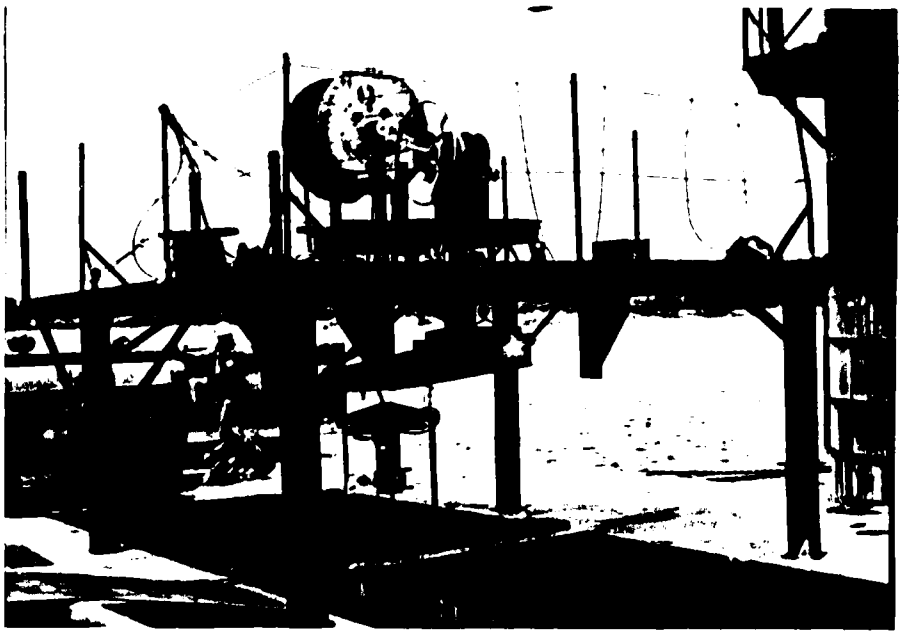
View northwest at airlifting in south socket and core drilling in north socket of Pier 8, Highway 62.

26 Mar 81 Norfork Bridges Photo No. 33



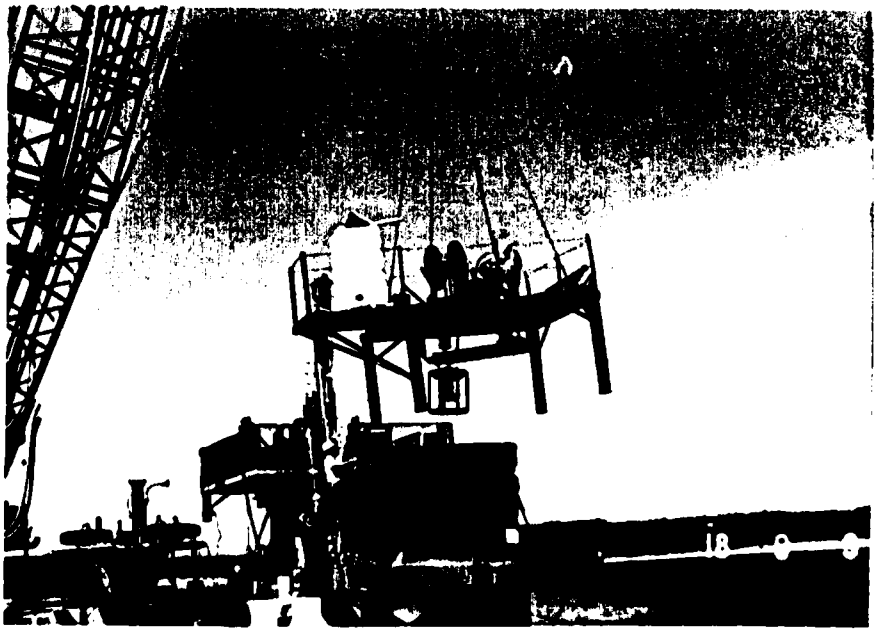
View west-southwest at T.V. inspection in south socket and airlifting in north socket of Pier 5, Highway 62.

25 Aug 80 Norfork Bridges Photo No. 34



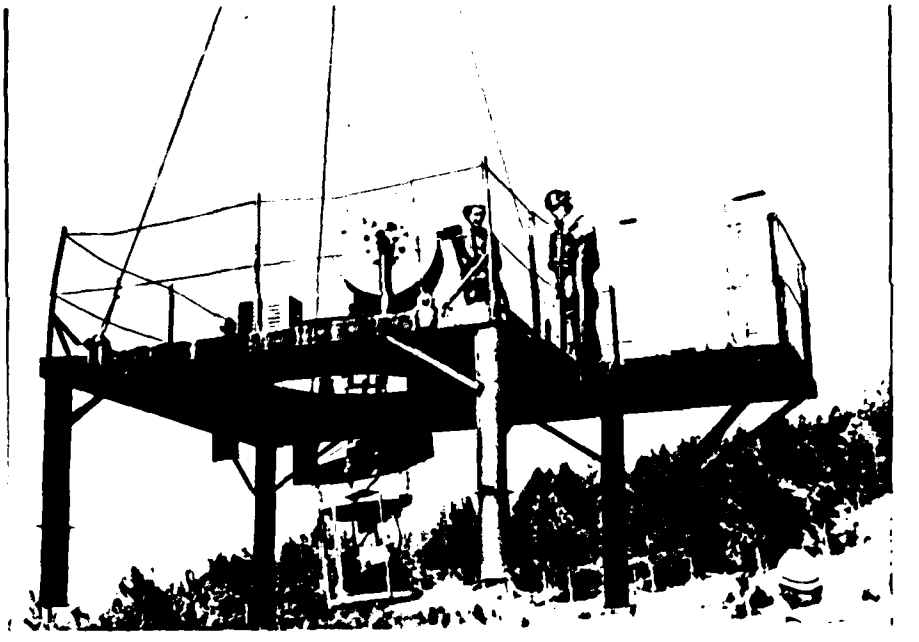
View of T.V. inspection platform with blue underwater camera cage suspended beneath.

15 Apr 81 Norfork Bridges Photo No. 35



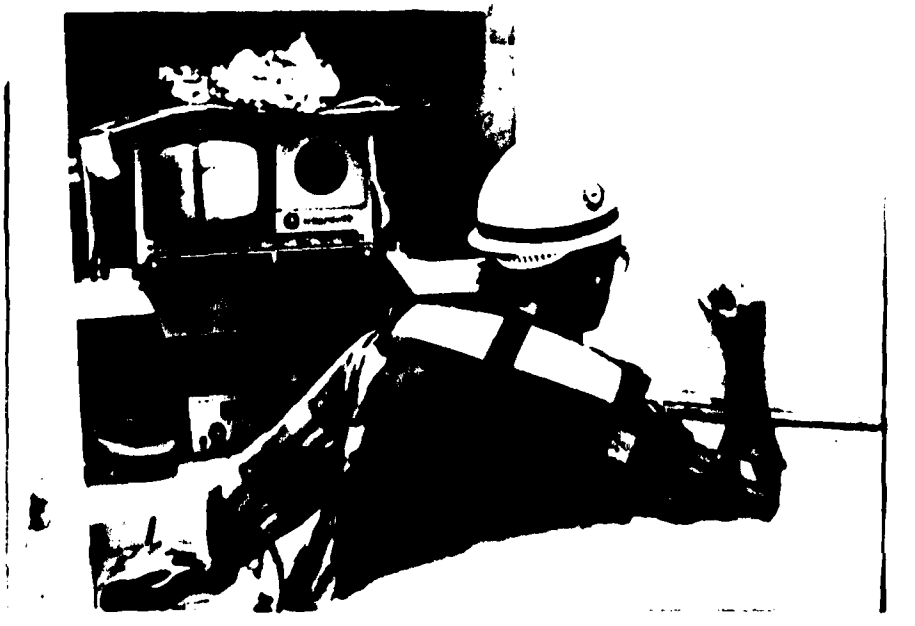
View of T.V. inspection platform being lowered onto the outer socket casing, core drill in background.

09 Sep 81 Norfork Bridges Photo No. 36



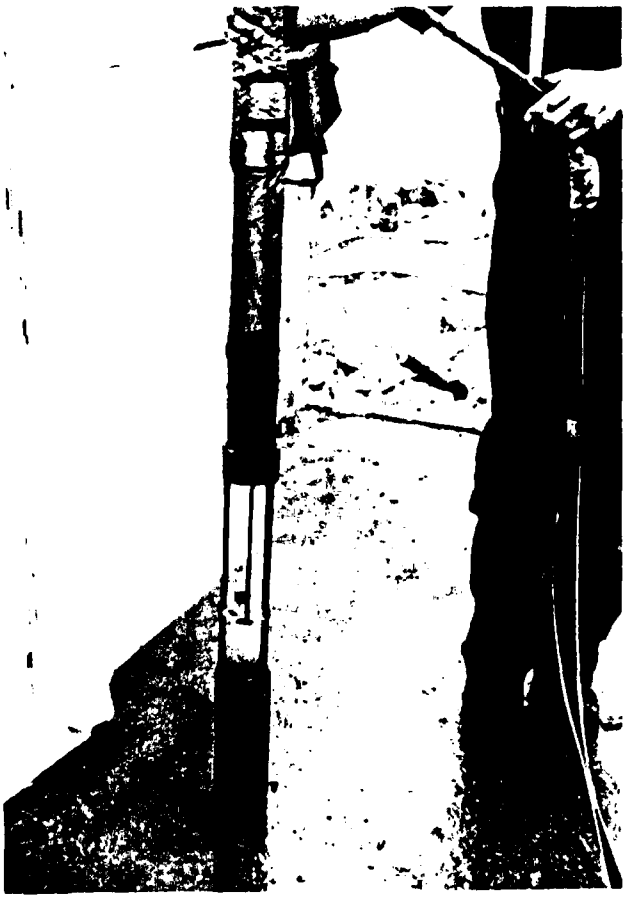
View of T.V. inspection platform with white T.V. monitor box on the right.

13 Mar 81 Norfork Bridges Photo No. 37



View of geologist [illegible] socket top from T.V. monitor in upper left, north socket, Pier 2, Bridge 6.

[illegible] Norfork Bridges Photo No. 38



View of T.V. camera with attached light and mounting bracket for core hole inspections.

July 80 Norfork Bridges Photo No. 39

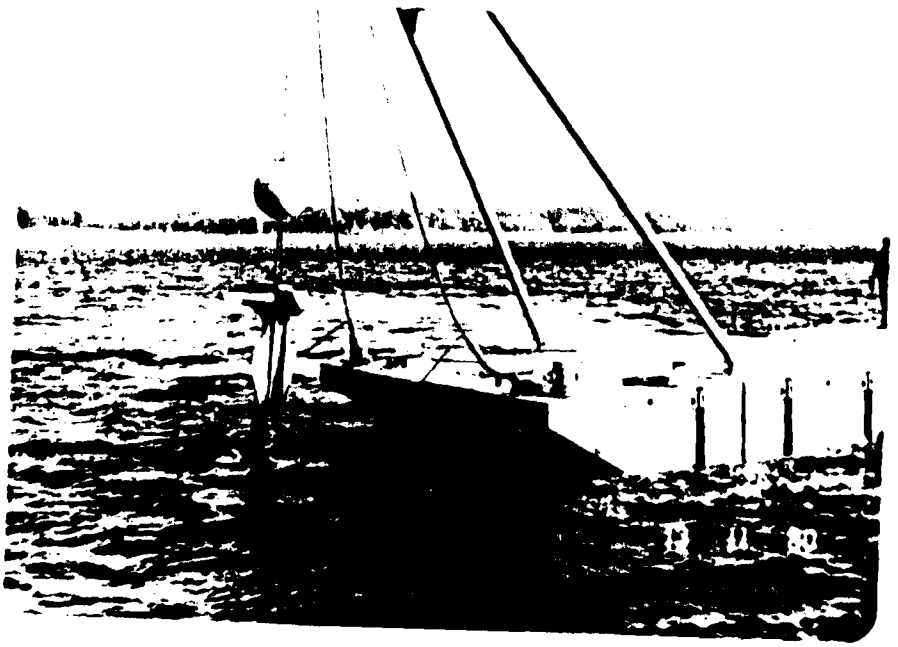


View of T.V. monitor [illegible] core hole.



View north of chiseling overburden and top of rock at site for Pier 10, Highway 101; Pier 11 and north abutment in background.

02 Jun 81 Norfork Bridges Photo No. 41



View of typical anchor and anchor setting barge.

13 Nov 80 Norfork Bridges Photo No. 42



View southwest at drilling of pile holes on south abutment, Highway 101.

22 Aug 80 Norfork Bridges Photo No. 43



View of rock bit and vertical pile holes on south abutment, Highway 101

22 Aug 80 Norfork Bridges Photo No. 44



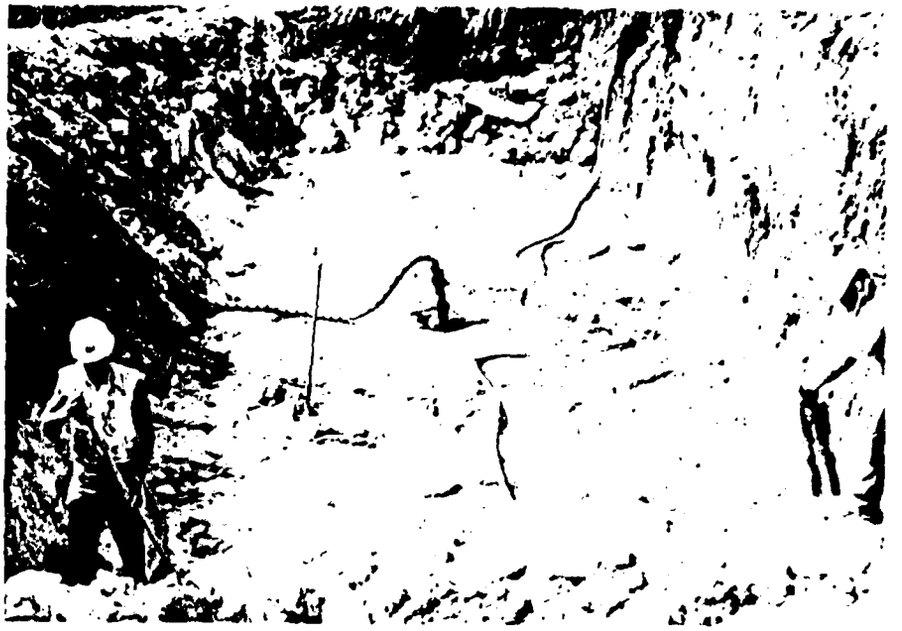
View west at drilling of battered pile holes on south abutment, Highway 101.

05 Sep 80 Norfork Bridges Photo No. 45



View east at concrete placement in pile holes on south abutment, Highway 101.

[illegible] Norfork Bridges Photo No. [illegible]



View north at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

June 30 Norfork Bridges Photo No. 47



View south at foundation excavation for east abutment, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

June 30 Norfork Bridges Photo No. 46



View of spread footing excavation for the south column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

May 80 Norfork Bridges Photo No. 49



View of spread footing excavation for the north column of Pier 1, Highway 62. Floor of excavation is Cotter-Jefferson City Dolomite.

May 80 Norfork Bridges Photo No. 50

APPENDIX B

ROCK SOCKET DRILLING LOGS

Pages 025 thru 183

LING LOG | Project No. DACW 03-79-C-[illegible]

Norfork Lake Bridges

2 LOCATION: 62-P2-N-Socket

3 Geotechnician: Robert Schmoker

4 HOLE NO.:

5 NAME OF DRILLER: Don Uchtman

6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT

7 Boring Method: Reverse Rotary

8 DEPTH DRILLED INTO ROCK: 25.2

9 TOTAL DEPTH OF HOLE: 29.3

11 SIZE AND TYPE OF BIT: 7 7/8" Smith Rock

Elevation of Bottom of Hole: 480.2

12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hein

13 Casing Record: Depth 46.0' Type 10' O.D.

14 TOTAL NUMBER CORE BOXES:

15 ELEVATION of Water: 540.30

16 DATE HOLE: STARTED 11/21/80 COMPLETED 11/24/80

17 ELEVATION TOP OF HOLE: 554.05 Platform

18 TOTAL CORE RECOVERY FOR BORING: 507.4 TOP

19 SIGNATURE OF INSPECTOR: 510.5 TOG

DRILL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
510.5							11/21/80 Start 7:50 1st No H20 Trpm 77.42' Stem & DH assembly @ 1' 2nd 13 rpm with H20 3rd 17rpm @2' 4th 27rpm @3' Stop 12:55 Add 20' Stem @9.7' Start 2:15 4th 27rpm with H20 97.42' Stem & DH Assy.
	1	40 Min	Sand		MUDDY		
	2	40 Min	Cement Grout		GREY	ROUGH	
	3	17 Min					
507.4			Top of Rock				
	4	18 Min	Dolomite - Grey - Dark Grey Mod Hard - Hard - Slightly Siliceous		MILKY	SMOOTH	
	5	33 Min	@ 4.4 - Clay Seam - Red @ 4.5 - Dolomite - Buff - Grey - Mod Hard - Slightly Fractured		RED	ROUGH	
	6	27 Min					
	7	35 Min	@ 6.0 Shale seam - Black - Soft - 6.0 - 6.05 @ 6.05 - Dolomite - Grey - Mod Hard @ 6.2 - 6.3 - Shale - Black - Soft		MILKY	SMOOTH	
503.3			@ 6.3 - Dolomite - Buff - Mod Hard				Top of Rock Socket
	8	40 Min	@ 6.7 - Dolomitic - Limestone Light Grey - Buff - Soft - Mod Hard @ 7.6 - Dolomite - Grey - Mod Hard				
	9	30 Min					
			@ 9.0 - 9.1 - Clay - Red - Soft		RED		
500.5'	10	35 Min	@ 9.1 - Dolomite - Buff - Mod Hard		MILKY	SMOOTH	

025

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO.

DRILLING LOG | DACW 03-79-C-0015 | Mississippi Valley Division Co. | SHEETS

Norfork Lake Bridges

62-P2-N-Socket

Geotechnician

HOLE NO

NAME OF DRILLER

DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT

Boring Method: Rotary

DEPTH DRILLED INTO ROCK

TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT: Elevation of Bottom of Hole

MANUFACTURER'S DESIGNATION OF DRILL

Casing Record | Depth | Type

TOTAL NUMBER CORE BOXES

ELEVATION of Water

DATE HOLE: STARTED | COMPLETED

ELEVATION TOP OF HOLE

TOTAL CORE RECOVERY FOR BORING

SIGNATURE OF INSPECTOR: Drill

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
500.5							3rd 2 rpm with H20 97.42' Stem & DH Assy Stop 3:05 @ 10.5' 11/21/80
500.0'		1 HR 15 Min	Dolomite - Buff - Mod Hard Massive				11/22/80
	11		@ 10.3 - Dolomite - Buff - Grey - Mod Hard - Hard Massive				
		45 Min					
	12		@ 12.0 - Dolomite - Limestone - Soft - Mod Hard - Massive				
		45 Min	@ 12.7 - Dolomite - Buff - Grey - Mod Hard - Massive		MILKY	SMOOTH	
	13						
		45 Min					
	14						
		45 Min					
	15						
		40 Min	@ 15.6 - 15.65 Shale - Black - Soft with Weathered Dolomite Pod - White - Soft		GREY	ROUGH	
	16		@ 15.65 - Dolomite - Grey - Mod Hard - Hard - Massive				
		40 Min	@ 16.2 - Dolomite - Buff - Mod Hard - Slightly Frac w/ Fe stains on Frac Planes				
	17						
		45 Min	@ 17.6 - Dolomite - Grey - Mod Hard - Massive		MILKY	SMOOTH	
	18						
		45 Min	@ 18.5 - Dolomite - Buff - Mod Hard - Hard - Massive				
	19						
		48 Min					
490.5	20						

026

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO BH2-P2-N-Socket

DRILLING LOG — DACW 03-79-C-0035 — Massman Construction Co. — OF 2 SHEETS

2 PROJECT: Norfork Lake Bridges	11 ELEVATION OF BOTTOM OF HOLE
3 LOCATION: 62-P2-N-Socket	12 MANUFACTURER'S DESIGNATION OF DRILL
4 GEOLOGIST: Geotechnician	13 CASING RECORD: Depth / Type
5 HOLE NO	14 TOTAL NUMBER CORE BOXES
6 NAME OF DRILLER	15 ELEVATION OF WATER
7 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16 DATE HOLE: STARTED / COMPLETED
8 BORING METHOD: Rotary	17 ELEVATION TOP OF HOLE
9 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING %
10 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR: DRILL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
490.5	20						97.42 Stem & DH Assembly 3rd 27rpm w/H20 Stop 3:12 11/22/80
	21	28 Min	Dolomite - Buff - Mod Hard - Hard - Massive @ 20.5 - Dolomitic Limestone Soft - Mod. Hard - Buff Massive				
489.2		39 Min	@ 21.4 - Sandstone - Quart cemented - Hard - White				11/24/80 Start 7:22 3rd 27rpm w/H20 97.42' Stem & Down Hole Assy. Stop 11:13
	22	45 Min	@ 22.0 - Dolomite - Buff - Mod Hard @ 22.1 - Sandstone - Hard - White - Quartz cemented				
	23	45 Min					
	24	35 Min	@ 24.0 - Sandstone Friable White		MILKY	SMOOTH	
	25	29 Min					
	26	37 Min	@ 25.9 - Dolomite - Grey - Mod Hard - Hard - Massive				
	27	8 Min	@ 27.0 - 27.1 - Dolomite - Buff - Weathered - Frac @ 27.1 - Dolomite - Buff w/large vugs, filled w/ Calcite crystals - White				Design Bottom of Rock Socket 483.3
482.2	28		Bottom of Rock Socket				Actual Bottom of Rock Socket
	29						

027

ENG FORM 1836 — PROJECT — HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Massman Construction Co.

1 Norfork Lake Bridges
2 LOCATION 62-P2-S-Socket
3 Geotechnician Robert Schmoker
4 HOLE NO.
5 NAME OF DRILLER Don Uchtman
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK 24.9
9 TOTAL DEPTH OF HOLE 28.47

10 SIZE AND TYPE OF BIT 10" Smith - Rock
11 Elevation of Bottom of Hole 482.4
12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hain
13 Casing Record | Depth 46' | Type 10" O.D.
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water 540.45
16 DATE HOLE | STARTED 11/25/80 | COMPLETED 12/1/80
17 ELEVATION TOP OF HOLE 553.84 platform
18 TOTAL CORE RECOVERY FOR BORING 507.3 T.O. Rock 510.57 T.O. Grout
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	1	12 Min	Sand		MUDDY GREY	ROUGH	11/25/80 Start 2:38 1st 7rpm w/H20 77.42' Stem & Down Hole Assy 2nd 17rpm @1.0 Stop @2.0'
		15 Min					
508.87	2		Cement Grout				11/26/80 Start 7:20 1st 7rpm w/H20 77.42" Stem & DH Assembly 2nd 17rpm @3.5 3rd 27rpm @4.0 Stop 10:15 Add 20' 97.42' Stem & DH Assy. Start 11:35 4th 27rpm with H20 97.42' Stem & DH Assy
	3	5 Min					
507.3		20 Min	Top of Rock				
	4		Dolomite - Buff- Grey - Mod Hard - Slightly Fractured				
		28 Min					
	5				MILKY	SMOOTH	
		30 Min					
	6						
		22 Min	@ 6.7 - 6.75 Shale - Black - soft @ 6.75 Dolomite - Grey - Mod Hard Massive		GREY	ROUGH	
	7						
503.3		28 Min	@ 6.9 - 7.2 Shale - Black - Soft @ 7.2 Dolomite - Grey - Mod Hard Massive				Top of Rock Socket
	8						
		32 Min	@ 7.5 Dolomite - Buff - Soft - Mod Hard - Fractured Slightly @ 8.2 Dolomite - Grey - Mod Hard Massive		MILKY	SMOOTH	
	9						
		23 Min	@ 9.0 Dolomite - Buff - Mod Hard @ 9.8 Dolomite - Buff - Grey- Mod Hard				
	10						

028

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P2-S-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 24.0
9 TOTAL DEPTH OF HOLE: 27.57

10 SIZE AND TYPE OF BIT:
11 Elevation of Botton of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL:
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water:
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE:
18 TOTAL CORE RECOVERY FOR BORING:
19 SIGNATURE OF INSPECTOR: DRILL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
500.87	10						97 42' Stem & DH Assy. 4th with H20 27rpm Stop 3:00 @15.0
		37 Min	Dolomite - Buff - Grey - Mod Hard				
	11		@ 10.2 - 10.3 Pod of white - soft - weathered dolomite				
		30 Min	@ 10.3 Dolomite - Buff - Mod Hard slightly frac w/Fe stains @ 11.2 Dolomite - Mod Hard - Hard - Grey - Slightly siliceous				
	12		@ 11.8 - 11.9 Chert seam - Brown - Hard				
		1 Hr	@ 11.9 Dolomite - Grey - Hard - Very hard - siliceous w/ Chert nodules				
	13		@ 12.7 Dolomite - Buff - Grey - Mod hard				
		35 Min					
	14				MILKY	SMOOTH	
		40 Min					
485.87	15		@ 15.5 Dolomite - Buff - Mod Hard Fractured w/Fe stains on Fractured planes				12/1/80 Start 7:18 4th 27rpm with H20 97.42' Stem & Down Hole Assy.
		38 Min	@ 16.2 Shale seam - Black - Soft				
	16		@ 16.25 Dolomite - Buff - Grey - Mod Hard - Slightly Frac				
		28 Min	@ 16.8 Dolomite - Grey - Mod Hard Frac - Fractures shale filled - black - soft				
	17		@ 17.1 Dolomite - Dark Grey - Mod Hard				
		36 Min	@ 17.5 Dolomite - Buff - Grey - Hard - Slightly Frac				
	18						
		33 Min	@ 18.8 Dolomite - Buff - Mod Hard Slightly Siliceous				
	19		@ 19.4 Dolomite - Buff - Hard w/ Chert (brown) nodules				
		44 Min	@ 19.6 Dolomite - Buff - Hard Siliceous				
	20						

029

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. | PROJECT | HOLE NO 62-P2-S-Socket

DRILLING LOG | DACW 03-79-C-0055 | Massman Construction Co. | of 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P2-S-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR: Drill

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
490.87	20						97.42' Stem & Down Hole Assy 4th 27rpm w/H2O Stop 1:15 Grease Swivel Start 1:22 Rough Drilling 25.0- 26.0 Possible solution cavitys (small) Stop 2:35 BOH
		37 Min	Dolomite - Buff - Hard - Silic @ 20.4 Dolomite - Buff - Mod Hard				
	21	36 Min	@ 21.5 Dolomite - Buff - Mod Hard Frac w/Fe stains on Frac planes				
	22	28 Min	@ 22.5 Sandstone - silica cemented very fine grained, hard		MUDDY	SMOOTH	
	23	52 Min					
	24	31 Min					
	25	45 Min					
	26	18 Min	@ 26.4 Dolomite - Buff - Mod Hard Frac				
	27		@ 26.6 - 27.0 Small cavern		MUDDY	ROUGH	
							Design Bottom of Rock Socket 483.3
	28	12 Min			MUDDY	SMOOTH	
482.4			Bottom of Rock Socket				Actual Bottom of Rock Socket

030

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO. 62-P2-S-Socket

...fort Lake Bridges

62-P3-N-Socket

...echnician
Robert Schmoker

H52-P3-N

...DRILLER
Don Uchtman

...TION OF HOLE
...VERTICAL ☐INCLINED _____ DEG FROM VERT

...Method: Reverse Rotary

...IN ROCK 25.96

...OF HOLE 26.96

...MFR'S DESIGNATION OF DRILL
Steven Hain

Casing Record	Depth	Type
473.61 564.01	91	10' OD ½" w

...TOTAL NUMBER CORE BOXES N/A

...ELEVATION of Water Variable 552.43

...DATE HOLE	STARTED	COMPLETED
	6/24/80	6/26/80

...ELEVATION TOP OF HOLE 565.98 Platform
474.3 Top of Rock
...CORE RECOVERY FOR ... 477.96 Top of Grout
...TIONS OF INSPECTION

...	Drill. Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
477.96	0					Start 9:48 97.42 Stem and kelly Full load 1st gear 7rpm w/H20 @10.32 .7 shift to 2nd gear 17rpm Stop 11:15 Start 11:17 in 1st gear 7rpm bit jumping on hard spot Stop 11:34 Hose problem Start 11:40 Stop 12:34 Start 1:05 Stop 1:10 Start 1:30 H20 off @ 7 H20 on @ 7.6 H2o off at 7.8
	50 Min					
	1	CEMENT GROUT		Cement Color	Smooth	
	26 Min					
	2	Dolomite Ledge in grout @ 1' Buff-Soft-Mod Hard				
	14 Min					
	3	Clay lens w/grout & mod hard Dolomite Ledge Rock	N/A			
474.3	19 Min	Top of Rock El: 474.3				
		Chert @ 4.5 - 4.6 Dolomite-Grey-Buff Mod Hard w/clay spots & grout		Muddy	Rough	
473.61						Bottom of Casing
	19 Min					2:45 8.1 H20 on 2nd gear 20rpm full load Stop 3:07 Tighten stem bolts 8.5 Start 3:43
	5	Dolomite very weathered soft-grey				
	8 Min	@5.8 Chert bed .1" thick				
	6	@6.4 Dolomite-Grey-Buff-Mod Hard-Clay-Grout				
	27 Min					
471.0	7					Top of rock socket
	1 HR	@7.6 Dolomite - Mod Hard-Buff-Grey		Slightly Muddy		Stop 5:15 @9.15
	8	@8.1 Dolomite-Hard-v hard-Silicious Grey-Dark Grey				
	52 Min					
	9	Dolomite-Hard-v hard Grey-Slightly Fractured Silicious		Milky	Smooth	
	1 HR 32 Min	Dolomite - Slightly fractured @ 9.5'				
	10					

...PROJECT ...HOLE ...

031

DRILLING LOG	Project No. DACW 03-79-C-0055	Maeseman Construction Co.
Norfork Lake Bridges		11 Elev. of Bottom of Hole
62-P3-N-Socket		12 MANUFACTURER'S DESIGNATION OF DRILL
3 Geotechnician		13 Casing Record / Depth / Type
4 [illegible]		14 TOTAL NUMBER CORE BOXES
5 NAME OF DRILLER		15 ELEVATION OF WATER
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		16 DATE HOLE / STARTED / COMPLETED
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING
9 TOTAL DEPTH OF HOLE		19 SIGNATURE OF INSPECTOR

ELEVATION / DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
457.96 / 20						Stop 3:45
	55 min	Dolomite-Buff-Grey Mod-Hard-Slightly Fractured				@20.6'
		@ 20.9 Dolomite - Buff Mod Hard-Fractured				6/25/80
21						6/26/80
	43 min					Start 8:05
						@20.6
22						2nd gear 20rpm
	36 min					w/H20 full wt
						137.42 Stem &
						Kelly
						Stop 9:42
						Start 9:44
						Engines pulled
						down to stop
						in soft zone
		Dolomite-soft-weathered 22.8-23.0'	milky	Smooth		22.8-23.0
23						Weathered Dol
		Dolomite-Buff-Mod Hard fractured w/lenses of weathered dolomite @ 23.4 Dolomite-Buff-Grey Mod Hard-Fractured				22.8-23.0
						White Iron
	44 min					Stained
						Stop 11:10
						Engine Work
24						and Stem add 30
						167.42 total
	42 min					Start 12:47
						Stop 1:50
						BOH 451/0
25						
	36 min					
26		@ 25.8 Dolomite-Grey Hard-V Hard-Silic Fractured				
	27 min					
451.0 / 27		Bottom of Rock Socket Elevation 451.0				

032

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Merriman Construction Co.

Norfork Lake Bridges

62-P3-N-Socket

Geotechnician

Method: Rotary

Casing Record | Depth | Size

Elev. of Bottom of Hole

Elev.	Depth	Drill Rate	Classification of Material	Water Loss	Water Color	Water Action	Remarks
467.98	10'						2nd gear Full load 137.42 Stem and Kelly w/H20 Stop 9:32 Ster Start 9:34
		50 min	Dolomite - Silicious Hard-V Hard Grey Slightly Fractured				
	11		@ 10.80-10.85 Dolomite weathered - soft				
		44 min	Dolomite - Buff - Grey Mod Hard-Hard-Fractured				Occasional muddy H20 Prob cave in of overburden
			Chert @ 11.75-11.9-12.0				
	12						
		45 min	.1' weathered Dolomite Seam @ 12.4 soft Fe stained		Milky	Smooth	
	13						
		46 min	Green Mudstone Seam @ 13.5 .05 thick				
	14						
		1 Hr 5 min	Dolomite-Grey-Buff Mod-Hard-Hard				
	15						
		40 min	@15.3-15.35 Dolomite-Soft-Brown				Stop 1:10 Eng Ck Start 1:20
	16						
		45 min					
	17		Dolomite-Grey-Buff Mod Hard-Fractured @ 17.0' w/occasional vugs to 18.6				
		30 min					
	18						
		40 min					
	19						
		40 min					
	20						

033

DACW 03-79-C-0055

Project: Norfork Lake Bridges

62-P3-S

Geotechnician: Robert Schmoker

62-P3-S

Name of Driller: Don Uchtman

4. Direction of Hole: [X] Vertical [ ] Inclined ____ Deg. From Vert.

Boring Method: Reverse Rotary

6. Depth Drilled into Rock: 31.8

5. Total Depth of Hole: 33.8

10. Size and Type of Bit: 10" Smith-Rock

11. Elev. of Bottom of Hole: 451.0

12. Manufacturer's Designation of Drill: Steven M. Hain Co.

13. Casing Record: 481.81-565.31 | Depth: 83.5 | Type: 10" dia. [illegible]

14. Total Number Core Boxes: N/A

15. Elev. of Water: Variable 553.02

16. Date Hole: Started 6/4/80 | Completed 6/20/80

17. Elevation Top of Hole: 467.05 Platform, 482.8 Top of Rock

18. Total Core Recovery for Boring:

19. Signature of Inspector:

Elevation	Depth	Drill Rate	Classification of Materials (Description)	Water Loss	Water Color	Drill Action	Remarks
484.8	1	27 min	Concrete (Grout)		Muddy	Rough	Depth of H20 to Top of Grout 11:51 Lost Table Engine H_2O muddy and sandy until bottom of casing reached
	1	28 min					
482.8	2		Top of Rock				
	2	1 Hr 41 min	DOLOMITE w/SS SEAMS				
	3						Bottom of 10 dia.
	3	1 Hr 25 min					Outer Casing (481.81) 4:25 Stop Bearing Burn out on Table 6/6/80 4.275 11:25 2nd gear 20rpm 11:35 Stop engine problem Start 12:45 Stop 1:51 Bearing check Start 2:02 Stop 2:43 Start 2:48 Stop 3:21 Start 3:35 Stop 5:00 6/7/80 Start 9:15
	4		S.S. @ 4.1 - .2 Thick		Slightly Milky	Smooth	
	4	50 min					
	5		Grey Dolomite				
	5		Chert				
	5	45 min	Cherty-Dolomite				
	6		Brown Dolomite				
	6	41 min					
	7						
	7	34 min					
	8						
	8	44 min					
	9						
	9	1 Hr 31 Min	Buff - Grey Dolomite				

NACW 03-79-C-0033

1 Project: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith-Rock
2 HOLE NO: 62-P3-S	11 Elev. of Bottom of Hole: 451.0
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Bain
4 HOLE NO: 62-P3-S	13 Casing Record: 481.81-565-31; Depth: 83.5; Type: 10' dia ¼"
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES: N/A
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT	15 Elev. of Water: Variable
Boring Method: Reverse Rotary	16 DATE HOLE: STARTED 6/4/80; COMPLETED 6/20/80
8 DEPTH DRILLED INTO ROCK: 31.8	17 ELEVATION TOP OF HOLE: 482.8 Top of Rock; 467.05 Platform
9 TOTAL DEPTH OF HOLE: 33.8	18 TOTAL CORE RECOVERY FOR BOXING:
	19 SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	Remarks
474.8	10						
		56 Min	Brown-Grey Dolomite Mod Hard			Smooth	Stop 11:52 Lunch Start 2:20 Stop 2:58 Block Twist
	11	59 Min					6/16/80 Start 4:35 @12.14 2nd gear 20rpm Stop 5:10 @ 12.82
	12	1 Hr 11 Min					6/17/80 Start 10:33 Stop 1:15 Start 2:00 Stop 4:40
	13	1 Hr 20 Min					6/18/80 Start 17.0 1st hour 1st gear 6-7rpm 17.0-17.3 Full weight with H20
471.0			Top of Rock Socket				Start 8:40 17.3 1hr 20min 9:40 11:00 2nd gear 14rpm Stop 11:00 Start 11:10 @18 No H20 2nd gear 14rpm Full Wt Stop 11:25 Start 11:43 12:50 @ 19 H20 Turned off Stop 1:18 Broken bolt on swivel Start 1:52 @19.5 H20 Back on 14rpm
	14	1 Hr 20 Min			Slightly Milky		
	15	1 Hr 15 Min					
	16	1 Hr 25 Min	DOLOMITE Grey-Mod Hard Hard				
	17	2 Hr 20 Min	SANDY DOLOMITE - Mod Hard - Hard @17.3 (Elev 467.5) Silica Cemented Sandstone Hard - Very Hard		Rough		
	18	1 Hr 22 Min	SS Fractured @ 17.9 (Elev. 446.9)		Rough-Smooth		
	19	1 Hr 39 Min	19.0-19.3 (Elev. 465.8 - 465.5) Gradation Milky Quartzite to Highly Silicious Dolomite		Smooth		

Norfolk Lake Bridges

62-P3-S

Geotechnician: Robert Schmoker

62-P3-S

Name of Driller: Don Uchtman

Direction of Hole: ☒ Vertical ☐ Inclined _____ Deg. From Vert

Boring Method: Reverse Rotary

Depth Drilled into Rock: 31.8

Total Depth of Hole: 33.8

Size and Type of Bit: 10" Smith-Rock

Elev. of Bottom of Hole: 451.0

Manufacturer's Designation of Drill: Steven M. Brin Co.

Casing Record: 481.81-565.31 | Depth 83.5 | Type 10' dia 3/4" Wal

Total Number Core Boxes: N/a

Elev. of Water: Variable

Date Hole: Started 6/4/80 | Completed 6/20/80

Elevation Top of Hole: 467.05 Platform; 422.8 Top of Rock

Total Core Recovery for Boring:

Signature of Inspector:

Elevation	Depth	Drill Rate	Classification of Materials (Description)	Water Loss	Water Color	Drill Action	Remarks
464.8	20	1 Hr 20 Min	DOLOMITE - GRAY Hard - V Hard - Highly Silicious			Mod Smooth	4:00 change fm 14rpm to 20rpm
	21		@ Elev. 461.1 (20.7) Dolomite - Buff - Gray Hard - Silic				Stop 4:45 @21.25
		1 Hr 28 Min	Dolomite - Buff - Grey Mod Hard			Smooth	6/18/80 Start 9:57 2nd gear w/H20 Full load and Throttle 18rpm 120 stem and 17.5 DH Assy.
	22						
		1 Hr 15 Min					
	23						
		1 Hr 15 Min					
	24						
		50 Min	Cavity Elev. 460.15 to 460.0 (24.65 to 24.8) Dolomite - Buff-Grey Mod. Hard - Fractured		Slightly Milky	Rough	
	25						
		58 Min				Smooth	
	26						
		34 Min	Elev. 458.6-458.5 Weathered Elev. 458.5-458.4 Claystone			Rough	Stop 3:40 Drop in Stem Start 3:48 Rough action on drill when clay reached
			Dolomite-Buff-Mod. Hard				
	27		Dolomite - very sandy - soft Mod Hard Buff-Gray				
		35 Min				Smooth	Stop @5:15 28.9 6/20/80 Start 7:30 @ 28.9 2nd gear 20rpm Full wt w/H20 120 Stem 17.5 DH
	28		Dolomite Hard Grey Buff Silic (Prob Intense frac)				
		41 Min					
	29		Dolomite - Buff Mod Hard - Slightly Silic Mod Frac				
		42 Min					

	10" Smith-Rock
Norfork Lake Bridges	11 Elev. of Bottom of Hole 451.0
62-P3-S	12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hein
Geotechnician Robert Schnoker	13 Casing Record 481.81 - 565-31 Depth 83.5 Type 10" dia 1" W
62-P3-S	14 TOTAL NUMBER CORE BOXES N/A
NAME OF DRILLER Don Uchtman	15 Elev. of Water Variable
1 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16 DATE HOLE STARTED 6/4/80 COMPLETED 6/20/80
Boring Method: Reverse Rotary	17 ELEVATION TOP OF HOLE 467.05 Platform ~~482.8 Top of Rock~~
19 DEPTH DRILLED INTO ROCK 31.8	18 TOTAL CORE RECOVERY FOR BORING
20 TOTAL DEPTH OF HOLE 33.8	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	Remarks
454.8	30.0						Stop 10:40 32.6
			Dolomite - Buff - Mod. Hard, Slightly Fractured Slightly Silic				Start 10:48 Discharge hose
		52 Min					
	31						
		52 Min		N/A	Slightly Milky	Smooth	
	32						
		1 Hr 5 Min					
	33						
		45 Min					
451.0			Bottom of Rock Socket (Elev. 451.0)				

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | OF ÷ SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P4-N-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 32.6
9 TOTAL DEPTH OF HOLE: 35.69
10 SIZE AND TYPE OF BIT: 10½" Smith Rock
11 Elevation of Bottom of Hole: 427.5
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hain
13 Casing Record: Depth 90' Type 10" O.D.
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water: 541.71
16 DATE HOLE: STARTED 1/6/81 COMPLETED:
17 ELEVATION TOP OF HOLE: 550.84 Platform
18 TOTAL CORE RECOVERY FOR BORING: 462.59 TCR 459.50 TOR
19 SIGNATURE OF INSPECTOR: CRLL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
462.59'	1	35 min.	SAND.				1/6/81 Start 10:30 7rpm w/H20 1st 156.2' Stem & DH Assy @12:22 @3.5 4th 28rpm w/H20 Stop 12:24 Start 12:29 Stop 2:40 Sroken discharge hose.
	2	25 min.	CEMENT GROUT		MUDDY	ROUGH	
	3	30 min.					
459.5			Top of Rock ~ Average				
	4	40 min.	Dolomite ~ Buff ~ Mod Hard ~ Slightly Weathered				
	5	1 hr.	@4.0'~ Dolomite ~ Buff ~ Grey ~ Mod Hard @ 4.4 ~ Dolomite ~ Brown ~ Hard Silic				
	6	31 min.	@ 5.3 ~ Dolomite ~ Dark ~ Grey ~ Mod Hard ~ Hard @ 5.7 ~ Dolomite ~ Buff ~ Grey ~ Mod Hard		MUDDY	SMOOTH	
455.59'	7	24 min.	@ 6.4 ~ Vuggy seam with pink Dolomite Crystals @ 6.5 ~ Dolomite ~ Buff Grey ~ Mod Hard				1/6/81 1/7/81 Start 9:20 28rpm w/H20 [illegible] 156.2' Stem & DH Assy
	8	30 min.	@ 7.7 ~ 7.8 ~ Vuggy seam filled with Pink Dolomite @ 7.8 ~ Dolomite ~ Grey Mod Hard ~ Hard				
	9	27 min.	@ 8.3 ~ Dolomite ~ Buff Grey ~ Mod Hard				
452.59'		21 min.	@ 9.4 ~ 9.6 ~ Clay ~ Red ~ Soft ~ Est. ½ of hole @ 9.6 ~ Dolomite ~ Buff		MUDDY	SMOOTH	

038

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 4 sheets

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P4-N-Socket
3. Georechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE

10. SIZE AND TYPE OF BIT: 102" Smith Rock
11. Elevation of Bottom of Hole: 427.5
12. MANUFACTURER'S DESIGNATION OF DRILL: Steven Hains
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
452.59	10						@10.0'
		32 min	@ 10.0 - 12.1 - Cavern Clay filled - Est. (greater than ½ of hole) Clay - Soft - Red		MUDDY	ROUGH	1st No H20 7rpm Weight held 156.2 Stem & DH Assy
	11		@ 10.6 - Cavern - Est. (less than 1/3 of hole)				Stop 11:35 @11.9 Bit hung in cavern
		41 min					Start 12;00 @12:25 - 12.1'
	12		@ 11.9 - Dolomite - Grey Hard - Very Hard - Siliceous				4th 28rpm W/ H20 Stop 3:08 @17.8'
		29 min					
	13				MILKY	SMOOTH	
		25 min					
	14						
448.00		28 min					Top of Rock Socket
	15		@ 15.5 - 15.6 - Clay filled seam - Est. (lessthan 1/8 of hole) with Calcite Crystals				
		27 min	@15.6 - Dolomite - Light Grey - Hard - Very Hard Siliceous		MILKY	ROUGH	
	16		@ 16.6 - 17.0 - Clay filled seam - Est. (less than 1/8 of hole) Dolomite- Grey - Hard Very Hard - Siliceous				
		45 min					
	17						
		26 min					
444.79					MILKY	SMOOTH	1/7/81 1/8/81 Start 7:30 4th 28rpm w/H20 156.2 Stem & DH Assy
	18		@ 18.1 - Dolomite - Light Grey - Hard - Very Hard - Siliceous with Chert Nodules - Milky				
		47 min					
	19		@ 19.0 - Chert - Milky - Very Hard				
		28 min					
442.59	20						

039

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 4 SHEETS

Norfork Lake Bridges
62-P4-N-Socket
Geotechnician
Boring Method: Rotary
Drill

10 SIZE AND TYPE OF BIT	
11 Elevation of Bottom of Hole	
12 MANUFACTURER'S DESIGNATION OF DRILL	
13 Casing Record	Depth / Type
14 TOTAL NUMBER CORE BOXES	
15 ELEVATION of Water	
16 DATE HOLE STARTED / COMPLETED	
17 ELEVATION TOP OF HOLE	
18 TOTAL CORE RECOVERY FOR BORING	%
19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
442.59	20						
	21	30 min	Chert - Milky - Very Hard				4th 28rpm w/H20 156.42' Stem & DH Assy Stop 9:52 Grease swivel Start 10:E @9.30 1st 7rpm No H20 Rough drill action in vuggy quart. @2.16 - 10:27 2nd W/ H2o . 17rpm Stop 3:10 @26.6
			@ 20.2 - Quartzite - Very Hard - Clear - Milky				
			@ 21.1 - Quartzite - Milky - Vuggy with Quartzite crystals and Goethite in vugs.				
	22	1 hr 4 min	@ 21.8 - Dolomite - Grey Hard - Very Hard - Siliceous with chert nodules and Quartzite				
	23	1 hr 25 min	@ 23.8 - Dolomite - Grey Buff - Mod Hard - Hard Numerous healed frac. with Iron stains on fractures.				
	24	45 min					
	25	30 min	@ 25.5 - Dolomite - Dark Grey Mod Hard - Massive		MILKY	SMOOT-	
	26	44 min					
435.99	27	1 hr 7 min					1/8/81 1/9/81 Start 7:35 2nd 17rpm w H2O 156.42 Stem & Down Hole Ass
	28	34 min	@ 28.7 - Dolomite - Brown - Grey - Mod Hard - Hard - Slightly Siliceous				
	29	32 min	@ 28.9 - 28.95 - Shale seam - Black - Soft -				
			@ 28.95 - Dolomite - Dark Grey - Brown - Mod Hard - Hard -				
432.59	30	37 min	Slightly siliceous				C40

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P4-N-Socket
3 Geotechnician
4 HOLE NO: 1
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
432.59	30						2nd 17rpm w/H2O
		35 min	@ Dolomite - Grey - Mod Hard - Brown - Hard Siliceous @ 30.5 - Dolomite - Grey Mod Hard				156.42 Stem & Down Hole Assy
	31						@31.0 - 10:14
		58 min					4th 28 rpm Stop 10:38 Grease Swivel Start 10:43
	32				MILKY	SMOOTH	Stop 1:33 BOH
		47 min					
	33						
		54 min	@ 34.4 - 34.45 - Shale seam - Black - Soft @ 34.45 - Dolomite - Grey - Mod Hard				
	34						
		35 min			GREY	ROUGH	Design Bottom of Rock Socket 428.0
	35				MILKY	SMOOTH	
		5 min					
425.9							Bottom of Rock Socket

041

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

CE - LINE LOG	DACW 03-79-C-0055	Massman Construction Co.	
3 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT 2 1/2" Smith-Rock	
4 LOCATION: 62-P4-S-socket		11 Elevation of Bottom of Hole 427.6	
5 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven Hains	
6 HOLE NO.		13 Casing Record: Depth 90', Type 10" O.D.	
7 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
8 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water 541.90	
9 Boring Method: Reverse Rotary		16 DATE HOLE: STARTED 1/13/81, COMPLETED 1/16/81	
8 DEPTH DRILLED INTO ROCK: 27.2		17 ELEVATION TOP OF HOLE 551.34' Platform	
9 TOTAL DEPTH OF HOLE: 34.19		18 TOTAL CORE RECOVERY FOR BORING 461.19 TOP 454.2 TOP	
		19 SIGNATURE OF INSPECTOR: DRLG	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	~~Water Loss~~	Water Color	~~Water~~ Action	REMARKS
461.19'							1/13/81 Start 11:10 156.42 Stem Kelly & DH Assy 1st 7rpm No H20 2nd w/H20 @1:15 17rpm Stop 3:10 @3.6'
	1	1 hr 40min	1) Dolomite - Light - Grey - Siliceous - Very Hard 2) Open Cavity - Sand Filled (ROCK) (SAND) (ROCK) @ 1.1 Cavity - Grout Filled				
	2	59 min					
	3	36 min	GROUT Dolomite - Buff - Mod Hard				
457.59							
	4	37 min	@ 3.5 - Red Clay Stone		MUDDY	ROUGH	1/14/81 Start 7:20 2nd 17rpm w/H20 156.42 Stem DH Assembly @4.5 7:55 4th 27rpm @6.9 1st trpm Rough drill action Stop 7:42 Clean out hole Start 7:50
	5	27 min	Dolomite - Buff - Mod Hard GROUT				
	6	19 min					
	7	33 min					
454.2'			Average Top of Rock				
	8	50 min	@ 7.6 - Sand and Red Clay				
	9	1 hr 4 min	SAND & CLAY				
	10	5 min					
451.19							

042

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | Massman Construction Co. | SHEET 1 of 1

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P4-S-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water ~~Water~~ Action (DRILL)	REMARKS
451.19	10						
		9 min	Sand and Red Clay				1st 7rpm w/H20 156.42' Stem & DE Assembly Stop 11:50 Grease Swivel Start 12:17 @12.0' - 12:30 No H20 2nd 17rpm @12:35 12.1'
	11				RED	ROUGH	
		29 min	@ 11.6 - Claystone - Red - Soft				
	12						
		45 min	@ 12.1 - Dolomite - Grey Hard - Very Hard - Siliceous				1st 7rpm @1:00 12.6 2nd 17rpm @13.0' H20 @1:25 - 13.5'4th 27rpm Top of Rock Socket Stop 3:12
	13						
448.0'		22 min					
	14						
		24 min					
			@ 14.9 - Dolomite - Grey Mod Hard - Hard		MILKY		
	15						
		24 min	@ 15.5 - Dolomite - Grey Buff - Mod Hard				
	16					SMOOTH	
		47 min	@ 16.3 - Quartzite - Milky - Hard - Very Hard @ 16.8 - Dolomite - Grey - Mod Hard - Hard Siliceous				
444.19	17						1/14/81
		35 min	@ 17.1 - Quartzite - Milky - Hard @ 17.5 - 18.1 - Quartzite Milky - Light Blue - Hard - Vuggy				1/15/81 Start 7:37 w/H20 4th 27rpm 156.42 Stem & DE Assembly @17.0' 19' 2nd 17rpm Rough drill actio metal in hole @8:40 19.5' 4th rpm 27
	18						
		33 min	@ 18.1 - Quartzite - Milky - Hard				
	19						
		1 hr 5min	@ 19.5 - Dolomite - Grey - Hard - Very Hard - Siliceous				
441.19	20						

043

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | Massman Construction Co. | SHEET

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P4-S-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record: Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR: Drill

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
441.19	20						con't 4th 27rpm w/H20 156,42 Stem & DH Assembly Stop 10:40 Grease Swivel 27rpm w/H20 4th 27rpm w/H20 Stop 3:13 @25.5
		43 min	@ 20.0 - Cherty - Dolomite - Grey Brown Hard - Very Hard				
	21						
		1 hr 4 min	@ 21.1 - Dolomite - Dark Grey - Hard - Very Hard - Siliceous		MILKY		
			@ 21.5 - Dolomite - Brown - Very Hard - Fractures with Iron stains on Fractures Planes - Highly - Siliceous				
	22						
		48 min	@ 21.9 - Dolomite - Buff - Grey - Mod Hard Hard				
	23						
		1 hr 6min	@ 23.7 - 23.8 - Shale Black - Soft				
			@ 23.8 - Dolomite - Grey - Hard - Siliceous		GREY		
	24						
		58 min					
			@ 24.9 - 25.0 - Shaley Dolomite - Black - Soft - Mod Hard			SMEAR	
	25						
435.69		39 min	@ 25.0 - Dolomite - Grey - Mod Hard - Siliceous				1/15/81
	26						1/16/81 Start 7:34 4th 27rpm W/H20 156.42 Stem & DH Assembly
		45 min	@ 26.1 - Dolomite - Grey - Mod Hard - Slightly Fractured				
	27				MILKY		
		25 min	@ 27.5 - Dolomite - Grey - Mod Hard - Slightly Fractured with Fractures Silica Filled				
	28						
		32 min	@ 28.2 - Dolomite - Grey - Mod Hard				
	29						
		32 min	@ 29.4 - Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
431.19	30						

044

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | Hassman Construction Co. | SHEET

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P4-S-Socket
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: DRILL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
431.19	30						
	31	35 min	Dolomite - Grey - Mod Hard - Hard - Slightly Silic				con't 4th 27rpm w/H20 156.42 Stem & Down Hole Assembly
	32	30 min			MUCKY	SMOOTH	
	33	34 min	@ 32.5 - Dolomite - Light Grey - Mod Hard				
		19 min					Design Bottom of Rock Socket 428.0
427.0'	34						

045

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	of 3 sheets
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: Smith 102" Rock	
2 LOCATION: 62-P5-N-Socket		11 Elevation of Bottom of Hole: 406.8	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hain	
4 HOLE NO.		13 Casing Record: Depth 120.5' Type 10' ½ Tk	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water: Varies 548.89	
		16 DATE HOLE: STARTED 7/21/80 COMPLETED 7/25/80	
7 Boring Method: Reverse Rotary		17 ELEVATION TOP OF HOLE: 562.7' (Platform)	
8 DEPTH DRILLED INTO ROCK: 27.5'		18 TOTAL CORE RECOVERY FOR BORING: 435.925 TOG	%
9 TOTAL DEPTH OF HOLE: 29.13		19 SIGNATURE OF INSPECTOR: 434.3 TOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
435.925							Start 2:35
		5 Min	CEMENT GROUT				1st gear No H20
	1						7rpm 186.15
							Stem kelly & Down Hole Assembly
							Stop @ 2' @ 3:0[illegible]
		29 Min	Top of Rock Elev 434.3				Avg. Top of Rock
434.3			Dolomite - Grey - Soft - Mod Hard - Slightly Weathered		Muddy		Start 7:20
	2						1st gear Full load No H20
		1 Hr 33 Min	@ 2.7' Dolomite - Buff - Grey - Mod Hard				8rpm H20 on @ 7:45 @ 2.1
	3						2nd gear 18rpm @8:37 2.8
			@ 3.3 - 3.8' Dolomite - Frac w/Fe stains on Frac planes				1st gear @ 8:50 @ 3.0 2nd gear
		57 Min	@ 3.8 Dolomite - Buff - Grey Mod Hard				@9:05 - 3.3' Stop 10:35 Template Adjust
432.0	4						Bottom of Casing 432.0
		58 Min				Smooth	Start 10:55 Stop 11:55 Start 12:30 Stop 1:20 Start 1:29
	5						Stop 3:15 @ 7.5
		47 Min	@ 5.8 - 6.1' Dolomite - Frac with Fe stained Jts				
	6		@ 6.1' Dolomite - Grey Buff - Mod Hard - Hard Silic		Milky		
		1 Hr 50 Min					
	7						
		2 Hrs					
	8		@ 8.0' Dolomite - Buff Fractured w/Fe stains on Jts & Frac - Mod Hard				046
427.3		58 Min					Top of Rock Socket
			@ 8.9' Dolomite - Buff - Grey - Mod Hard				Start 7:50
	9						2nd gear No H20
							Full load 18rpm
							Stop 8:10 Stem
							Start 9:40 1st
		1 Hr 5 Min					8rpm No H20
	10						2nd gear 18rpm
							H2o on @ 10:30

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO. 62-P5-N-Socket

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P5-N-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record: Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
		48 Min	@ 10.5' Dolomite - Grey - Mod Hard				
	11						
		39 Min	@ 11.4 Dolomite - Buff - Grey				Stop - 3:15 @ 13.3'
	12		@ 11.9 - 12.1' Soft weathered Dolomite layer (white)				
		1 Hr	@ 12.1 0 12.3' Dolomite - Buff - Grey - intensely frac - Mod Hard with pods of white weathered dol				
			@ 12.5' Thin shale layer				Start 7:45 2nd gear w/H20 Full wt 18rpm
	13		@ 12.35' Dolomite - Buff - Grey - Mod Hard - Slightly Frac				
		55 Min	@ 13.6 - 13.7' Shaly - Dolomite - green, black - soft - med hard				H20 off 1st gear @ 16'
	14		@ 13.7' Dolomite - Buff - Mod Hard - Slightly Frac		Milky	Smooth	@9:58 Rough Drill on bottom of cavern partial void below 16
		55 Min					2nd gear 18rpm
			@ 14.8 Dolomite - Grey - Mod Hard				H20 on @ 16.5 @ 10:38
	15						
		38 Min	@15.6 - Cavern - 16.0' quartz & calcite crystals in cavern (Partial cavern 16-16.5')				Stop 11:30 Gasket out of stem 17.4' Start 11:50
	16						
		1 Hr 8 Min	@ 16.5 Dolomite - Grey Mod Hard				
			@ 16.9' Dolomite = Buff - Mod Hard - Frac @ 17.1 - 17.2'				
	17						
		1 Hr 6 Min	@ 17.6 Dolomite - Buff - Grey - Slightly frac - Mod Hard				
	18						
		1 Hr 28 Min					
	19						
		55 Min	@ 19.8 - 20' Weathered Dolomite (white)				047
	20						

DRILLING LOG

Project No.: DACW 03-79-C-0055

Contractor: Massman Construction Co.

Of 3 Sheets

1 PROJECT: Norfork Lake Bridges

2 LOCATION: 62-P5-N-Socket

3 Geotechnician

4 HOLE NO.

5 NAME OF DRILLER

6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT

7 Boring Method: Rotary

8 DEPTH DRILLED INTO ROCK

9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT

11 Elevation of Bottom of Hole

12 MANUFACTURER'S DESIGNATION OF DRILL

13 Casing Record | Depth | Type

14 TOTAL NUMBER CORE BOXES

15 ELEVATION of Water

16 DATE HOLE | STARTED | COMPLETED

17 ELEVATION TOP OF HOLE

18 TOTAL CORE RECOVERY FOR BORING %

19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	21	1 Hr 10 Min	Dolomite - Buff - Grey Mod Hard - Slightly Frac				Stop 3:15 @ 20.6'
	22	1 Hr 7 Min	@ 21.9' Thin seam of white weathered Dolomite				7/25/80 Start 7:35 2nd 18 rpm Full load 186.5 Stem Kelly DH Assy. w/#20
		58 Min	Dolomite - Buff - Mod Hard - Frac w/Fe stains on frac.				Stop 11:00 Engine check Start 11:05 3rd gear @27.5' 2:27 30rpm
	23	55 Min			Milky	Smooth	
	24	50 Min	@ 24.6' Dolomite - Grey mod Hard @ 24.9' - 24.95' Black shale seam				
	25	1 Hr	Dolomite - Grey - Mod Hard				
	26	57 Min	@ 26.2' Siltstone seam @ 26.7' Black shale seam				
	27	38 Min	@ 27.5 - 27.8' Chert - Black @ 27.8 Dolomite - weathered silicious - mod hard				
	28	25 Min					
406.8			Bottom of Hole - 406.8				Actual bottom of Rock Socket

048

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO: 62-P5-N-Socket

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 3 sheets

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P5-S-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 24.5
9 TOTAL DEPTH OF HOLE: 27.4
10 SIZE AND TYPE OF BIT: Smith 102" Rock
11 Elevation of Bottom of Hole: 407.3
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hain
13 Casing Record: Depth 136.5' Type ½ TK 10'
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water: Varies 550.43
16 DATE HOLE: STARTED 7/8/80 COMPLETED 7/18/80
17 ELEVATION TOP OF HOLE: 567.60 Platform
18 TOTAL CORE RECOVERY FOR BORING: 431.6 TOR 434.51 TOG
19 SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
434.51							
	1	15 Min	Cement Grout				Start 1st gear 7rpm 187.42' Stem & Kelly w/H20 Stop 12:58 Start 1:00 Stop 1:39 Start 1:40 Stop 1:42 Start 1:50 Stop 2:52 Start 2:57
	2	10 Min			Muddy	Smooth	
	3	15 Min					
431.6			Avg. Top of Rock 431.6				Avg. Top of Rock
	4	55 Min	Dolomite - Grey - Mod Hard Fractured				
	5	1 Hr 22 Min	@ 4.5' Dolomite - Grey - Mod Hard				
429.4							Bottom of Casing 429.4
	6	45 Min			Milky White		Start 7/9/80 @5.6' 7:24 2nd gear 17rpm Full wt. 187.42 Stem & DH Assy w/H20
	7	1 Hr 20 Min	@ 6.4' Dolomite - Dark Grey Mod Hard - Hard - Silic				
427.3							Top of Rock Socket
	8	1 Hr 3 Min	@ 7.4' Dolomite - Buff Mod Hard				
	9	1 Hr 10 Min					
	10	1 Hr 15 Min					

049

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO. 62-P5-S-Socl

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 of 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P5-S-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water 16 DATE HOLE | STARTED | COMPLETED
7 Boring Method: Rotary	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING %
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
424.51	10	1 Hr 23 Min	DOLOMITE- Grey - Grey-Black Mod Hard - Hard Silic Mod Dolomite - Grey - Mod Hard		White	Rough	Stop 1:53 @10.8 Engine Check Start 1:58 Stop 2:26 @11.4 Fuel and Grease 7/9/80 Start 7:16 @11.4 2nd gear with H20 130 psi
	11	1 Hr 21 Min	Dolomite - Mod Hard - Hard Silic Dolomite - Grey - Hard			Med Smooth	
	12	2 Hr 18 Min	Dolomite - Mod Hard with vugs with calcite crystals			Smooth	
	13	1 Hr 3 Min	Dolomite - Mod Hard - occ chert seams & small partings and calcite			Rough	
			Dolomite - light grey with sandstone & shale partings with calcite crystals w/ Fe staining on frac planes				
	14	1 Hr 17 Min				Smooth	
	15	47 Min	Dolomite - Grey w/Fe stainings & calcite crystals				
	16	6 Min	SANDSTONE Fractured Dolomite		Red Sandy	Rough	
		28 Min	DOLOMITE - light grey - Fe staining - mod hard - sandstone				
	17	1 Hr	Dolomite - Light - mod hard		White Lime	Smooth	
	18	55 Min	Dolomite - hard - light grey				
	19	1 Hr 6 Min	Dolomite - mod-hard Light				Stop 8:45 Service Drill Start 7:17 a.m.
	20						050

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO. 62-P5-S-Sock

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 3 sheets

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P5-S-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
414.51	20						
		1 Hr 17 Min	Dolomite - Hard - Dark Grey		White	Smooth	2nd gear @26.50 ppm & 17-19 rpm on Kelly H20 @ 150 psi
	21						
		1 Hr 17 Min	Dolomite - Hard - Dark Grey				
	22						
		1 Hr 18 Min					
	23						
		1 Hr 20 Min	1' layer of soft weathered Dolomite			Rough	
	24		Dolomite - Grey - Grey-Black - Mod Hard - Hard				Rough drilling in weathered area, 1st gear 7rpm @24' 2nd gear 17rpm @2:24 24.7' Stop 3 11 @25.4
		1 Hr 2 Min					
	25		Dolomite - Grey - Black - Mod Hard w/pods of white weathered Dolomite			Smooth	
		1 Hr 42 Min					7/14/80 Start 9:42 1st gear w/H20 187.42 Stem Kelly DH Assy Full load 8rpm Stop @ 10:55 Air leak
	26						
		2 Hr 19 Min					
	27						
407.1			Bottom of Hole - 407.1				Actual Bottom of Rock Socket Start 9:56 @26 1st gear 8rpm W/H20 186.175 Stem Kelly DH Assy Stop 11:40 26.7 Start 7:.) 186.175' Stem Full load w/H20 2nd 18rpm 26.7 Start

051

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO. 62-P5-S-Socket

DRILLING LOG | Project No. DACW 03-79-C-0035 | Messman Construction Co. | Sheet 3 of 3

1. Norfork Lake Bridges
2. LOCATION 62-P6-N-Socket
3. Geotechnician Robert Schmoker
4. HOLE NO.
5. NAME OF DRILLER Don Uchtman
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. Boring Method: Reverse Rotary
8. DEPTH DRILLED INTO ROCK 25.70
9. TOTAL DEPTH OF HOLE 28.24
10. SIZE AND TYPE OF BIT 12½" Smith-Rock
11. Elevation of Bottom of Hole 408.5'
12. MANUFACTURER'S DESIGNATION OF DRILL Steven Hains
13. Casing Record: Depth 121.0' Type 10" O.D.
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water 542.32
16. DATE HOLE STARTED 1/24/81 COMPLETED 1/28/81
17. ELEVATION TOP OF HOLE 556.04' TOP
18. TOTAL CORE RECOVERY FOR BORING 436.14' TOC
19. SIGNATURE OF INSPECTOR 433.9 ' TOR

ELEVATION 436.44'	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	1	32 min	SAND				1/24/81 Start 7:30 1st 7rpm No H2O 186.3' stem kelly & DH Assy @1.0 2nd 17rpm No H20 Stop 8:06 shift Start 8:51 Mal. H20 on @10:00 @3.5 Stop 10:05 eng Start 10:00
	2	15 min	CEMENT GROUT		Muddy	Rough	
		5 min	Sandy Clay				
433.9'	3		Dolomite - Buff - Grey Hard - Siliceous				Top of Rock Stop 10:15 @4.0 Weld lugs Start 10:45 Stop 11:40 discharged pl[illegible] Start 12:45
	4	1 hr 3 min	@ 4.1 Dolomite - Buff - Grey Hard - Siliceous - with Chert - Nodules - Grey Brown				
	5	1 hr 25min	@ 4.5 Dolomite - Grey - Mod Hard - Siliceous				
		1 hr 3min	@ 5.3 Dolomite - Brown - Hard Siliceous		Milky	Smooth	
	6	57 min	@ 6.2 Dolomite - Grey - Hard Siliceous				
	7						
429.0		1 hr 24min					Top of Rock [illegible] 1/2[illegible] 81 Start 7:40-41 2 rpm w H20 186.3' stem & DH Assy
	8	1 hr 15min	@ 8.4 Shale - Black - Soft		Grey	Rough	
	9		@ 8.45 Dolomite - Grey - Hard Siliceous				
		57 min	@ 9.4 Dolomite - Light Grey Mod Hard - Hard		Milky	Smooth	
426.44'	10						

052

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | 1 of 3 SHEETS

PROJECT: Norfork Lake Bridges
1 LOCATION: 62-B6-N-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION OF WATER
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR: DRILL

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
426.44	10						con't 4th 2"rpm w/H20 186.3" stem kell & DH Ass Stop 12:14 Grease swivel Start 12:26 Stop 3:05@14.0'
		53 min	Dolomite - Light Grey - Mod Hard - Hard				
	11						
		47 min	@11.4 Dolomite - Grey - Mod Hard		Milky	Smooth	
	12						
		52 min					
	13						
		58 min	@13.4 Shale - Black - Soft @13.5 Dolomite - Grey - Mod Hard - Massive		Grey	Rough	
412.44	14						1/27/81 Start 7:25 4th 2"rpm w H20 186.3' stem kell & DH Assy Stop 10:32 Grease swivel Start 10:38
		45 min					
	15		@15.0 - 15.1 Shale - Black - Soft				
		49 min	@15.1 Dolomite - Grey - Mod Hard - Hard - Massive - Slightly Silic		Milky	Smooth	
	16						
		56 min	@16.1 Dolomite - Buff - Grey Hard - Siliceous				
	17		@17.1 Dolomite - Buff - Brown Hard - Very Hard - Siliceous				
		37 min	@17.6 Dolomite - Buff - Grey Mod Hard - Slightly Silic Fractures		Muddy	Rough	
	18						
		53 min	@17.8 - 18.2 Cavern - Clay and Calcite crystal filled (est -1/8 of hole)				
	19						
		41 min	@18.3 Dolomite - Grey - Mod Hard Hard - Fractured Silic		Milky	Smooth	
	20						

053

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 3 sheets

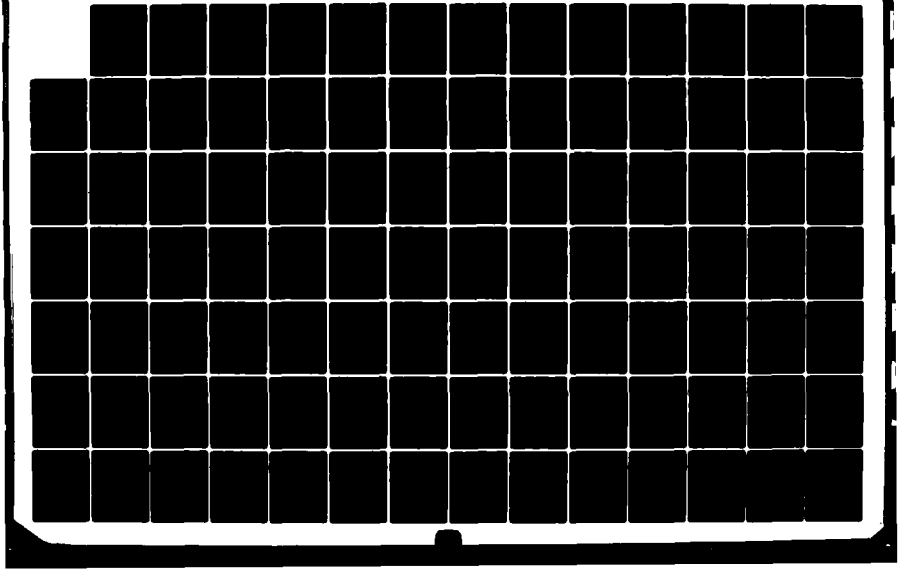
1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P6-N-Socket
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION OF WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

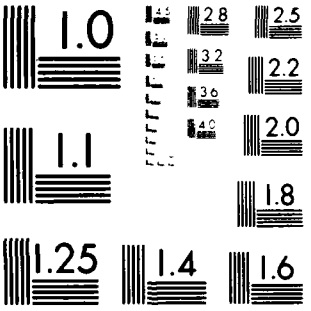
ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
416.44'	20					Drill	
	21	43 min	Dolomite - Grey - Mod Hard - Silic - Fracture				1/27/81 4th 27rpm w/H20 186.3' stem kell DH Assy Stop 2:10 Grease Swivel Start 2:23 Stop 3:13
			@ 20.6 Dolomite - Buff - Mod Hard - Silic - Fracture				
	22	35 min	@ 21.9 Dolomite - Dark Grey - Mod Hard - Massive				
	23	40 min					
		39 min					
	24						
412.04		32 min			Milky	Smooth	1/27/81 1/28/81 Start 7:10 4th 2 rpm w H20 186.3' stem kell & DH Assy
	25	24 min					
	26		@ 26.2 Dolomite - Dark Grey - Mod Hard - Fractured				
		18 min					
	27						
		16 min					Design Bottom of Rock Socket 409.0
	28						
408.2							Bottom of Rock Socket

AD-A130 553 NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

2/5

UNCLASSIFIED F/G 13/13 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DRILLING LOG | Project No. DACW [illegible]-79-C-0055 | Contractor: Marsman Construction Co. | Sheet 1 of 3 Sheets

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102 Smith-Rock
2 LOCATION: 62-P6-S-Socket	11 Elevation of Bottom of Hole: 408.5'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven Hains
4 HOLE NO.	13 Casing Record: Depth 121.0, Type 10'OD
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water.
7 Boring Method: Reverse Rotary	16 DATE HOLE: STARTED 1/29/81, COMPLETED 2/4/81
8 DEPTH DRILLED INTO ROCK: 25.90	17 ELEVATION TOP OF HOLE: 556.38' Platform
9 TOTAL DEPTH OF HOLE: 29.73	18 TOTAL CORE RECOVERY FOR BORING: 437.73 TOG, 433.9 TOR
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
437.73'							1/29/81 Start 12:58 1st 7rpm w/H2o 186.3' stem - kelly & DH Assy 4th @ 2:09 4.3' Stop 2:45
	1	11 min	SAND				
	2	16 min	AND		muddy Grey	ROUGH	
	3	16 min	CEMENT GROUT				
433.9'	4	11 min	Average Top of Rock Dolomite - Grey - Mod Hard - Hard - Massive				
		57 min					
432.73'	5						1/29/81
		1 hr. 12 min	@ 5.4 Cherty - Dolomite - Brown - Grey - Hard @ 5.7 Dolomite - Grey - Mod Hard - Hard				2/2/81 Start 8:00 4th 27rpm no H2O 186.3' stem kelly & DH Assy H20 lines frozen Stop 12:36 Grease swivel Start 12:53
	6						
		1 hr. 9 min					
	7		@ 6.8 Dolomite - Grey - Hard Silic		MILKY	SMOOTH	
		1 hr. 17min					
	8						
		1 hr. 2 min					
429.00'			@ 8.8 Dolomite - Grey - Mod Hard - Hard				Top of Rock Socket
	9						
		47 min					
	10						

055

DRILLING LOG | Project No. DACW [illegible]79-C-0055 | Contractor: Massman Construction Co. | of 3 sheets

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P6-S-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION OF WATER
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
427.73	10						186.3' kelly & DH Assy 4th 27rpm No H2O Stop 3:12 @11.3
							2/2/81
							2/3/81 Start 7:52 4th rpm No H2O 186.3' kelly & DH Assy Stop 9:06 Unhook H2O lines Start 9:38 Stop 3:17 @20.0
	11	1 hr 6min	Dolomite - Grey - Mod Hard				
			@ 10.9 Dolomite - Light Grey - Mod Hard - Massive				
	12	1 hr 16min					
		39 min			MILKY	SMOOTH	
	13						
	14	52 min	@ 13.5 Dolomite - Dark Grey - Massive - Mod Hard - Hard				
		43 min					
	15		@ 15.2 Shale - Black - Soft				
		44 min	@ 15.3 Dolomite - Dark Grey - Mod Hard - Hard - Slightly Silic		GREY	ROUGH	
	16						
		55 min					
	17		@ 16.8 Dolomite - Brown - Grey Hard - Siliceous				
		49 min			MILKY	SMOOTH	
	18		@ 18.2 Dolomite - Grey - Hard Siliceous - Vuggy with calcite filled vugs				
		43 min					
	19		@ 19.1 Dolomite - Grey - Hard Siliceous - Vuggy - Clay filled				
		36 min			MUDDY		
	20						

056

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW [illegible]9-C-0055 | Contractor: Massman Construction Co. | 1 of 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P6-S-Socket
3 Geotechnician:
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION OF WATER
16 DATE HOLE STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
417.73'	20						2/4/81
		37 min	Dolomite - Grey - Hard Siliceous - Vuggy with clay filled vugs @20.2		MUDDY		Start 7:55 @20.0 4th 27 rpm w/H20 186.3' kelly & DH ASSY
	21		Dolomite - Grey - Hard - Siliceous - Fractured with Iron Stains on Frac. @21.1				Stop 1:06 BOH
		44 min	Dolomite - Buff - Mod Hard - Slightly Fractured				
	22						
		34 min	@22.6 Dolomite - Grey - Mod Hard - Massive				
	23						
		37 min			MILKY	SMOOTH	
	24						
		35 min					
	25						
		38 min					
	26						
		27 min					
	27						
		29 min	@27.8 Shale - Black - Soft @27.85 Dolomite - Grey - Mod Hard - Massive		GREY	ROUGH	
	28						
		24 min					
	29						
		6min			MILKY	SMOOTH	057
408.0'							Bottom of Rock Socket

HOLE NO

LING LOG | DACW 03-79-[illegible] | Massman Construction Co. | 3

Norfork Lake Bridges	11 SIZE AND TYPE OF BIT 102" Smith Rock
2 LOCATION 62-P7-N-Socket	12 Elevation of Bottom of Hole 408.9'
3 Geotechnician Robert Schmoker	13 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain Co.
4 HOLE NO	14 Casing Record 121.0 / Depth 432.2 / Type 10' OD ¼" wall
5 NAME OF DRILLER Don Uchtman	15 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT	16 ELEVATION of Water 541.45
7 Boring Method: Reverse Rotary	18 DATE HOLE STARTED 9/10/80 COMPLETED 9/12/80
8 DEPTH DRILLED INTO ROCK 24.8'	17 ELEVATION TOP OF HOLE 446.23 Platform
9 TOTAL DEPTH OF HOLE 29.83'	18 TOTAL CORE RECOVERY FOR BORING 433.6 T.C.R.
	19 SIGNATURE OF INSPECTOR 438.72 T.O.C.

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	1	5 Min	CEMENT GROUT				9/10/80 Start 8:05 No H20 1st gear 7rpm 2nd gear 17rpm @8:33 @2.8' @9:20 @5.6' H20 on H20 off 9:22 (Rough drill action) Stop 10:00 Stem Adj Start10:05 in 3rd gear 26rpm Stop 10:15 Fuel drill engines Start 10:3[illegible] Stop 11:02 Start 11:11 w/H2o 2nd gear 17 rpm Stop 11:30 10' can adjustment Start 2:20 2nd w/H20 17rpm 1st gear @7.2:35 2nd gear @3:40 @7.5 3rd @4:04 @7.5'
	2	10 Min					
	3	17 Min			Milky	Smooth	
	4	8 Min					
	5	11 Min					
433.6			Top of Rock				Avg. Top of Rock
	6	54 Min	Dolomite - Buff - Mod Hard w/occasional chert nodules				
432.2	7	1 Hr 41 Min					Bottom of Casing
	8	1 Hr 40 Min					Stop 4:15 [illegible].
	9	25 Min					
	10	27 Min					
428.90							Top of Rock Socket

058

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P7-N-Socket

1 DRILLING CO.	2 CONTRACT NO. DACW 03-79-C-0055	3 NAME OF CONTRACTOR Norman Construction Co.	4 SHEET 1 of 3
5 PROJECT Norfork Lake Bridges		11 SIZE AND TYPE OF BIT Elevation of Bottom of Hole	
6 LOCATION 62-P7-N-Socket		12 MANUFACTURER'S DESIGNATION OF DRILL	
7 Geotechnician		13 Casing Record Depth Type	
8 HOLE NO.		14 TOTAL NUMBER CORE BOXES	
9 NAME OF DRILLER		15 ELEVATION of Water	
10 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		16 DATE HOLE STARTED COMPLETED	
20 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
21 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	
22 TOTAL DEPTH OF HOLE		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
428.73							
		28 Min	Dolomite - Grey - Buff Mod Hard - Frac				Stop 11:37 Mark Kelly Start 11:39
	11						
		25 Min					
	12		@ 11.9 - 12.3 - Clay - Red Filled pod 1/3 of hole				
		23 Min	@ 12.3 - Dolomite - Grey Mod Hard - Slightly Frac				
	13				Milky	Smooth	
		20 Min					
	14						
		20 Min	@ 14.6 Dolomite - Buff - Grey - Mod Hard - Intensely Frac				
	15						
		22 Min					
	16						
		20 Min					
	17						
		30 Min	Dolomite - Grey - Mod Hard				
	18						
		22 Min					
		27 Min					059

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO. 62-P7-N-Socket

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | of 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P7-N-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	21	21 Min	Dolomite - Grey - Mod Hard				3rd gear 26rpm 176.8' Stem & DH Assy. w/H20 1st @1:45 H20 off Stop 2:19 Drill Adj. Start 3:20 1st 7rpm H20 on @3:40 2nd gear 17rpm @3:50 3rd-26rpm @4:00 Stop 4:20
	22	26 Min					
	23	22 Min			Milky	Smooth	
	24	18 Min					
	25	32 Min	@ 24.6 - 25.7 - Cavern over 1/2 of hole w/pink calcite crystals. Clay on bottom of cavern.				
	26	57 Min	Dolomite - Grey - Mod Hard				
	27	29 Min					Start 7:14 3rd 176.8' Stem & DH Assy w/H20 Stop 8:30 @408.9 BOH
	28	34 Min					
	29	18 Min					060
408.8		12 Min	Bottom of Hole				Bottom of Rock Socket

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P7-N-Socket

DACW 03-79-C-0[illegible] [illegible]an Construction Co.

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102@ Smith Rock
2 LOCATION: 62-P7-S-Socket	11 Elevation of Bottom of Hole: 408.9'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M.Hains
4 HOLE NO:	13 Casing Record: Depth 432.0, Type 1/2"
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES: 0
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water: Varies 542.31
7 Boring Method: Reverse Rotary	16 DATE HOLE: STARTED 9/5/80, COMPLETED 9/9/80
8 DEPTH DRILLED INTO ROCK: 23.8	17 ELEVATION TOP OF HOLE: 555.33 T.O. Platform
9 TOTAL DEPTH OF HOLE: 27.0	18 TOTAL CORE RECOVERY FOR BORING: 435.9 T.O. Grout
	19 SIGNATURE OF INSPECTOR: 432.7 T.O. Rock
	553.5 T.O. Can

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
435.9							
	1	10 Min	CEMENT GROUT				Start 12:25 1st gear 7rpm 186.6' Stem & DH Assy w/H20 off
		45 Min					Stop 1:45 Stem Adj and H20 off
	2						Start 2:15 2nd gear 17rpm
		15 Min			Milky	Smooth	@2:16 H20 on
	3						Stop 4:20
							@4.0
432.7		2 Hr 15 Min	Top of Rock				Avg. Top of Rock
			DOLOMITE				
432.0							Bottom of Casing
	4	1 Hr 19 Min					Start 8:26 @4.0 2nd gear 17rpm
	5						W/H20 1186.6 Stem & DH Assy
		1 Hr 35 Min					@9:10 1st gear 7rpm (rough action)
	6						2nd gear @9:25
		1 Hr 2 Min					3rd gear @3:00
	7						@8.7 28rpm
428.9							Stop 3:15 @10.0
							Avg. Top of Rock
							Socket
	8	53 Min					
	9	58 Min					
	10	1 Hr 2 Min					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO 62-P7-S-Socket

DRILLING LOG | MACH 03-79-C-[illegible] | [illegible]ion Co.

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P7-S-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15 ELEVATION of Water.
7 Boring Method: Rotary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
425.9							
	11	1 Hr 15 Min	Dolomite - Mod Hard Buff - Grey			2nd	Start @10.0 7:45 gear w/H20 186.6 Stem & DH Assy 17rpm 3rd gear 26rpm @10.8- 8:50 Stop 1:32 Mark kelly Start 1:35
	12	35 Min					
	13	30 Min			Milky	Smooth	
	14	35 Min	@ 13.5 Thin shale seam - .05' w/pyrite crystals @ 13.6 Dolomite - Grey - Mod Hard				
	15	25 Min					
	16	32 Min					
	17	28 Min					
	18	30 Min					
	19	30 Min					
	20	27 Min					061

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P7-S-Socket

DRILLING LOG | DACW 03-79-C-[illegible] | Museman Construction Co. | SHEET 3 OF [illegible] SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P7-S-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
	21	20 Min	Dolomite - Buff & Grey Mod Hard - w/numberous healed fractures in buff				
	22	16 Min	@ 21.3 - .05' TK seam filled with calcite crystals & purite shale				
	23	29 Min	@ 21.35 - 21.9 - Chert - Grey - dark grey - hard				
	24	26 Min	@ 21.9 - Dolomite - Grey & Buff - Mod Hard		Milky	Smooth	
	25	30 Min					
	26	32 Min					
		31 Min					Start 7:13 3rd gear 26rpm w/H20 186.6 Stem & DH Assy Stop 7:44BOH
408.9	27		Bottom of Hole				Bottom of Rock Socket

062

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P8-N-Socket
3. Geotechnician: Robert Schmoker
4. HOLE NO.:
5. NAME OF DRILLER: Don Uchtman
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7. Boring Method: Reverse Rotary
8. DEPTH DRILLED INTO ROCK: 24.4
9. TOTAL DEPTH OF HOLE: 27.72
10. SIZE AND TYPE OF BIT: 102" Smith - Rock
11. Elevation of Bottom of Hole: 405.8'
12. MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
13. Casing Record: Depth 121.0' Type 10.0'OD
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION of Water: 544.97
16. DATE HOLE: STARTED 3/20/81 COMPLETED 3/23/81
17. ELEVATION TOP OF HOLE: 553.24 TOP
18. TOTAL CORE RECOVERY FOR BORING: 433.52 TOG
19. SIGNATURE OF INSPECTOR (Drill): 430.2 'TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Action	REMARKS
433.52							3/20/81
	1	17 min	CLAY & MUD		Muddy	Rough	Start 3:10 1st 7rpm w/H20 186.3 Stem - Kelly & D&H Assy Stop 4:15
	2	27 min	CEMENT GROUT				
		21 min					
430.52	3		CLAY & MUD				3/20/81
430.20		1hr	Average Top of Rock				3/21/81
		21min	Dolomite - Buff - Grey Mod Hard - Hard-Siliceous				Start 7:35 1st 7rpm w/H20 186.3' Stem kelly & dh Assy @3.3 2nd 17rpm 3.4 4th 27rpm
	4	49 min	4.4 Dolomite - Brown - Hard Silic				
	5	55 min	5.4 Dolomite - Highly Siliceous Brown - Grey - Hard - Slightly Fractured		Milky Brown	Smooth	
	6	52 min	5.7 Dolomite - Light Grey - Mod Hard				
	7	38 min					
	8	42 min	8.9 - 8.95 Shale Seam - Black - Soft		Grey	Rough	
	9	41 min	8.95 Dolomite - Dark Grey - Hard - Hard - Silic		Milky	Smooth	
423.52	10						

063

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT	
2. LOCATION: 62-P8-N-Socket		11. Elevation of Bottom of Hole	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO.		13. Casing Record	Depth / Type
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15. ELEVATION of Water	
7. Boring Method: Rotary		16. DATE HOLE: STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING	%
		19. SIGNATURE OF INSPECTOR (Drill)	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
423.52	10	39 min	Dolomite - Dark Grey - Silic - Mod Hard - Hard		Milky	Smooth	4th 27rpm w/H20 186.3' Stem - Kelly & DH Assy. Stop 3:16 @12.6
			10.6 - 10.65 Shale Stem - Black - Soft		Grey	Rough	
	11	40 min	10.65 Dolomite - Grey - Hard Silic				
	12	41 min	12.3 - 12.5 Shale - Black - Soft				3/21/81
419.92			12.5 Dolomite - Grey - Hard Silic		Milky	Smooth	3/23/81 Start 7:30 4th 27rpm w/H20 186.3' Stem - Kelly DH Assembly
	13	40 min	13.1 Dolomite - Dark Grey - Mod Hard 13.8 Dolomite - Brown - Hard Silic				
	14	31 min	14.6 - 14.8 Clay filled cavern (Est. less than ¼ hole)				
	15	28 min	14.8 Dolomite - Light Buff Hard - Silic Fractures with Iron Stains		Muddy	Rough	
	16	39 min	16.6 Dolomite - Light Buff - Mod Hard Hard-Sly. Silic-Sly.Frac.				
	17	30 min	17.1 Dolomite - Grey - Mod Hard		Milky	Smooth	
	18	38 min	18.4 Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
	19	27 min	19.2 Dolomite - Dark Grey Mod Hard				
413.52	20						

064

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS
PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 62-P8-N-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR (Drill)	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Action	REMARKS
413.52	20						
		28 min	Dolomite - Dark Grey - Mod Hard				4th 27rpm w/H20 186.3 Stem Kelly & DH Assy Stop 3:00 BCH
	21						
		31 min			Milky		
	22						
		26 min	22.6 - 22.9 Shale Seam - Black - Soft		Grey		
	23		22.9 Dolomite - Buff - Mod Hard - Slightly Frac.			Smooth	
		30 min			Milky Brown		
	24						
		30 min	24.6 Dolomite - Brown - Hard Very Hard - Highly Siliceous		Milky		
	25						
		27 min	25.6 Dolomite - Buff - Mod Hard - Fractures				
	26				Milky Brown		
		22 min	26.5 Dolomite - Grey - Mod Hard - Weathered with Iron Stains		Milky		Design Bottom of Rock Socket 406.8
	27						
405.8'		1/2 MIN.	Bottom of Rock Socket				

065

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0015	Contractor: Massman Construction Co.	SHEET 1 OF 4 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 62-P8-S-Socket		11 Elevation of Bottom of Hole: 405.7'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO: 1		13 Casing Record: Depth 121.0; Type 10' ϕD	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water: 544.79	
7 Boring Method: Reverse Rotary		16 DATE HOLE: STARTED 3/14/81; COMPLETED 3/18/81	
8 DEPTH DRILLED INTO ROCK: 28.8'		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE: 31.65'		18 TOTAL CORE RECOVERY FOR BORING: %	
		19 SIGNATURE OF INSPECTOR: (Drill)	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
437.35							
	1	50 min	CEMENT GROUT		Muddy	Rough	Start 2:16 1st 7rpm w/H20 186.3 Stem Kelly & DH Assy Stop 3:15 @1.5
435.86	2	21 min	CLAY MUD				3/16/81 Start 1st 7rpm w/H20 186.3 Stem Kelly &DH Assy @7.5 - 2.8 2nd
	3	33 min	Average Top of Rock				17rpm Stop 8:1
434.5'			Dolomite - Brown - Mod Hard - Hard - Slightly Silic				Grease Swivel Weld Stem bolt lugs. Start 9:30 4th 27rpm
	4	54 min	3.2 Dolomite - Grey - Hard Silic				@9.30 1st 7rpm
		44 min	3.9 Dolomite - Grey - Mod Hard - Slightly Frac. 4.8				6.7 - 7.0 @7.0 4th 27rpm Stop 2:33 Crane Repair Start 2:55
	5		Dolomite - Grey - Brown Mod Hard - Hard - Slightly Silic		Milky	Smooth	
	6	47 min					
		46 min	6.7-7.0 Clay filled cavern - Red (Est. 1/8 of hole)				
	7		7.0 Dolomite - Grey - Brown Hard Silic		Red	Rough	
		40 min	7.4 Dolomite - Grey - Brown Hard - Silic - Fractured (Brown clay filled frac		Muddy		
	8		8.2 Dolomite - Grey - Mod Hard				
		1hr 1min	8.4 Dolomite - Grey - Hard Silic			Smooth	
	9		9.8 Shale Seam - Black - Soft		Milky		
		49 min	9.9 Dolomite - Grey - Hard Silic				
427.35	10						

066

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Maesman Construction Co.	SHEET 2 OF 4 SHEETS
1. [illegible] Norfork Lake Bridges		10. SIZE AND TYPE OF BIT	
2. LOCATION 62-P8-S-Socket		11. Elevation of Bottom of Hole	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO.		13. Casing Record / Depth / Type	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION of Water	
7. Boring Method: Rotary		16. DATE HOLE STARTED / COMPLETED	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR (Drill)	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	~~Water~~ Loss	Water Color	~~Water~~ Action	REMARKS
427.35'	10						4th 27rpm w/H20 186 3' Stem - Kelly & DH Ass'y Stop 4:15 @11
							3/16/81
							3/17/81 Start 7:43 4th 27rpm w/H20 186 3' Stem- Kelly & DH Ass'y
426.25'	11	50 min	Dolomite - Grey - Hard Silic				
			10.2 Dolomite - Light Grey - Mod Hard				
	12	34 min					
		39 min	12.2 Dolomite - Brown - Mod Hard		Milky		
	13	43 min	13.5 Dolomite - Grey - Mod Hard				
	14	44 min	14.9 Shale - Black - Soft			Smooth	
	15	39 min	15.0 Dolomite - Grey - Mod Hard		Grey		
			15.4 - 15 45 Shale - Black - Soft				
	16	39 min	15.45 Dolomite - Grey - Mod Hard - Hard - Slightly Silic		Milky		
	17	42 min	16.7 Shale Pod (Est1/3 of hole) Black - Soft - Pyritic		Grey		
	18		17.1 Dolomite - Grey - Hard Silic				
	19	40 min	18.2 Dolomite - Brown - Hard Highly Siliceous		Milky		
			19.1 - 19 4 Chert - Black - Hard				
		39 min	19.4 Dolomite - Grey - Very Hard - Highly Siliceous				
417.35'	20						

067

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (OVER)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 4 SHEETS

PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P8--S-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water / 16 DATE HOLE STARTED / COMPLETED
7 Boring Method: Rotary	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING %
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR (Drill)

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
417.35	20						
		52 min	Dolomite - Grey - Hard - Very Hard				4th 27rpm w/H20 186 3 Stem Kelly & DH Assy Stop 3:15 @23.4
	21		20.1 - 20.15 Highly Siliceous Shale - Black - Soft				
		47 min	20.15 Dolomite - Grey - Hard Silic - Slightly Frac.				
			20.9 Dolomite - Light Grey Mod Hard - Hard - Slightly Silic				
	22		21 8				
		37 min	Dolomite - Grey - Mod Hard				
	23						
							3/17/81
413.95		36 min	23.8 Dolomite - Dark Grey - Mod Hard		Milky	Smooth	3/18/81 Start 7:35 4th 27rpm w/H20 186.3 Stem - Kelly & DH Assy
	24						
		44 min					
	25						
		39 min					
	26						
		37 min					
	27		27.2				
		39 min	Dolomite - Grey - Dark Grey - Mod Hard - Hard Slightly Silic				
	28		27 6 - 27.7 Weathered Dolomite - Pod - White - Soft				
		37 min	27 7 Dolomite - Dark Grey Mod Hard				
	29		29 4				
		22 min	Dolomite - Buff - Mod Hard - Fractures				
			29 6 Dolomite - Grey - Mod Hard				
407.35	30						

068

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 OF 4 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P8-S-SOcket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE / STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
407.35	30						
		32 min	Dolomite - Grey - Mod Hard				4th 27rpm w/H20
			30.6		Milky	Smooth	186.3 Stem Kelly & DH Assy
	31		Dolomite - Buff - Grey Mod Hard - Slightly Fractured				Stop 12:09 BOH
							Design Bottom of Rock Socket 406.8
405.7'		2 min	Bottom of Rock Socket				

069

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS

1. Norfork Lake Bridges
2. LOCATION 62-P9-N-Socket
3. Geotechnician Robert Schmoker
4. HOLE NO
5. NAME OF DRILLER Don Uchtman
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7. Boring Method: Reverse Rotary
8. DEPTH DRILLED INTO ROCK 26.23
9. TOTAL DEPTH OF HOLE 28.34
10. SIZE AND TYPE OF BIT 102" Smith Rock
11. Elevation of Bottom of Hole 403.07
12. MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain
13. Casing Record | Depth 120' | Type 10' O.D.
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water Various 540.55
16. DATE HOLE | STARTED 10/21/80 | COMPLETED 10/23/80
17. ELEVATION TOP OF HOLE 550.53 Platform
18. TOTAL CORE RECOVERY FOR BORING 429.3 TOR / 431.41 TOC
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
431.41							10/21/80 Start 9:35 1st Gear W/H20 186.2 Stem & DH Assy. 7rpm @10:30 2nd w/H20 17rpm 1.3 3rd @11.:40 2.1 27rpm Stop 12:00 H20 Loss Start 1:50 3rd 27rpm w/H20 Stop 3:35 @5.5 Weld lugs on Stem
	1	20 Min	CEMENT GROUT		Muddy	Rough	
		1 Hr 5 Min					
429.3	2		Top of Rock		Milky		
		1 Hr 13 Min	DOLOMITE - Grey - Dark Grey Hard - Very Hard - Highly siliceous - massive				
	3		@ 3.3 Dolomite - Buff - Mod Hard - Sandy - w/Pink Chert nodules				
		44 Min	@ 3.7 Dolomite - Buff - Mod Hard - weathered				
	4						
		25 Min	@ 4.4 Dolomite - Grey - Mod Hard - Hard - very slightly fractured			Smooth	
	5		@ 4.9 Dolomite - Buff - Grey Mod Hard				
429.91		43 Min	@ 5.4 Dolomite - Grey - Mod Hard - Hard - w/grey chert modules				10/22/80 Start 7:25 186.2' Stem & DH Assy. 3rd 27rpm with H20 Stop 7:45 @6.0' Table Check Start 7:52 Stop 9:02 Table Check Start 9:07
	6		@ 5.9 Dolomite - Grey - Mod Hard - Slightly Fractured				
		48 Min					
	7						
		42 Min	@ 7.6 Dolomite - Grey - Mod Hard - Hard				
	8						
		49 Min	@ 8.3 Shale - Black - soft -		Grey	Rough	
			@ 8.5 Dolomite - Buff - Grey Mod Hard - Slightly Frac				
	9		@ 8.8 Dolomite - Light grey - Mod Hard - Massive		Milky	Smooth	
		44 Min					
	10						

070

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P9-N-Soc

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 Norfork Lake Bridges	11 Elevation of Bottom of Hole
2 62-P9-N-Socket	12 MANUFACTURER'S DESIGNATION OF DRILL
3 Geotechnician	13 Casing Record / Depth / Type
4 HOLE NO	14 TOTAL NUMBER CORE BOXES
5 NAME OF DRILLER	15 ELEVATION of Water
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	16 DATE HOLE STARTED / COMPLETED
7 Boring Method: Rotary	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
421.41	10						186.2' Stem & Down Hole Assembl 3rd 27rpm w/H20 Stop 12:43 Grease Kelly Start 1:11 Stop 2:09 Broken H20 Hose Start 3:23 Stop 4:15
		40 Min	DOLOMITE - Light Grey - Mod Hard - Massive				
	11		@ 10.9 - 11.0 Shale seam - Black - Soft				
		35 Min	Dolomite - Mod Hard - Buff - Grey - Slightly Fractured				
	12						
		32 Min	@ 12.2 Dolomite - Mod Hard - Grey		Milky		
			@ 12.9 - 13.0 Shale - Black - Soft				
	13		@ 13 Dolomite - Buff - Grey Mod Hard - Slightly Frac			Smooth	
		35 Min					
			@ 13.8 Dolomite - Buff - Grey - Mod Hard				
	14						
		31 Min					
	15						
		30 Min	@ 15.6 Dolomite - Buff - Mod Hard - Frac				
415.41	16						10/23/80 Start 8:11 186.2' Stem & DH Assy. 27rpm w/H20 3rd 1st Gear @8:55 (Rough Drilling in cavern area) 17.2 - 18.1 3rd Gear @ 18.5 @9:10 .
		36 Min					
	17		@ 17.2 Chert - brown - Grey				
		18 Min	Small Cavern - approx. 1/8 of hole - Siltstone filled @ bottom 17.8 - 18.1		Muddy	Rough	
	18		@ 18.1 Dolomite - Buff - Mod Hard - intense frac - Extreme weathering on fractures				
		38 Min					
	19		@ 18.6 Dolomite - Buff - Mod hard - slightly fractured		Milky	Smooth	
		33 Min					
	20						

071

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO 62-P9-N-Soc

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 of 3 SHEETS

1. Norfork Lake Bridges
2. LOCATION 62-P9-N-Socket
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
411.41	20						186.2' Stem & Down Hole Assy 3rd w/ H20 27 rpm Stop 1:41 BOH
	21	30 Min	DOLOMITE - Mod Hard - Buff - Slightly Fractured			Smooth	
		29 Min					
	22	27 Min	@ 22.1 Dolomite - Mod Hard Grey - Massive @ 22.5 - 22.6 Shale Seam - Black - Soft @ 22.6 Dolomite - Grey - Mod Hard		Milky Grey	Rough	
	23	34 Min			Milky	Smooth	
	24	29 Min					
	25	24 Min					
	26	27 Min	@ 25.8 - 25.85 Shale Seam Black - Soft @ 25.85 Dolomite - Grey - Mod Hard @ 27.15 - 27.2 - Shale - Black - Soft @ 27.2 Chert - Brown - Hard		Grey Milky	Rough Smooth	
	27				Grey Milky	Rough Smooth	Design Bottom of Rock Socket 404.2
403.07			Bottom of Hole				

072

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P9-N-Soc

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | CONTRACTOR: Maseman Construction Co. | SHEET 1 OF 3

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith Rock
2 LOCATION: 62-P9-S-Socket	11 Elevation of Bottom of Hole: 403.14
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hain
4 HOLE NO	13 Casing Record: Depth 120.0' / Type 10' O.D.
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water: Various 540.87
7 Boring Method: Reverse Rotary	16 DATE HOLE: STARTED 10/28/80 / COMPLETED 10/30/80
8 DEPTH DRILLED INTO ROCK: 25.16	17 ELEVATION TOP OF HOLE: 549.33 Platform
9 TOTAL DEPTH OF HOLE: 26.99	18 TOTAL CORE RECOVERY FOR BORING: 430.13 TOG
	19 SIGNATURE OF INSPECTOR: 428.3 TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
430.13							
	1	15 Min	CEMENT GROUT		Grey		10/28/80 Start 2:10 186.2' Stem & DH Assy 1st 7rpm No H20 H20 on @ 3:06 @1.2 @3:12 1.3' 2nd 17rpm @2' 1st 7rpm (Rough Drill Action-Extremely Frac. Rock) @4:00 3.1' H20 Stop 4:12
		55 Min	Average Top of Rock				
428.3	2	25 Min	DOLOMITE - Buff Grey-Mod Hard- w/Fe stains on frac planes - very fractured		Milky		
427.03	3	1 Hr 17 Min	Chert - brown Dolomite - Buff- Mod Hard Slightly Frac - FE stained Dolomite - Mod Hard - Grey				10/29/80 Start 7:40 2nd 17rpm No H2[illegible] 186.2' Stem & DH Assy. H20 @ 7:50 @3.4 3rd 27rpm @ 7:5[illegible] Stop 9:55 Weld lugs on St[illegible] Start 9:15
	4						
	5	30 Min					
	6	40 Min	Chert Dolomite - Grey - Mod Hard Dolomite - Buff - w/healed frac - Fe stained - Mod Hard			Smooth	
	7	50 Min	Dolomite - Mod Hard - Grey - Buff				
	8	45 Min	Estimate: Decomposed limestone pod 1/8 of hole .1' thick Dolomite - Mod Hard - Grey - Buff				
	9	45 Min					
	10	40 Min	@9.8 Dolomite - Buff - Grey Vuggy w/Calcite filled Vugs				073

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P9-S-Socke

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 3 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P9-S-Socket
3. Geotechnician
4. HOLE NO
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
420.13	10						3rd 27rpm w/H20 186.2' Stem & DH Assy. 2nd 2:05 - 2:10 Rough Action in Decomposed l.s. 3rd @2:10 Stop 3:00 @13.1
		40 Min	Dolomite - Buff - Grey Vuggy - w/calcite filled vugs @ 10.2 Dolomite - Brown - Grey = Mod Hard - Hard - Siliceous				
	11						
		40 Min	@ 10.8 to 10.85 & 11.3 - 11.35 Shale - Black - soft @ 10.85 Dolomite - Buff - Grey - Mod Hard - Hard - Slightly siliceous - Slightly fractured				
	12						
		40 Min	@ 11.7 - 11.75 Decomposed Limestone @ 11.75 Dolomite - buff - grey - Mod Hard - slightly fractured		Milky	Smooth	
417.03	13						10/30/80 Start 7:31 3rd 27rpm w/H20 186.2' Stem & DH Assy. Stop 8:22 @14.5 Swivel Check Start 8:32 11:25 1st Caver
		34 Min	@ 13.6 Dolomite - Buff - Mod Hard - Fractured				
	14		@ 14.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac				
		38 Min	@ 15.7 - 15.9 - Claystone - Brown - Soft @ 15.9 - 16.0 - Shale - Black - soft				
	15		@ 16.1 Dolomite - Grey - Buff - Mod Hard - Slightly Fractured				
		37 Min			Muddy	Rough	
	16						
		30 Min				Smooth	
	17		@ 17.4 to 17.5 Decomposed limestone seam soft				
		30 Min	@ 17.5 - Dolomite - Buff - Mod Hard - Slightly Frac			Rough	
	18				Milky		
		30 Min	@ 19.1 - 19.3 Small cavern Calcite crystals			Smooth	
	19		@ 19.3 Dolomite - Buff - Grey - Mod Hard - Slightly Fractured			Rough	
		30 Min	@ 19.8 Small Cavern			Smooth Rough	074

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P9-S-Socket
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
410.13	20						186.2' Stem & DH Assy 1st 7rpm H20 Off @ 11:45 On at 11:52 Rough Drill Action in Cavern @21.1 2nd 17rpm 3rd @ 12:45 @22.2' 27rpm Stop 2:43 BOH
		30 Min	Cavern - Cont. 19.8 - 21.1 Approximately 1.8 of hole in Dolomite - Grey - Mod Hard			Rough	
	21						
		38 Min	@ 21.1 Chert - Brown - Milky - Hard DOLOMITE - Buff - Mod Hard - Fractured				
	22				Milky		
		47 Min					
	23						
		30 Min				Smooth	
	24						
		23 Min	@ 25.5 Dolomite - Grey - Mod Hard @ 25.85 - 25.9 - Shale - Black - Soft				
	25						
		30 Min	@ 25.9 - Dolomite - Grey - Mod Hard				
	26						Design Bottom of Rock Socket 404.2
	27		Actual Bottom of Hole 403.14				

075

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P9-S-Soc

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P10-N-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 25.2
9 TOTAL DEPTH OF HOLE: 28.69
10 SIZE AND TYPE OF BIT: 102" Smith-Rock
11 Elevation of Bottom of Hole: 403.2
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M, Hains
13 Casing Record: Depth 128.5' Type 10 OD
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water: 546.28
16 DATE HOLE: STARTED 4/2/81 COMPLETED 4/5/81
17 ELEVATION TOP OF HOLE: 557.74 TOP
18 TOTAL CORE RECOVERY FOR BORING: 431.89 TOG
19 SIGNATURE OF INSPECTOR: 428.4 TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
431.89							Start 12:44 1st 7rpm w/H2o 186.3 Stem Kelly & DH Assembly @4.0 - 2:09 4th 27rpm Stop 4:15 @5.5
	1	5min	SAND				
		36min	CEMENT GROUT		Muddy	Smooth	
	2	6 min	CLAY AND MUD				
	3						
428.4'		28 min	Average Top of Rock Dolomite - Grey - Hard Highly Sicileous			Rough	
	4						
		1 hr. 51 min					
	5		5.2 Dolomite - Grey - Mod Hard				
426.39		50 min					4/2/81 4/3/81 Start 7:31 4th 27 rpm w/H20 186.3 Stem Kelly DH Assembly
	6		5.9 - 5.95 Shale Seam - Black - Soft				
		40 min	5.95 Dolomite - Grey - Hard - Silic				
	7		6.7 Dolomite - Grey - Brown Hard Highly Siliceous		Milky	Smooth	
		38 min					
	8		7.9 Dolomite - Light Grey - Mod Hard				
		34 min					
	9						
		34 min					076
421.89							

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 62-P10-N-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
421.89	10						4th 27rpm W/H20 186.3 Stem Kelly & DH Assy @2:45 1st 7rpm (cavern) @18.3' 4th 27rpm Stop 4:18 @ 18.5'
		34 min	Dolomite - Light Grey - Mod Hard 10.4				
	11		Dolomite - Grey - Mod Hard Hard - Slightly Silic 10.8				
		31 min	Dolomite - Grey - Mod Hard				
	12						
		41 min	12.6 - 12.8 Dolomite - Grey - Mod Hard Vuggy - Filled with Pink Calcite crystals				
	13		12.8				
		30 min	Dolomite - Buff - Grey - Mod Hard 13.0 - 13.1 Shale Seam - Black - Soft				
	14		13.1 Dolomite - Grey - Mod Hard		Milky	Smooth	
		31 min					
	15						
			15.2 Dolomite - Buff - Grey - Mod Hard				
		41 min					
	16		15.9 Dolomite - Buff - Slightly Fractured - Mod Hard				
		36 min					
			16.8 Dolomite - Brown - Hard Silic				
	17						
		49 min	17.6 - 18.3 Cavern (Est. Less than 1/3 of hole in above Dolomite)			Very Rough	
	18						
413.39		1 hr. 25 min	18.6 Dolomite - Brown - Mod Hard Hard Slightly Silic - Slightly Fractured				4/3/81 4/4/81 Start 7:35 4th 27 rpm w/H20 186.3 Stem Kelly & DH Assembly
	19					Smooth	
			19.2 Dolomite - Buff - Mod Hard - Slightly Fractured				
		33 min					
411.89	20						

077

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P-N-Socket
3 Geotechnician
4 HOLE NO: 1
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	~~Water~~ Loss	Water Color	Drill Action	REMARKS
411.89	20		Dolomite - Buff - Mod Hard Slightly Fractured				4th 27rpm w/H20 186.3 Stem Kelly & DH Assy Stop 12:11 BOH
		33 min					
	21						
		27 min					
	22		22.1 Dolomite - Dark Grey - Mod				
		29 min	Hard - Massive				
	23				Milky	Smooth	
		32 min					
	24						
		31 min					
	25						
		28 min					
	26						
		22 min	26.5 - 26.6 Shale Seam - Black = Soft 26.6 Dolomite - Grey - Mod Hard				
	27						
		19 min	27.6 Dolomite - Buff - Grey Mod Hard				Design Bottom of Rock Socket 404.5
	28						
403.20			Bottom of Rock Socket				

078

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

...LING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS
... Norfork Lake Bridges		10 SIZE AND TYPE OF BIT 10 2"SMith-Rock	
... H62-P10-S-Socket		11 Elevation of Bottom of Hole 403.5	
1 Geotechnician Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL Steven M Hains	
4 HOLE NO		13 Casing Record: Depth 128.5' Type 10 OD	
5 NAME OF DRILLER Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE X VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water 546.01	
7 Boring Method: Reverse Rotary		16 DATE HOLE STARTED 3/30/81 COMPLETED 4/1/81	
8 DEPTH DRILLED INTO ROCK 25.1		17 ELEVATION TOP OF HOLE 558.15 TOP	
9 TOTAL DEPTH OF HOLE 29.05		18 TOTAL CORE RECOVERY FOR BORING 432. 55 TOG	
		19 SIGNATURE OF INSPECTOR 428. 6 TOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
432.55							Start 1:15 186.3 Stem Kelly & DH Assy 1st 7rpm w/H20 @4.0' 4th 27rpm Stop 4:16 @5.0'.
	1	5min	SAND			Smooth	
	2	6min			Muddy		
		44min	CEMENT GROUT				
	3	51min	CLAY - MUD			Rough	
428.6'	4		Average Top of Rock				
		1 hr 15min	Dolomite - Grey - Hard - Silic - w/Chert Nodules 4.8 Dolomite - Grey - Mod Hard				
427.55'	5						3/30/81
	6	39min	5.9 Dolomite - Sandy - Well rounded Qtz sand - Buff Mod Hard Dolomite 6.2 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic		Milky	Smooth	3/31/81 Start 8:01 4th 27rpm w/H20 186.3 Stem Kelly & DH Assy Stop 9:37 Tighten swivel packing Start 10:03
		1 hr					
	7	46min	6.9 Dolomite - Grey - Hard - Silic				
	8	44min	8.4 Dolomite - Grey - Hard Silic w/Brown Chert Seams 8.9 Dolomite - Grey - Hard - Silic				
	9	46min					
422.55'	10						

079

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 2 OF 3 SHEETS

Norfork Lake Bridges
LOCATION H62-P10-S-Socket
Geotechnician
HOLE NO
NAME OF DRILLER
DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
Boring Method: Rotary
DEPTH DRILLED INTO ROCK
TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT
Elevation of Bottom of Hole
MANUFACTURER'S DESIGNATION OF DRILL
Casing Record | Depth | Type
TOTAL NUMBER CORE BOXES
Elevation of Water
DATE HOLE | STARTED | COMPLETED
ELEVATION TOP OF HOLE
TOTAL CORE RECOVERY FOR BORING %
SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
422.55	10		con't				
		43min	Dolomite - Grey - Hard - Silic @10.2 Dolomite - Light Grey - Mod Hard				4th 27rpm w/H20 186.3 Stem Kelly DH Assy Stop 4:17
	11	31min					
	12	34min	12.5 Dolomite - Brown - Mod Hard Massive		Milky		
	13	34min	13.1 Dolomite - Grey - Mod Hard				
	14	25min	14.8-14.95 Shale - Black - Soft 14.95 Dolomite - Grey - Grey - Hard - Silic - Massive		Grey	Smooth	
	15	27min	15.5 - 15.6 Shale - Black - Soft 15.6 Dolomite - Grey - Mod Hard		Milky Grey		
	16	31min	16.7 - 16.8 Shale - Black - Soft 16.8 Dolomite - Grey - Mod Hard Hard - Slightly Silic		Milky Grey		
	17						
415.25		38min	17.6 Dolomite - Buff - Grey Mod Hard				3/31/81 4/1/81 Start 8:00 4th 27rpm W/H20 186.3 Stem Kelly & DH Assy
	18	35min	18.7 Dolomite - Light Brown Hard Silic		Milky		
	19	29min	19.6 Dolomite - Light Brown Mod Hard				
412.55	20						

080

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSCRIPT)

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 of 3 SHEETS

Norfork Lake Bridges
LOCATION H62-P10-S-Socket
Geotechnician
HOLE NO
NAME OF DRILLER
DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED DEG FROM VERT
Boring Method: Rotary
DEPTH DRILLED INTO ROCK
TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT
Elevation of Bottom of Hole
MANUFACTURER'S DESIGNATION OF DRILL
Casing Record | Depth | Type
TOTAL NUMBER CORE BOXES
ELEVATION of Water
DATE HOLE STARTED COMPLETED
ELEVATION TOP OF HOLE
TOTAL CORE RECOVERY FOR BORING %
SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
412.55	20						4th 27rpm w/H20 186.3 Stem kelly & DH Assy Stop 1:57 BOH
		27min	Dolomite - Light Brown - Mod Hard 20.1 - 20.6			Rough	
	21		Dolomite - Grey - MOD Hard Hard with Grey Chert Nodules Vuggy 20.6				
		38min	Dolomite - Light Brown - Mod Hard - Slightly Frac with Iron Stains				
	22						
		41min					
	23		23.0 Dolomite - Buff - Grey - Mod Hard				
		28min	Buff with Frac with Iron Stains				
	24		24.2		Milky	Smooth	
		32min	Dolomite - Grey - Mod Hard				
	25						
		26min					
	26						
		29min					
	27						
		31min	27.4 - 27.45 Shale Seam - Black - Soft 27.45 Dolomite - Grey - Mod Hard				
	28						Design Bottom of Rock Socket 404.5
		17min					
403.5'	29		Bottom of Rock Socket				

081

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANS. CSD)

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Sheet 1 of 3 Sheets

4 Name: Norfork Lake Bridges	10 Size and Type of Bit: 102" Smith - Rock
5 Location: 62-P11-N-Socket	11 Elevation of Bottom of Hole: 405.8'
6 Geotechnician: Robert Schmoker	12 Manufacturer's Designation of Drill: Steven Hains
7 Hole No.	13 Casing Record: Depth 120.0' Type 10.0' OD
8 Name of Driller: Don Uchtman	14 Total Number Core Boxes
9 Direction of Hole: ☒ Vertical ☐ Inclined ____ Deg. from Vert.	15 Elevation of Water: 543.62
10 Boring Method: Reverse Rotary	16 Date Hole: Started 2/21/81 Completed 2/24/81
11 Depth Drilled into Rock: 25.6 '	17 Elevation Top of Hole: 552.73' TOP
12 Total Depth of Hole: 27.33'	18 Total Core Recovery for Boring: 432.33' TOG / 430.6' TOR
	19 Signature of Inspector

Elevation	Depth	Drill Rate	Classification of Materials (Description)	Water Loss	Water Color	Drill Action	Remarks
432.33'							
			MUD				Start 9:33
		37 min			Muddy	Smooth	186.3' stem - kelly & DH Assy
	1		CEMENT				1st rpm w/H20 @10:10 4th 27rpm
			GROUT			Rough	Stop 3:15 @8.1'
		39 min					
430.6'			Average Top of Rock				
	2		Dolomite - Dark Grey - Hard - Siliceous with Chert Nodules				
		39 min	2.3 Dolomite - Buff - Grey Mod Hard				
	3						
		38 min	3.6 Dolomite - Buff - Grey Mod Hard - Slightly Frac.				
	4		3.8 Dolomite - Buff - Grey Mod Hard				
		48 min	4.3 Dolomite - Grey - Hard Silic		Milky	Smooth	
	5						
		49 min					
	6						Top of Rock Socket
426.0'							
		42 min	6.9 Shale - Black - Soft				
	7		7.0 Dolomite - Grey - Hard Silic				
		45 min	7.5 Dolomite - Light grey Mod Hard				
424.23'	8						2/23/81
							Start 7:27 @8.1
		38 min					4th 27rpm w/H20
	9						186.3' stem - kelly & DHAssy
		48 min	9.4 Dolomite - Grey - Dark Grey - Mod Hard				
422.33'	10						

082

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	of SHEETS: 2 of 3
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 62-P11-N-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description) (con't)	Water Loss	Water Color	Drill ~~Water~~ Action	REMARKS
	10						
		40 min	Dolomite - Grey - Dark Grey - Mod Hard		Milky	Smooth	4th 27rpm w/H20 186.3' stem - Kelly & DH Assy
	11						
		39 min	11.6-11.8 Shale - Black - Soft		Grey	Rough	
	12		11.8 Dolomite - Grey - Hard Silic		Milky	Smooth	
		35 min	12.1 Dolomite - Light Grey - Mod Hard		Grey	Rough	
	13		12.4-12.5 Shale - Black - Soft		Milky		
		32 min	12.5 Dolomite - Grey - Mod Hard				
	14		12.9 Dolomite - Buff - Mod Hard - Slightly Fractured		Brown	Smooth	
		31 min	13.6-13.9 Dolomite - Buff - Mod Hard - Extremely Frac. with Iron Stains		Milky Brown		
	15		13.9 Dolomite - Buff - Mod Hard - Frac with Iron Stains				
		23 min					
	16		16.6- 16.8 Chert - Grey - Hard				
		22 min	16.8 Dolomite - Buff - Hard Siliceous - Slightly Fractured with Iron Stains			Rough	
	17						
		39 min					
	18				Milky	Smooth	
		39 min	18.2 Dolomite - Buff - Mod Hard fractures with Iron Stains				
	19						
		32 min					
412.33'	20						

083

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Haseman Construction Co. | SHEET: 3 of 3

3 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
4 LOCATION: 62-P11-N-Socket	11 Elevation of Bottom of Hole
5 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
6 HOLE NO.	13 Casing Record: Depth / Type
7 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
8 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 ELEVATION of Water
9 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
10 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
11 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR: Drill

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
412.33'	20		(con't)				
		31 min	Dolomite - Buff - Mod Hard Fractures with Iron Stains				4th 27rpm w/H20 186.3' stem - kelly & DH Assy. Stop 4:45 @ 24.4'
	21		21.2 Dolomite - Buff - Grey Hard - Silic				
		35 min	21.3 Dolomite - Buff - Grey Mod Hard		Milky	Smooth	
	22						
		33 min	22.5 Dolomite - Grey - Mod Hard - Slightly Silic				
	23						
		31 min	23.2 Dolomite - Grey - Mod Hard				
	24						
407.93'							2/23/81
		39 min					2/24/81 Start 7:28 4th 27rpm w/H20 186.3' stem - kelly & DH Assy
	25		25.0-25.1 Shale - Black - Soft & Weathered - Dolomite White - Soft		Grey	Rough	
		23 min	25.1 Dolomite - Buff - Grey Mod Hard - Slightly Fractured		Milky Brown	Smooth	
	26						
		24 min					
	27						
405.0'							Bottom of Rock Socket

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 of 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P11-S-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 25.9'
9 TOTAL DEPTH OF HOLE: 29.13'

10 SIZE AND TYPE OF BIT: 102" Smith - Rock
11 Elevation of Bottom of Hole: 404.8
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven Hains
13 Casing Record: Depth 120.0' | Type 10.0' OD
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water: 543.41
16 DATE HOLE: STARTED 2/17/81 | COMPLETED 2/19/81
17 ELEVATION TOP OF HOLE: 552.63' TOP
18 TOTAL CORE RECOVERY FOR BORING: 433.93' TOG
19 SIGNATURE OF INSPECTOR: 430.7' TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
433 93'							2/17/81 Start 12.06 1st 7RPM w/H20 186.3' Stem-Kelly & D.H.Assy. @1:18 2nd 17RPM @1:44 4th 27RPM Stop 3:10 @5.4
	1	5 min	SAND AND				
	2	34 min	CEMENT GROUT				
	3	8 min	Clay and Sand				
430.7'		1hr 9min	Av. Top of Rock *Dolomite - Grey - Hard Very Hard - Siliceous* 3.8 Dolomite - Buff - Grey Mod Hard		MILKY		
	4	46 min	4.6 Dolomite - Grey - Mod Hard - Hard - Slightly Silic			SMOOTH	
428 53'	5	59 min					2/17/81
	6		5.8 Dolomite - Brown - Grey - Mod Hard				2/18/81 Start 7:37 4th 27RPM with H20 186 3' Stem-Kelly & D.H. Assy.
	7	43 min	6.5 Dolomite - Grey - Hard-Siliceous				
	8	37 min	7.2 Dolomite - Grey - Mod Hard				
426.0'							Top of Rock Socket
	9	52 min					
	10	42 min					
423.93'							

085

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P11-S-SOcket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
423.93'	10		(cont)				
		45 min	Dolomite - Grey - Mod Hard 10.6 Dolomite - Gre_ - Black Hard-Silic				4th 27RPM w/H20 186.3' stem - kelly & D.H. Assy stop 12:22 grease swivel start 12:36 stop 3:17 EOD
	11	49 min	10.8 Dolomite - Grey - Mod Hard				
	12	46 min	12.9-13.0 Shale - Black - Soft				
	13	33 min	13.0 Dolomite - Buff - Grey Mod Hard 13.5-13.6 Shale - Black - Soft				
	14	41 min	13.6 Dolomite - Grey - Mod' Hard 14.5 Dolomite - Buff - Grey Mod Hard (Buff slightly fractured with Iron Stains)		MILKY	SMOOTH	
	15	31 min	14.9 Siltstone - Weathered - Soft - Brown				
417.93	16		15.1				2/18/81
		34 min	Dolomite - Buff - Mod Hard - Fractured				2/19/81 start 8:06 4th 27rpm w/H20 186.30' stem - kelly & DH Assy.
	17	40 min	17.3 Dolomite - Grey - Hard Siliceous				
	18	38 min	18.0 Dolomite - Grey - Hard Siliceous - Fractures with Iron Stains				
	19	41 min	19.4 Dolomite - Buff - Mod Hard				
413.91'	20						

086

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET: 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P11-S-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
413.93	20		(con't)				
		34 min	Dolomite - Buff - Mod Hard				4th 27rpm w/H20 186.3' stem - kelly & DH Assy stop 11:39 grease swivel start 11:53 stop 3:15
	21		20.7				
		38 min	Dolomite - Buff - Mod Hard - S ightly Fractured with Iron Stains		Milky		
			21.4				
	22		Dolomite - Buff - Grey Mod Hard				
		31 min	22.8				
			Shale - Black - Soft				
	23		22.85		Grey	Smooth	
		39 min	Dolomite - Buff - Grey Mod Hard				
			23.4				
	24		Dolomite - Grey - Mod Hard				
		35 min					
	25						
		35 min			Milky		
	26						
		30 min					
			26.7				
	27		Dolomite - Buff - Mod Hard - Slightly Frac.				
		30 min	27.6				
			Dolomite - Buff - Grey Mod Hard				1/18/81 1/19/81 start 4th 27rpm w/H20 186.3' stem - kelly & D.H. Assy Stop 7:43 boh
	28						
		13 min					
404.8	29						Bottom of Rock Socket

087

PROJECT | HOLE NO

1 PROJECT NO. LOC	2 PROJECT DACW 03-79-C-0055	3 CONTRACTOR Massman Construction Co.	4 SHEET 1 of 4
5 NAME Norfork Lake Bridges		10 SIZE AND TYPE OF BIT 102" Smith - Rock	
6 LOCATION 62-P12-N-Socket		11 Elevation of Bottom of Hole 429.8	
7 GEOLOGIST Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains	
8 HOLE NO		13 Casing Record: Depth 91.0; Type 10 OD	
9 NAME OF DRILLER Don Uchtman		14 TOTAL NUMBER CORE BOXES	
10 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water 546.90	
Boring Method: Reverse Rotary		16 DATE HOLE: STARTED 4/13/81; COMPLETED 4/16/81	
11 DEPTH OF ELEVATION ROCK 35.6		17 ELEVATION TOP OF HOLE 558.1 TOP	
12 TOTAL DEPTH OF HOLE 36.78		18 TOTAL CORE RECOVERY FOR BORING 466.58 TOG; 465.4 TOR	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
466.58						
	1	19 min	SAND CEMENT GROUT	Muddy	Rough	4/13/81 Start 3:34 1st 4 w/H20 7rpm 156.22 Stem Kell DH Assy Stop 4:18 @1.4
465.4			Average Top of Rock			
465.18		1 hr 6 min	SAND Dolomite Light Grey Mod Hard			
	2		Actual Top of Rock			4/14/81 Start 7:19 1st 7rpm w/H20 156.22 Stem Kelly & DH Assy Stop 8:27 Weld side plate Start 9:38 Stop 10:15 Barge anchor let loose reset anchor & align can Start 11:24 Stop 12:52 Plugged dischg Start 2:07 @4.0 2nd 17rpm Stop 4:16
		58 min				
	3		3.2 Dolomite - Buff - Mod Hard - Weathered			
	4	50 min				
		58 min	4.8 Dolomite - Light Grey Mod Hard			
	5					
		1 hr 8min		Milky Brown	Smooth	
	6		6.0 Dolomite - Buff - Mod Hard			
460.08		1 hr 34min	6.6 Dolomite - Light Grey Buff - Mod Hard - Hard Silic			4/14/81 4/15/81 Start 7:29 2nd 17rpm w/H20 156.22 Stem Kelly & DH Assy Stop 1:06 Straighten can Start 1:16
	7					
		1 hr 32min	7.9-8.0 Siltstone - Tan - Green Weathered - Soft	Milky		
	8		8.0 Dolomite - Buff - Grey Hard - Silic	Brown		
		1 hr 46min	8.3 Dolomite - Buff - Grey Mod Hard			
	9			Milky Brown		
		1 hr 42min				
456.58	10					

088

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | Massman Construction Co. | 1 of 4 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P12-N-Socket
3. Geotechnician
4. HOLE NO
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
456.58	10					2nd 17rpm w/H20 156.22 Stem Kelly & DH Assy Stop 12.1 @4:15
		1 hr 18min	Dolomite - Buff - Grey Mod Hard 10.2 Dolomite - Buff - Mod Hard - Weathered			
	11					
		1 hr 19min	11.6 Dolomite - Buff - Grey Mod Hard			
	12					4/15/81
454.48						4/16/81 Start 7:34 2nd 17rpm w/H20 156.22 Stem Kelly & DH Assy @14.3 - 10:10 4th 27rpm
		1 hr 13min	12.6 Dolomite - Buff - Grey - Soft - Mod Hard - Weathered			
	13			Milky Brown		
		1 hr 27min	13.9 Dolomite - Buff - Grey Mod Hard		Smooth	
	14					
		42 min				
	15					
		44 min	15.1 Dolomite - Buff - Mod Hard - Hard - Slightly Silic			
	16					
		49 min	16.8 Dolomite - Brown - Hard Siliceous			
	17					
		46 min	17.5 Dolomite - Grey - Mod Hard	Milky		
	18					
		46 min	18.5 - 18.7 Clay seam - Brown - Soft 18.7 Dolomite - Brown - Mod Hard	Brown	Rough	
	19			Milky Brown	Smooth	
		42 min				
446.58	20					

089

ENG FORM 1926 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING CO. | PROJECT NO. DACW 03-79-C-0055 | CONTRACTOR Massman Construction Co. | 1 of 4 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P12-N-Socket
3 Geotechnical
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
446.58	20					
	21	42 min	Dolomite - Brown - Mod Hard 20.3 Dolomite - Brown - Mod Hard Fractured 20.9 - 22.2 (< 1/3) Cavern less than 1/3 of hole	Milky Brown	Smooth	4th 27rpm w/H20 156.22 Stem Kelly & DH Assy @20.9 - 3:12 1st 7rpm H20 off cavern 2nd 17 rpm w/H20 @3:35 - 21/?
	22	30 min	21.8 Dolomite - Milky White Hard - Highly Siliceous	Muddy	Rough	Stop 4:15 @23.1
	23	25 min				
443.48		32 min	23.4 Dolomite - Milky White Mod Hard - Hard Weathered - Hard - Silic	Milky Brown	Smooth	4/16/81 4/17/81 Start 7:20 4th 27 rpm W/H20 156.22 Stem Kelly & DH Assy Stop 8:57 Grease Swivel Start 9:34 2nd 17rpm H20 on @26.9 27.1 1st 7rpm @28.0 2nd 17rpm
	24	31 min	24.8 Quartzite - Milky - Very Hard			
	25	38 min	25.9 Dolomite - 2/3 Tan - Hard - Silic - Vuggy with Calcite filled vugs - 1/3 Quartzite milky - Very Hard		Rough	
	26	34 min	26.8 Dolomite - Apprx ½ Tan Hard - Silic & Quartzite ½ Milky - Very Hard	Milky	Very Rough	
	27	51 min				
	28	30 min			Mod Smooth	
	29	21 min	29.8 Appx 90% BEDR CORE Quartzite - Milky - Very Hard - Dolomite - Tan - Hard - Silic			
436.58	30					

090

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | DACW 03-79-C-0055 | Meggesen Construction Co. | 1 of 4 Sheets

Norfork Lake Bridges

LOCATION 62-P12-N-Socket

GEOTECHNICAL

HOLE NO. 1

NAME OF DRILLER

DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT

Boring Method: Rotary

DEPTH DRILLED INTO ROCK

TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT

11 Elevation of Bottom of Hole

12 MANUFACTURER'S DESIGNATION OF DRILL

13 Casing Record | Depth | Type

14 TOTAL NUMBER CORE BOXES

15 ELEVATION of Water

16 DATE HOLE | STARTED | COMPLETED

17 ELEVATION TOP OF HOLE

18 TOTAL CORE RECOVERY FOR BORING

19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
436.58	30		Appx 90%			
		30 min	Quartzite - Milky - Very Hard - Dolomite - Tan - Hard Silic Appx 10%			
	31		31.1			
		55 min	Dolomite - Brown - Hard Highly Siliceous			
	32		32.1			
		42 min	Dolomite - Tan - Hard - Silic - Fractures with Iron stains on Frac planes	Milky	Smooth	
	33					
		32 min	33.4 Dolomite - Grey - Mod Hard - Hard			
	34					
		31 min				
	35		34.9 Dolomite - Light Grey Mod Hard - Slightly frac w/FE stains on frac planes			
		24 min	35.2 Dolomite - Brown - Mod Hard - Hard - Slightly Silic			Design Elevation of Rock Socket 430.7
	36	14 min	36.1 Dolomite - Buff - Grey Mod Hard			
429.8			36.3 Dolomite - Grey - Mod Hard			
			Bottom of Rock Socket			

091

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

NC 100 | DACW 03-79-C-0095 | Hasman Construction Co. | of 4 sheets

Bartlett Lake Bridges

62-P12-S-Socket

Robert Schmoker

Steven M. Hains

Don Uchtman

Elevation of Bottom of Hole 429.80

Casing Record: Depth 98.5, Type 10 O.D.

Elevation of Water 547.33

Direction of Hole: X Vertical ☐ Inclined ____ Deg from vert

Date Hole: Started 4/21/81, Completed 4/23/81

Elevation Top of Hole 558.14 TOP

Boring Method: Reverse Rotary

Depth Drilled Into Rock 31.7

Total Depth of Hole 34.17

Total Core Recovery for Boring 463.97 TOG

Signature of Inspector 461.5 TOR

Elev.	Depth	Drill Rate	Classification of Materials	Water Color	Drill Action	Remarks
463.97						
	1	7 min	SAND			Start 2:35 1st 7rpm w/H20 156.22 Stem - Kelly & DH Ass
	2	41 min	CEMENT GROUT	Muddy Brown	Slightly Rough	
461.5			Average Top of Rock			
	3	19 min	2.5 Siltstone - Tan - Yellow Soft			
	4	7 min	CLAY AND OVERBURDEN			
			Actual Top of Rock			
			SILTSTONE			
	5	13 min	4.8 Quartzite - White - Vuggy Hard - Fractures			
458.37	6	36 min	5.4 Chert - Hard - Light Brown			4/21/81 4/22/81
			5.8 Dolomite - Milky light Grey - Mod Hard - Hard Slightly Silic	Milky Brown		Start 7:20 1st 7rpm w/H20 156.22 Stem - Kelly 7 DH Ass @7.0-8:2
	7	46 min	6.6 Dolomite - Light Brown Soft - Mod Hard- Friable			4th 27rpm w/H2
	8	19 min			Smooth	
			8.2 Siltstone - Yellow - Soft - Mod Hard - Extremely Weathered			
	9	15 min		Yellow		
		14 min				092
453.97	10					

ENG FORM 35 24 ... PROJECT ... HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | 2 of 4 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 62-P12-S-Socket
3 Geotechnical
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION OF WATER
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	RUN	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
453.97	10					Stop @10.0 @9:15 Tighten Kelly Bolts Start 9:36 4th 27rpm w/H20 156.22 stem - kelly & DH Assy
	11	14 min	Siltstone - Yellow - Soft Mod Hard - Extremely Weathered	Yellow		
			10.8 Dolomite - Buff - Light Grey - Mod Hard - Fracture with Fe Stains			
		16 min				
	12					
		17 min				
	13			Milky Brown	Smooth	
		18 min				
	14					
		17 min				
	15					
		17 min				
	16					
		16 min	16.7 Dolomite - Grey - Mod Hard			
	17		17.2-18.5 Dolomite - Grey - Mod Hard w/clay filled vugs			
		23 min=		Brown	Slightly Rough	
	18					
		10 min	18.5 Dolomite - Grey - Mod Hard			
	19					
		16 min		Milky	Smooth	
443.97	20					

093

PROJECT | HOLE NO

DACW 03-79-C-0055

Hageman Construction Co.

1 of 4 SHEETS

Norfork Lake Bridges

62-P12-S-Socket

Geotechnical

Boring Method: Rotary

Casing Record	Depth	Type

Elevation of Water

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
~~413.97~~	20					
		16 min	Dolomite - Grey - Mod Hard			4th 27rpm w/H20
	21		20.5 Quartzite appx.50% Milky White - Hard and Dolomite - 50% Hard Grey - Silic	Milky	Smooth	156.22 Stem - Kelly & DH Assy @22.0 1st 7rpm 2nd 17rpm @23.6 25.1 1st 7rpm H20 off @3:02 @26.0 2nd 17rpm w/H20 @26.4 4th 27rpm w/H20 Stop 4:15 @30/0
		18 min				
	22		22.0 (appx 2/3) Dolomite - Grey - Mod Hard and (appx 1/3) Quartzite Milky - White - Hard			
		26 min				
	23		23.1 - 23.6 Cavern (Est less than 1/8 of hole)	Milky Brown	Rough	
		24 min				
	24		24.1 (appx. 2/3) Quartzite - Milky White Hard - Vuggy and Dolomite - Grey - Mod Hard (appx. 1/3)			
		10 min			Slightly Rough	
	25					
		1 hr 8min				
			25.9 Dolomite - Brown - Highly Siliceous -with brown chert nodules - Hard		Very Rough	
	26			Milky		
		16 min				
	27		27.1 Dolomite - Light Grey Mod Hard 27.5 Dolomite - Grey - Mod Hard fractures with Iron stains			
		22 min				
	28				Smooth	
		16 min				
	29					
		19 min				
433.97	30					

094

PROJECT

HOLE NO

BRDG 03-79-S-0035

Norfork Lake Bridges

62-P12-S-Socket

Contractor: Massman Construction Co.

Elevation o. Bottom of Hole

Casing Record | Depth | Type

Elevation of Water

Date Hole: Started | Completed

Boring Method: Rotary

Elev.	Drill Rate	Classification of Materials	Water Color	Drill Action	Remarks
433.97	30	Dolomite - Grey - Mod Hard - Fractures w/Fe Stains			Start 7:25 830 4th 27rpm w/H20 156.22 Stem Kelly & DH Ass Stop 9:00 BCH
	32 min				
31					
	18 min	31.8 Dolomite - Buff - Grey Mod Hard - Intensely Fractured with Fe Staine	Milky	Smooth	
32					
	25 min				
33					Design Bottom of Rock Socket =30.7
	20 min				
34					
429.8		Bottom of Rock Socket			

095

EJC FORM 1024 ... IS OBSOLETE

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS

1. NAME: Norfork Lake Bridges
2. LOCATION: 62-P13-N-Socket
3. Geotechnician: Robert Schmoker
4. HOLE NO:
5. NAME OF DRILLER: Don Ucthman
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7. Boring Method: Air Assist Rotary — Rotary
8. DEPTH DRILLED INTO ROCK: 26.0'
9. TOTAL DEPTH OF HOLE: 29 5'
10. SIZE AND TYPE OF BIT: 102" Smith - Rock
11. Elevation of Bottom of Hole: 513.9'
12. MANUFACTURER'S DESIGNATION OF DRILL: Steven Hains
13. Casing Record: Depth 7.5 | Type 10'OD
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION of Water: 543.85
16. DATE HOLE: STARTED 2/26/81 | COMPLETED 3/10/81
17. ELEVATION TOP OF HOLE: 547.9 TOC
18. TOTAL CORE RECOVERY FOR BORING: 543.4 TOG
19. SIGNATURE OF INSPECTOR: Drill — 539.9 TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
543.4							Start 2:15 1st 7rpm w/H20 57.5 Kelly &DH Assy Straight Rotary Air Assist @2' 2nd 17rpm Stop 3:10
	1	28 min	CEMENT				
541.5'		16 min	Top of Rock before Chisel Excavation		Cement Gray	Smooth	
	2		GROUT				
540.9'		18 min					2/26/81
	3						2/27/81 Start 8:55 2nd 17rpm w/H2o 57.5 Kelly & DH Assy Straight Rotary Air Assist Stop 9:04 Bit Alignment Start10:29 1st 7rpm WT Held Stop 11:56 Gasket Blowout Stabilizer Pads Put on
539.9'		55 min	Top of Rock				
	4		Dolomite - Buff - Mod Hard			Rough	
		57 min	4.8 Dolomite - Buff - Grey Mod Hard				
538.4'	5				Milky	Smooth	Start 1:43 1st 7rpm 2nd 17rpm @4.0 1st 7rpm @4.5 Stop 3:06 @5.0 2/27/81
		55min	5.8 Dolomite - Grey - Mod Hard				
	6						2/28/81 Start 8:06 1st 7rpm w/H2o 57.5 Kelly & DH Assy Straight Rotary Air Assist 2nd 17rpm @8:16 Stop 9:52 ADD 8.0' can to top of bit body Start 11:26 2nd 17rpm 4th 27rpm @11:45 2nd 17 rpm @12:11 7.5
		1hr 5min					
	7						
		1hr 3min	7.5 Dolomite - Hard - Silic Grey - Brown				
	8		7.8 Dolomite - Mod Hard - Grey				
		56 min					
	9						
		1hr 1min	9.7 Dolomite - Grey - Hard Silic				
533.4'	10						

096

ENG FORM 1836 MAR 71 — PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 of 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 62-P13-N-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record Depth	Type
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE STARTED	COMPLETED
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING %	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Water Action	REMARKS
533.4'	10		con't				
532.9'		50 min	Dolomite - Grey - Hard Silic 10.2' Dolomite - Grey - Mod Hard				2nd 17rpm 57.5 Kelly & DH Assy Straight Rotary Air Assist w/H20 Stop 3:15 3/2/81
	11						
		56 min	11.4 - 11.5 Chert - Brown - Hard 11.5 Dolomite - Buff - Grey Mod Hard				Start 9:46 2nd 17rpm 57.5 Kelly & DH Assy Straight Rotary Air Assist w/H20 Stop 1:52 Broke weld on 8' can on bit body
	12						
		41 min	12.5 Dolomite - Light Grey Mod Hard - Dark Grey Hard - Silic - Dolomite		Milky	Smooth	
	13						
		41 min	13.0 - 13.05 Chert Seam - Brown - Hard 13.05 Dolomite - Light Grey Mod Hard				
	14						
		56 min	13.9 Dolomite - Grey - Hard Silic 14.4 Dolomite - Brown - Grey Hard				
	15						
527.9'		1hr 6min	14.8 Dolomite - Grey - Mod Hard				3/2/81
	16		15.8 Dolomite - Grey - Mod Hard - Hard - Silic Slightly				3/3/81 Start 7:41 2nd 17rpm 57.5 Kelly DH Assy Straight Rotary Air Assit w/H20 Stop 10:45 18.5
		1hr 14min	16.7 Dolomite - Grey - Mod Hard				
	17						
		50 min	17.9-18.0 Shale - Black - Soft		Milky	Smooth	
	18		18.0 Dolomite - Brown - Grey Mod Hard - Hard Slightly Silic				097
524.9'		57 min					
	19						3/9/81 Start 1:04 18.5 2nd 17rpm Straight Rotary w/H20 Air Assist 67.5 Stem Kelly & DH Assy Stop 2:10 Air Copp Repa
		48 min	19.8 Dolomite - Grey - Mod Hard		Milky	Smooth	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (CLASSIFIED)

PROJECT

HOLE NO 2-2 (Y)

Start

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 3 SHEETS

1. Norfork Lake Bridges
2. LOCATION 62-P13 N-Socket
3. Geotechnician
4. HOLE NO
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record | Depth | Type
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR Drill

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Water Action	REMARKS
523.4'	20		con't				
			Dolomite - Grey - Mod Hard				3/9/81
		47 min	20.2 Dolomite - Sandy - Quart Sand - Well Rounded -		Milky		2nd 17rpm 67.5 Kelly Stem & DH ASSY Straight Rotary Air Assist
	21		Dolomite - Grey - Mod Hard			Smooth	
		43 min	21.3 Sandstone - Quartz - Well Rounded - Ca Cemented				
521.5'			21.6				3/9/81
	22		Dolomite - Grey - Mod Hard - Weathered				3/10/81
		59 min	22.5 Dolomite - Grey - Brown - - Mod Hard				Start 7:21 21.9 2nd 17rpm 67.5 Kelly Stem & DH Assy. Straight Rotary Air Assist
	23				Milky		Stop 12:45 BOH
		34 min	23.6 Dolomite - Grey - Dark Grey - Soft - Mod Hard Weathered				
	24						
		37 min	24.4 Dolomite - Dark Grey - Mod Hard				
	25						
		38 min	25.45-25.5 Weathered Dolomite Pod White - Soft		Grey	Smooth	
			25.5				
	26		Dolomite - Dark Grey Mod Hard				
		46 min	26.6 Dolomite - Grey - Mod Hard				
	27						
		47 min			Milky		
	28						
		46 min	28.2 Dolomite - Grey - Mod Hard				Design Bottom of Rock Socket 514.7
	29						
513.9'		9 min	Bottom of Rock Socket				

098

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

Hole No.

DRILLING LOG	Project No. NAEW 03-79-C-0055	Contractor Western Soil Exploration Co.	SHEET 1 of 3 SHEETS

PROJECT Norfork Lake Bridges	10 SIZE AND TYPE OF BIT 102" Smith - Rock
2 LOCATION 62-P13-S-Socket	11 Elevation of Bottom of Hole 514.0'
3 Geotechnician Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL Steven Hains
4 HOLE NO	13 Casing Record 7.5 Depth Type 10.0 OD
5 NAME OF DRILLER Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 Elevation of Water 542.95
7 Boring Method Air-Assist Rotary	16 DATE HOLE STARTED 2/7/81 COMPLETED 3/9/81
8 DEPTH DRILLED INTO ROCK 24.8'	17 ELEVATION TOP OF HOLE 546.9' TOC
9 TOTAL DEPTH OF HOLE 28.08'	18 TOTAL CORE RECOVERY FOR BORING 542.08' TOG
	19 538.8' TOR

ELEVATION	DEPTH b	Drill Rate	CLASSIFICATION OF MATERIALS (Description) d		Drill Action	
542.08'						2/7/81 Start 10:46 57.5 Kelly & DH Assy 1st 7rpm Air Rotary
	1	3min	CEMENT GROUT	Grey	Smooth	Stop 11:02 Kelly Check Start 11:06 Stop 11:30 H20 Leak Start 2:17 Stop 2:30 @3.3 10' casing blow out
	2	3min				
	3	32min				
538.8'		10min			Rough	
	4		HAND EXCAVATED ROCK			
537.2'						
	5	9min	Dolomite - Brown - Grey Mod Hard - Hard - Slightly Silic			3/3/81 Start 1:14 1st 7rpm 57.5 Kelly & DH Assy Straight Rotary - Air Assit
		1 hour 2min	@ 5.4' Dolomite - Brown - Hard - SILIC	Milky	Smooth	with H20 2nd 17rpm @5.0' Stop 3:15 @7.1'
	6					
		43 min	6.4 Dolomite - Brown - Mod Hard			
	7					
534.98'						3/4/81 Start 7:23 2nd 17rpm 57.5 Kelly & DH Assy. Straight Rotary Air Assist. w/H20 Stop 8:45 Tighten kelly bolts Start 9:02 Top of Rock Socket
		50min				
	8					
534.7						
		1hour 36min	8.4 Dolomite - Grey - Hard Silic			
	9		9.2 Dolomite - Grey - Brown			
		1hour 8min	Mod Hard 9.8			
532.08	10		Dolomite - Buff - Grey Mod Hard			

099

DRILLING LOG | Project No. DACW 03-79-C-0054 | Contractor Morgan Construction Co. | SHEET 2 OF 3 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION: 62-P13-S-Sweet
3. Geotechnician
4. HOLE NO
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT: 102" Smith - Rock
11. Elevation of Bottom of Hole
12. MANUFACTURER'S DESIGNATION OF DRILL
13. Casing Record Depth Type
14. TOTAL NUMBER CORE BOXES
15. Elevation of Water
16. DATE HOLE STARTED COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19.

ELEVATION	DEPTH 10s	Drill Rate	CLASSIFICATION OF MATERIALS (Description) con't	Water Color	Drill Action	con't
	11	1hour 9 min	Dolomite - Buff - Grey Mod Hard 10.3 10.35 Chert Brown - Hard 10 35 Dolomite - Grey - Mod Hard			2nd 17rpm 57.5' Kelly & DH Assy Straight Rotary Air Assist w/H20 Stop 12:59 Weld can on Bit Body
	12	43 min	11.4 Dolomite - Grey - Brown Mod Hard			
530.08		50 min	12.3 Dolomite - Grey - Mod Hard		Smooth	3/4/81
	13	1hour 5min		Milky		3/5/81 Start 7:28 2nd 17R 57.5 Kelly & DH Assy Straight Rotary Air Assist w/H20 14.3 1st 7rpm 15.0 2nd 17rpm Stop 12:40
	14	1hour 6min	13.9 Dolomite - Mod Hard - Hard - Grey - Brown 14.3 Dolomite - Grey - Soft Mod Hard		Rough	
	15	1hr 17min	15.1 Dolomite - Grey - Mod Hard			
	16	54min			Smooth	
525.08	17					3/5/81
	18	1hour 50min	17.6 Dolomite - Buff - Grey Mod Hard Reverse Rotary			3/7/81 Start 7:48 Reverse Rotary 67.5' Stem Kelly & DH Assy 2nd 17rpm w/H20 17.5' 8:30 4th 27rpm Stop 10:28 Switch to Straight Rotary Air Assist. Start 10:55 4th 27rpm Stop 11:12 Cut discharge holes in 10' can Start 11:32 2nd 17rpm
	19	1hour 22min	18 6 Dolomite - Grey - Mod Hard	Milky	Smooth	
	20	47min	19.6 Dolomite - Sandy (Quartz Sand well rounded) Grey Mod Hard			

100

Hole No.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massar Construction Co.	SHEET 3 OF 3 SHEETS
1 PROJECT Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION 62-P13-S-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record Depth Type D	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Elevation of Water	
		16 DATE HOLE STARTED	COMPLETED
7 Boring Method Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	%
9 TOTAL DEPTH OF HOLE		19	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	
522.08	20		con't			con't
		36 min	Dolomite - Sandy (Quartz Sand well rounded) Dolomite - Grey - Mod Hard			67.5' Kelly Stem DH Assy. 2nd 17rpm Straight Rotary Air Assist
	21		21.2			Stop 2:33 Mark Kelly
		43 min	Dolomite - Grey - Dark Grey - Mod Hard			Start 2:37 Stop 3:09 Engine Check Start 3:47 Stop 4:13 24.8'
	22					
		40 min	22.4 Dolomite - Grey - Mod Hard & Light - Grey Hard Silic			
	23		22.8-22.85 Shale - Black - Soft			
		32 min	22.85 Dolomite - Grey - Dark Grey - Mod Hard	Milky	Smooth	
	24		23.7			
		49 min	Dolomite - Dark Grey Mod Hard			
517.38						3/7/81
	25					3/9/81 Start 7:32 @24.8'
		58 min	25.7 Dolomite - Light Grey Mod Hard - Weathered			67.5' Kelly Stem & BH Assy 2nd rpm (17) Straight Rotary Air Assist w/H20
	26					Stop 10:12 BOH
		51 min	26.8 Dolomite - Grey - Mod Hard			
	27		27.1			Design Bottom of Rock Socket 514.7
		41 min	Dolomite - Brown - Grey Mod Hard - Hard			
514.0	28		Bottom of Rock Socket			

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 4 SHEETS
3 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith - Rock	
4 LOCATION: H101-P1-West-Socket		11 Elevation of Bottom of Hole: 497.4'	
5 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M Hains	
6 HOLE NO.		13 Casing Record: Depth 31' Type 10 O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water 548.62	
7 Boring Method: Straight Rotary Air Assist		16 DATE HOLE: STARTED 7/21/81 COMPLETED 7/25/81	
8 DEPTH DRILLED INTO ROCK: 32.48'		17 ELEVATION TOP OF HOLE: 559.88' TOP	
9 TOTAL DEPTH OF HOLE: 34.48'		18 TOTAL CORE RECOVERY FOR BORING: %	
		19 SIGNATURE OF INSPECTOR: 529.88' TOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
531.88'							7/21/81 Lake El 548.62 Start 3:03 1st 7rpm Straight Rotary - Air Assist 77.5' Smooth Stem - Kelly DH Assy Stop 4:31 Remove Bit Blocks Start 5:05 2nd 17rpm Stop 5:25 4.5'
	1	4 min	SAND		Brown		
		4 min					
529.88	2		Top of Rock				
		37 min	2.0 Dolomite - Light Grey - Mod Hard - & Hard - Slightly Silic		Milky		
	3	43 min	3.5 Dolomite - Light Grey Mod Hard				
	4						
527.38		40 min					7/21/81 7/22/81 Start 7:13 2nd 17rpm 77.5 stem-kelly-DH Assy
	5	37 min	5.4 Dolomite - Sandy (Well Rounded Sand) Mod Hard Light Grey				
	6	25 min					
	7	26 min					
	8	25 min	8.5 Dolomite - Mod Hard Light Grey				
	9	35 min					102
521.88	10						

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 4 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P1-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
521.88	10	35 min	Dolomite - Mod Hard - Light Grey		Milky		2nd gear 15rpm Straight Rotary Air Assist 77.5 Kelly - stem - DHA @13.5 Stop 1:00 Switch to Reverse Rotary Start 1:50 4th 27rpm 14.3 4:00 Switch back to Ratary & 2nd 17rpm
	11		11.3				
		36 min	Clay - Red - Soft 11.5 Dolomite - Buff - Mod Hard - Weathered		Red		
	12		12.1		Milky Brown		
		54 min	Dolomite - Buff - Grey Mod Hard - Hard - Grey Slightly Silic			Smooth	
	13		13.1 - 13.3				
		1 hr 55min	Clay - Red - Soft 13.3 Dolomite - Buff - Grey Mod Hard - Hard - Grey Slightly Silic		Red		
Reverse 2hr 10min	14				Milky Brown		
		1 hr 5 min					
	15		15.6				
516.38		1 hr 19min	Dolomite - Grey - Hard Siliceous - Massive				7/22/81
			16.4				7/23/81
	16		Dolomite - Buff - Grey Mod Hard				Lake El 548.42 Start 7:45 2nd rpm 17 77.5' stem - kelly & DH Assy - 16' Switch to Reverse Rotary 4th 27rpm w/H2O Stop 2:20 18.1 Switch to Straight Rotary Air Assist Repair Pennant Line Bushing Start 3:50 18. Stop 5:25 20.0
		3 hr 7min	16.8 - 17.0 Clay Seam (est ½ of hole)				
Reverse Rotary	17		17.0 Sandy Dolomite - Buff Grey - Silic - Hard				
		1 hr 59min	17.5 Dolomite - Grey - Buff Mod Hard - Hard - Grey Silic				
45 min	18						
		1 hr 40min					
	19						
		40 min					
511.88	20						

103

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (CONTINUED)

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 4 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P1-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
511.88	20						
		55 min	Dolomite - Grey - Buff Mod Hard - Hard - Grey Silic				7/24/81 Lake el 548.30 Start 7:28 @ 20.0 2nd 17rpm Straight Rotary Air Assist Stop 9:04 Add 20' Joint Start 10:30 97.5 stem - Kelly & DHA 28.0-1:34 H20 off and Air Off (smooth hole) 1st 7rpm Stop 2:00 Gear box Adj Start 3:25 Stop 5:30 29.3'
	21		20.5			Smooth	
		41 min	Sandy Dolomite - Buff - Mod Hard - Si grains Well rounded		Milky Brown		
	22		21.1 Dolomite - Buff - Grey Mod Hard				
		39 min	22.7 Dolomite - Grey - Mod Hard				
	23						
		31 min					
	24						
		34 min					
	25						
		30 min					
	26		26.0 Dolomite - Buff - Grey Mod Hard - Slightly Frac.				
		23 min					
	27						
		27 min	27.9 (est 1/8 of hole) Quartzite Milky - White Hard & Dolomite - Buff Grey - Mod Hard -(3/4 of hole)				
	28		& Cavity - Clay filled (est 1/8 of hole)		Red	Very Rough	
		2 hr 21min					
	29		29.0 Cavity Ends 50% Quartzite				104
502.58			50% Dolomite 29.6				7/24 7/25 Start 7:13 29.8
		33 min	Quartzite - Milky White Hard with Clay filled		Milky Brown	Mod Smooth	2nd 17rpm Straight Rotary Air Assist
501.88	30		vugs				97.5 stem Kelly DHA

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 of 4 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P1-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO: 1	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERED FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
501.88	30						
	31	55 min	Quartzite - Milky White Hard with Clay filled Vugs		Milky	Mod Smooth	2nd 17rpm Straight Rotary Air Assist 97.5 Stem - Kelly DHA Stop 9:35 Gear Box Adj Start 9:46 Stop 10:01 Gear Box Adj Start 10:25 Stop 11:23 B.O.H.
		41 min					
	32	38 min					
	33	40 min	33.4 Dolomite - Buff - Mod Hard 50% of hole & Quartzite - Milky White - Hard 50% of hole				
497.9	34						Plan POH
		18 min	Bottom of Rock Socket				
497.4							

105

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 of 6 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P1-East-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Straight Rotary Air Assist
8 DEPTH DRILLED INTO ROCK 42.23
9 TOTAL DEPTH OF HOLE 42.23

10 SIZE AND TYPE OF BIT 10½" Smith-Rock
11 Elevation of Bottom of Hole 489.8'
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record: Depth 25' Type 10'OD
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water 7/29 Elev. 548.1
16 DATE HOLE STARTED 7/29/81 COMPLETED 8/4/81 plan 8/7/81 revise
17 ELEVATION TOP OF HOLE 556.53'
18 TOTAL CORE RECOVERY FOR BORING %
19 SIGNATURE OF INSPECTOR 532.03' TCRock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
532.03'			Top of Rock				
	1	35 min	Dolomite - Buff - Mod Hard				Start 7:50 1st 7rpm Straight Rotary - Air Assist 77.5' stem - kelly & DHA
	2	36 min					81.5' - 8:42 2nd 17rpm
	3	34 min			Milky Brown	Smooth	
	4	30 min	3.4 Dolomite - Buff - Mod Hard - Slightly Frac.				
	5	35 min					
	6	32 min					
	7	28 min	6.5 Sandy Dolomite - Buff Mod Hard - (Very fine Silica sand)				
	8	27 min					
	9	29 min	8.4 Dolomite - Buff - Mod Hard				
522.03	10	44 min					106

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-Pl-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT	15 ELEVATION of Water 16 DATE HOLE | STARTED | COMPLETED
7 Boring Method: Rotary	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING %
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
522.03'	10						2nd 17rpm Straight Rotary Air Assist 77.5 stem - kelly & DHA
		22 min	Dolomite - Buff - Mod Hard				
	11						
		25 min					Stop 2:48 @14.0 gear box adj. Start 3:50 @14.0 4th 27rpm Stop 7/29 5:20 @18.0
	12						
		23 min			Milky Brown	Smooth	
	13		13.2				
		18 min	Dolomite - Buff - Mod Hard - Slightly Frac				
	14						
		16 min					
	15						
		21 min					
	16						
		25 min	16.5 Dolomite - Grey - Mod Hard				
	17						
		28 min					
514.03'	18						7/29
		25 min	Dolomite - Buff - Grey Mod Hard				7/30 Start 7:04 2nd 17rpm - 77.5' stem - kelly - DHA Stop 7:16 Fuel Leak Start 7:37 4th 27rpm Lake el 548.04
	19						
		25 min					
512.03'	20						

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P1-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
512.03	20						7/30/81
		20 min	Dolomite - Buff - Grey Mod Hard 20.7				4th 27rpm 77.5 stem - kelly & DHA @21.5 1st 7rpm
	21		Dolomite - Buff - Mod Hard - Slightly Frac 21.5		Milky Brown	Smooth	Stop 8:51 @22.0 Add 20' stem Start 11:38 1st 4rpm
		16 min	Cavity Clay filled (est < 1/8 of hole) Red in above Dolomite -				Stop 1:25 Gear Box Adj Start 1:53
	22				Red	Rough	Stop 2:02 Gear Box Adj Start 2:05
509.83		1 hr 1 min					Stop 2:12 Mark Kelly Start 2:1[illegible] Stop 2:30 Flush and Ream Hole Start 3:08
	23		23.8				Stop 3:32 Flush Hole 7/31/81
		31 min	Cavity (Est 30% of hole)				Clay cavern grouted to Elev 509.83 22.2' 8/3/81
	24						Cement Grout Drilled out
		17 min	24.8-28.9 Cavity - Red Clay filled 100% of hole				
	25						
		5 min					
	26					Mod Smooth	
		3 min					
	27						
		3 min					
	28						8/3/81 Lake Elev 547.[illegible] Start 4:40 @29.5
		11 min	28.9 Cavity (Est < 1/8 of hole) Balance = Sandy Dolomite Light Grey - Soft - Mod Hard and Buff - Mod Hard Dolomite -				97.5 Stem - Kelly & DHA 1st 7rpm Straight Rotary Air Assist
	29		29.4			Mod	@29.8 2nd 17rpm
502.53		58 min	Quartzite - Milky White Hard Vuggy			Rough	7/30/81 Stop 4:[illegible] 8/3/81 30.0'
502.03	30				Milky White		

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 OF 6 SHEETS
1 PROJECT: Norfork Lake Bridges		11 SIZE AND TYPE OF BIT	
2 LOCATION: 101-P1-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record / Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
Section M 61-21	Rotary	16 DATE HOLE STARTED / COMPLETED	
8 DEPTH DRILLED IN ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
502.03'	30		Quartzite - Milky White Hard - Vuggy		Milky White	Mod Smooth	Start 7:38 30.0 - Lake Elev 548.8 97.5 stem - Kelly & DH Assy 2nd 17rpm
		1hr 9min					
	31		31.1 Clay filled Cavern in above Quartzite (Est ¼ of hole)		Red	Rough	Stop 8:32 Gear Box Adj Start 8:37
		18 min	31.5 - 33.1 Clay filled Cavern 100% of hole				Stop 8:55 Gear Box Adj
	32					Smooth	Start 9:03 31.1 1st 5rpm Weight held back 31.1 - 34.1
		11 min					Stop 10:25 34.1 Start 10:2
	33		33.1 Dolomite - Grey - Weathered - Soft				Gear Box Adj Stop 10:35 Gear Box
		32 min	33.8 Dolomite - Buff - Mod Hard & Siltstone Pod (Est 1/3 of hole)		Brown	Rough	Start 10:40 34.68 B.O.H. Stop 10:45
	34						Plan B.O.H. 497.9' el.
		41 min	34.2 Quartzite White Hard Plan				
497.4'			Bottom of Rock Socket		Milky		

109

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 5 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P1-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
	30						
	31						
	32						
	33						8 Additional feet drilled below plan avg. to clay cavern in rock socket
	34						
497.4'	35	13 min	50% Dolomite - Buff - Grey - Mod Hard 50% Quartzite - Milky White - Hard				8/7/81 (el 547.5) Start 10:42 2nd 17rpm w/H2O Reverse Rotary 97.5 Stem - Kelly - DHA @37.5 4th 27rpm
	36	30 min	36.1 Dolomite - Buff - Grey Mod Hard		Brown	Smooth	
	37	50 min	37.2 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic				
	38	1hr 24min			Milky Brown		
	39	1 hr 1min	38.6 Dolomite - Buff - Mod Hard				
	40	41 min	39.2 - 39.3 Vuggy - Calcite filled (in above Dolomite)				

110

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 6 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P1-East-Socket	11 Elevation of Botton of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record: Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
	40						
		53 min	Dolomite - Buff - Mod Hard				4th 27rpm w/H20
			40.4				97.5' stem-kelly
			Dolomite - Buff - Grey				& DHA
			Mod Hard - Slightly Frac				Stop 5:24 BOH
	41				Milky Brown	Smooth	
		51 min					
	42						
489.8'		24 min	Actual Bottom of Rock Socket				

111

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 of 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT 102" Smith-Rock	
2 LOCATION: H101-P2-West-Socket		11 Elevation of Bottom of Hole 411.7	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO		13 Casing Record: Depth 120.0' Type 100.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water 543.72	
7 Boring Method: Reverse Rotary		16 DATE HOLE: STARTED 9/14/81 COMPLETED	
8 DEPTH DRILLED INTO ROCK: 27.3		17 ELEVATION TOP OF HOLE 560.55 TOPlatform	
9 TOTAL DEPTH OF HOLE: 29.4		18 TOTAL CORE RECOVERY FOR BORING 411.1 TOG 439.0 TOR	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
441.1							9/14/81
	1	30 min	Chert - Brown Overburden Hard		Milky Brown	Smooth	Start 9:41 Lake Elev. 543.72' 1st 7rpm w/H2O 176.3' stem - kelly & DHAssy @3.5 2nd 17rpm @10.0 4th 27rpm
		9 min	CEMENT GROUT				
439.0'	2		Average Top of Rock 1.6				
		19 min	Dolomite - Buff - Mod Hard - Slightly Frac 2.9				
	3	27 min	Dolomite - Buff - Pink Mod Hard - Slightly Silic - Slightly Frac				
	4	15 min	4.3 Dolomite - Buff - Grey Mod Hard - Frac w/Fe Stained frac planes				
	5	21 min	5.8 - 6.2 Siltstone - Grey - Soft (est 1/8 of hole) balance above Dolomite 6.2				
	6	25 min	Dolomite - Buff - Grey Mod Hard - Frac w/Fe Stained frac planes				
	7	24 min					
	8	21 min					
	9	30 min					
431.1	10		9.8 Dolomite - Buff - Grey Mod Hard - Slightly Frac				

112

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P2-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
431.1	10						con't
		28 min	Dolomite - Buff - Grey Mod Hard - Slightly Frac				Lake Elev. 543.72' 4th 27rpm w/H20 176.3' stem - Kelly & DH Assy
	11	41 min	11.4 Dolomite - Buff - Grey Mod Hard - Slightly Silic Frac w/Fe stained Frac planes				
	12	47 min					
	13	45 min					
	14	52 min	14.1 Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Frac w/Fe stained frac planes				
	15	47 min	15.2 Dolomite - Buff - Grey Mod Hard - Frac w/fe stained joints and frac				
425.6'							9/14/81
	16	31 min					9/15/81 Start 7:23 4th 27rpm w/H20 176.3' stem - kelly & DH Assy H20 off @19.0 Pump repair
	17	19 min	17.4 Chert - Grey - Brown Hard				
	18	18 min	18.5 Dolomite - Pink - Grey Hard - Silic Frac				
	19	25 min					
421.1	20						

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 3 OF 3 SHEETS

PROJECT: Norfork Lake Bridges
LOCATION: H101-P2-West-Socket
Geotechnician
HOLE NO.
NAME OF DRILLER
DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
Boring Method: Rotary
DEPTH DRILLED INTO ROCK
TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
421.1	20						con't
		20 min	Dolomite - Pink - Grey Hard - Silic Frac				4th 27rpm No H20 176.3' stem kelly & DH Assy H20 on @20.1 Stop 10:00 Mark Kelly Start 10:12 Stop 1:35 B.O.H
	21	20 min	21.2 Dolomite - Pink - Grey Mod Hard - Frac.				
	22	28 min			Milky Brown	Smooth	
	23	22 min	23.5 Quartzite - Milky White Hard				
	24	23 min	24.0 Sandy Dolomite - Buff Pink - Hard - Silic 24.2 Dolomite - Pink Grey Mod Hard - Hard - Slightly Silic Frac.				
	25	32 min					
	26	23 min					
	27	22 min	27.1 Quartzite - Milky White Hard 27.4 Chert - Brown - Hard 27.8				
	28	43 min	Dolomite - Pink - Buff Hard - Silic - Slightly Frac				
	29	25 min					
411.7			Bottom of Rock Socket				

ENG FORM 1836 MAR 77 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: H101-P2-East-Socket		11 Elevation of Bottom of Hole: 411.6'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO.		13 Casing Record: Depth 115.2' Type 10.CD	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water 545.05	
7 Boring Method: Reverse Rotary		16 DATE HOLE: STARTED 9/4/81 COMPLETED 9/11/81	
8 DEPTH DRILLED INTO ROCK: 40.08		17 ELEVATION TOP OF HOLE: 560.18TOPlatform	
9 TOTAL DEPTH OF HOLE: 40.08		18 TOTAL CORE RECOVERY FOR BORING: N/A TOGrout 1	
		19 SIGNATURE OF INSPECTOR: 451.68 TORock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
451.68							
		47 min	Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic		Milky Brown	Mod Smooth	9/4/81 Lake Elev. 545.05' Start 11:41 1st 7rpm w/H20 176.3 stem - kelly - DHA @.5 2nd 17rpm @5.5 4th 27rpm Stop 2:34 Weld side plates on drill stem
	1		.4 Chert - Grey - Hard				
		12 min	.8 Quartzite - Milky White Very Hard - Highly Siliceous				
	2		1.6 Dolomite - Buff - Soft Mod Hard - Weathered				
		13 min	2.8 Dolomite - Buff - Grey Mod Hard - Slightly Frac				
	3						
		26 min	3.9 Chert - Grey - Hard				
	4		4.1 Dolomite - Buff - Grey Mod Hard				
		30 min					
	5						
		28 min	5.4 Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Slightly Frac				
	6		6.5 Dolomite - Buff - Grey Mod Hard - Hard - Silic				
445.18'		31 min	7.2 Dolomite - Buff - Grey Mod Hard - Slighely Frac				9/4/81 9/8/81 Start 7:51 Lake Elev. 544.62' 4th 27rpm w/H20 176.3 stem - kelly - DHA
	7						
		25 min					
	8		8.1 Dolomite - Buff - Mod Hard				
		54 min					
	9		9.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac w/Fe stained Frac Planes				
		48 min					
441.68	10						

115

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P2-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING %	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
441.68	10	1 hr 17min	Dolomite - Buff - Grey Mod Hard Frac w/FE stained Fractured Planes 10.4 - 10.5				4th 27rpm w/H20 176.5 stem kelly DH Assy Stop 3:50 Air Loss
	11	2 hr 8min	Shale - Black - Soft 10.5 Dolomite - Buff - Grey Mod Hard 11.0 - 11/1		Milky Brown	Smooth	Start 5:01 Stop 5:20 @13.7
	12	1 hr 18min	Shaley Dolomite - Dark Grey - Soft 11.1 Dolomite - Light Grey Mod Hard - Hard - Silic (Slightly) 12.7				
	13	1 hr 24min	Dolomite - Light Grey - Mod Hard 13.2				
437.98			Dolomite - Grey - Brown Hard- Very Hard - Highly				9/8/81
	14	1 hr 12min	Siliceous 13.5 Dolomite - Light Grey Mod Hard 14.4				9/9/81 Start 7:30 Lake Elev. 544.44' 176.3 stem - kelly & DHAssy 4th 27rpm w/H20
	15	1 hr 10min	Dolomite - Grey - Green Mod Hard - Slightly Frac 14.8 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic				Stop 10:58 Chg cone bits 1.3' drop in ca Stop 17.8
	16	1 hr 2min	16.4 Dolomite - Buff - Grey Mod Hard - Slightly Fractured w/FE stained frac planes				
	17	57 min					
433.88	18	45 min					9/10/81 Start 8:53 Lake Elev. 544.26' 4th 27rpm w/H20 176.3 stem = Kelly & DHAssy
	19	45 min					
431.68	20						

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOC: H101-P2-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
431.68	20						
		44 min	Dolomite - Buff - Grey Mod Hard - Slightly Frac w/FE stained frac planes				9/10/81 Lake Elev. 544.26' 4th 27rpm w/H20 176.3 stem - kelly & DH Ass'y Stop 5:18
	21		20.8 Dolomite - Buff - Mod Hard		Milky Brown	Smooth	
		45 min					
	22						
		40 min					
	23						
		49 min					
	24						
		47 min					
	25		25.2 Dolomite - Buff - Mod Hard - Slightly Fractured				
		36 min					
	26						
		36 min	26.8 - 27.5 Chert - Grey - Brown Hard				
	27						
		47 min	27.5 Dolomite - Light Grey Mod Hard		Milky		
			27.8 Dolomite - Grey - Pink Mod Hard - Hard - Silic				
	28	1 hr 4min	28.6 Dolomite - Grey - Hard Silic - Slightly Frac		Milky Grey		
422.98							
	29						9/11/81 Lake Elev 544.1[illegible] Start 7:25 4th 27rpm w/H20 176.3' stem - kelly - & DHA
		50 min					
421.68	30						

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P2-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
421.68	30						con't 9/11/81
		49 min	Dolomite - Grey - Hard - Silic - Slightly Frac				Lake Elev. 544. .12
			30.9		Milky Grey	Smooth	4th 27rpm w/H20
	31		Dolomite - Grey - Hard Silic - Slightly Frac w/Silica healed frac				176.3' stem - kelly & DH Ass'y
		1 hr 2min	31.2				Stop 1:25
			Dolomite - Grey - Mod Hard -				Weld Baffel on
	32		32.2				Disposal barge
		44 min	Dolomite - Buff - Grey Mod Hard - Slightly Frac				Start 1:35
			33.1				
	33		Quartzite - Milky White Hard				
		59 min	33.6				
			Sandy Dolomite - Buff - Grey - Mod Hard - Friable				
			33.8				
	34		Dolomite - Grey - Pink Hard - Silic				
		42 min	34.5				
			Dolomite - Grey - Pink Hard - Silic - frac w/Fe stained frac planes				
	35						
		34 min					
	36		36.0				
		19 min	Chert - Grey - Brown Hard				
			36.8				
	37		Dolomite - Buff - Hard - Silic Frac w/Fe stained frac planes				
		55 min	37.3				
			Dolomite - Buff - Mod Hard				
			37.8				
	38		Dolomite - Buff - Mod Hard - Slightly Frac w/Fe stained Frac Planes				
		40 min					
	39						
		41 min					
411.68	40						

118

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG | PROJECT NO. DACW 03-79-C-0015 | Mesenan Construction Co. | SHEETS 5 of 5

Norfork Lake Bridges

LOCATION H101-P2-East-Socket

Geotechnical

HOLE NO

NAME OF DRILLER

DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT

Boring Method: Rotary

DEPTH DRILLED INTO ROCK

TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT

Elevation of Bottom of Hole

MANUFACTURER'S DESIGNATION OF DRILL

Casing Record | Depth | Type

TOTAL NUMBER CORE BOXES

ELEVATION of Water

DATE HOLE STARTED | COMPLETED

ELEVATION TOP OF HOLE

TOTAL CORE RECOVERY FOR BORING

SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
411.68						
411.6		9min	Dolomite - Buff - Mod Hard - Slightly Frac w/Fe Stained frac planes	Milky Grey	Smooth	4th 2 rpm w/H20 176.3' stem - Kelly & DH Ass Stop 4:20 B.C.H.

ENG. FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Masman Construction Co. | SHEET 1 OF 6 SHEETS

1. Norfork Lake Bridges
2. LOCATION 101-P3-W-Socket
3. Geotechnician Robert Schmoker
4. HOLE NO.
5. NAME OF DRILLER Don Uchtman
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7. Drilling Method: Reverse Rotary
8. DEPTH DRILLED INTO ROCK 50.3'
9. TOTAL DEPTH OF HOLE 53.8'
10. SIZE AND TYPE OF BIT 102" Smith-Rock
11. Elevation of Bottom of Hole 384.5'
12. MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hains
13. Casing Record: Depth 121.0' | Type 10" CD
14. TOTAL NUMBER CORE BOXES
15. ELEVATION of Water 548.69' 6/19
16. DATE HOLE STARTED 6/19/81 | COMPLETED 7/2/81
17. ELEVATION TOP OF HOLE 558.11 TOP
18. TOTAL CORE RECOVERY FOR BORING 438.3 TOG 434.8 TOR
19. SIGNATURE OF INSPECTOR

ELEVATION 438.3'	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
	1	13 min	OVERBURDEN		Muddy	Smooth	6/19/81 Start 2:09 1st 7rpm w/H20 186.7' stem-kelly & DH Assy Stop 3:14 Weld on lugs Start 3:53 @6.0 2nd 17rpm with H20 Stop @6.2-5:06
	2	24 min	CEMENT GROUT				
	3	6 min	OVERBURDEN			Rough	
434.8'		12 min	Actual Top of Rock 3.5 Chert - Grey - Hard				
	4	22 min	4.2 Siltstone Pod - Yellow Soft (est 1/3 of hole) Balance Chert		Yellow		
	5	54 min	4.8 Dolomite - Very Hard Pink - Grey - Highly Siliceous (est ½ of hole) Balance Siltstone - Yellow - Soft				
432.1'	6	21 min	5.6 Siltstone - Yellow - Soft - (all of hole) 6.0 Dolomite - Very Hard - Pink - Grey - Highly Siliceous (est 1/3 of hole) Siltstone - Yellow			Mod Smooth	6/19/81 6/20/81 Lake Elev 548.54 Start 7:28 1st 7rpm w/H20 186.7' stem - kelly - & DH Assy @7:37 2nd 17rpm @8.0 1st 7rpm H20 off @9.0 2nd 17rpm w/H20
	7	51 min	Soft (est 2/3 of hole) 7.0 Sand - Well Rounded - Silica & Unconsolidated (est 1/3 of hole)		Milky	Rough	
	8	1 hr 14min	Dolomite - Grey - Hard Siliceous 8,2				
	9	43 min	Dolomite - Grey - Hard Slightly Silic with Siltstone Pod (est pod 1/8 of hole) 9.8				
428.3'	10		Chert - Tan & Pink - Hard			Smooth	

120

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

1. DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 6 SHEETS
2. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT	
3. LOCATION: 101-P3-W-Socket		11. Elevation of Bottom of Hole	
4. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL	
5. HOLE NO		13. Casing Record: Depth / Type	
6. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
7. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15. ELEVATION of Water	
8. Boring Method: Rotary		16. DATE HOLE: STARTED / COMPLETED	
9. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE	
10. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
428.3	10		Chert - Tan - Pink - Hard		Milky	Smooth	2nd 17rpm w/H2O 186.7' stem-kelly & DH Assy @10.7 1st 7rpm No H2o Stop 3:08
	11	51 min	10.7 Siltstone Pod - Yellow Soft (est ⅓ of hole) Balance - Chert - Hard Tan - Pink			Mod Smooth	
	12	1 hr 5min	11.3 Dolomite - Pink - Grey Hard - Silic - (Siltstone Pod Continues)		Yellow Brown	Smooth	
	13	2 hr 36min	12.7 Dolomite - Grey - Pink Very Hard - Silic with small Cavern (est 1/3 of hole) Sand - Silt &		Milky	Very Rough	6/20/81 6/22/81 Start Lake Elev,548.32'
425.3'	14	2 hr 4min	Siltstone Filled 13.3 Dolomite - Grey - Pink Hard - Silic		Yellow Brown	Mod Rough	1st 3rpm No H2O 186.7 stem - kelly & DH Assy @13.3 7rpm Stop 10:45 Air Leak Start 10:56 @14.0 2nd 17rpm No H2o
	15	1 hr 21min	14.4 Siltstone Pod (est ⅓ of hole) Yellow - Soft in above Dolomite				
	16	58 min					
	17	46 min					
	18	44 min					
	19	43 min	18.4 Dolomite - Buff - Grey Mod Hard - Siltstone Pod Continues				
418.3'	20	33 min					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 6 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT
2. LOCATION: 101-P3-W-Socket	11. Elevation of Bottom of Hole
3. Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO	13. Casing Record: Depth / Type
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION of Water
7. Boring Method: Rotary	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING
	19. SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
418.3'	20						
	21	34 min	Dolomite - Buff - Grey Mod Hard - with Siltstone Pod (est ⅓ of hole) Yellow & Soft		Yellow Brown	Mod Rough	2nd 17rpm No H20 186.7 stem kelly & DH Assy
	22	36 min					
	23	39 min	22.8 Dolomite - Buff - Grey Mod Hard and Siltstone Buff - Pink - Very Soft (est 1/3 of hole)		Milky Brown		
415.3'							6/22/81
	24	1 hr 19min					6/23/81 Start 7:21 Lake Elev. 548.82 2nd 17rpm No H20 186.7 stem kelly & DH Assy H20 on @24.4' Stop 1:49 @29.2' Air Leak
	25	46 min					
	26	48 min	25.5 Dolomite - Buff - Grey Mod Hard - Slightly Fractured with Iron Stains - Stained Frac Planes				
	27	50 min	26.7 Dolomite - Grey - Pink Mod Hard - Hard - Silic Slightly Frac		Milky	Smooth	
	28	1 hr 2min	27.5 Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac.				
	29	1 hr 23min	28.6 Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous				122
409.1'							6/23/81
408.2	30						6/24/81 9' Drop in can Start @31.1

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 of 6 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 101-P3-W-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
		16 DATE HOLE: STARTED / COMPLETED	
Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	
9 TOTAL DEPTH OF HOLE		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
408.3	30						6/25/81
408.2							6/25/81
408.0'		1 hr 59min	Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous			Mod Smooth	Start 4:35
	31		30.5		Milky		186.7 stem - Kelly & DH Assy
		59 min	Dolomite - Grey - Pink Hard - Very Hard - Siliceous - (est 50%) Chert - Brown - Pink Hard			Mod Rough	Lake Elv 548.7
			31.5				6/26/81
	32						Start 7:09
		38 min	Siltstone Pod - Yellow Soft - (est < 1/8 of hole) in above rock		Brown	Rough	@30.3' 186.7' stem -kelly - & DH Assy with H20 2nd 17rpm @32.5 1st 7rpm
			32.2				Stop 12:11 @34.2
	33		Dolomite - Grey - Pink Hard - Silic (est 2/3 of hole) & Siltstone - Yellow - Brown - Very Soft (est 1/3 of hole)				
		48 min	33.8				
1hr 3min	34		Dolomite - Light Grey Hard - Siliceous - Massive (est ¾ of hole)			Very Rough	
404.1'			Siltstone - Yellow - Brown - Very Soft (est ¼ of hole)				6/26/81
		48 min					6/29/81
CAN DROP	35						Can fell 1.15' 6/25/ While Drilling
			35.9				Start @35.35' 6/29 Add 7.5
402.95			Dolomite - Light Grey Hard - Silic - Massive (est ½ of hole) & Chert Grey - Brown (est ½ of hole) & Siltstone - Yellow - Very Soft (est ¼ of hole)				can - 20' kelly
		1 hr 29min					6/29/81
	36						Start 12:18 @35.35 1st 7rp
		20min					NoH20 206.7' Stem - Kelly DH Assy Stop 1:02 Tighten kelly bolts
CAN DROP 401.3'	37		36.3 Chert - Grey - Hard		Milky Brown	Mod Smooth	Start 1:18
401.1'			37.3 Dolomite - Grey - Pink Hard - Very Hard - Slightly Frac Silica Healed Frac.				36' @2:03 Stop @2:03 Table Ch
		1 hr 21min					Start 4:24
	38		37.5 - 38.1 Siltstone -Pod (in above Dolomite) Yellow - Soft (est < 1/8 of hole)				Stop 4:44 Table check
		1 hr 49min					6/30/81 .2' can drop 6/29/81
	39		38.9 Dolomite - Grey - with Buff Iron Stains - Mod Hard				Start 6/30/81 38:29 1st gear
		50 min				Smooth	7rpm NoH20 206.7 stem - Kelly & DH Assy
3 [illegible] 3	40						Lake Elev 548.21 @38.1 2nd 12rp

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 5 of 6 SHEETS

PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P3-W-Socket
3 Geotechnician
4 HOLE NO.: 1
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH CHISELED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
398.3'	40						
		1 hr 9min	Dolomite - Grey - w/Buff Iron Stains - Mod Hard 40.6 - 41.9				Stop 11:13 Tighten kelly bolts Start 11:24 H20 on @39.0
	41		Siltstone Pod in above Dolomite - Buff - White Soft (est 1/8 of hole)		Milky Brown		
		1 hr 11min				Mod Smooth	2nd 17rpm w/H20 206.7' stem - kelly & DH ASsy Lake Ele/548.8
	42		42.1 Dolomite - Dark Grey Mod Hard - Massive				Stop 4:16 @44.3
		1 hr 2min	42.3 Dolomite - Dark Brown Mod Hard - Massive				
	43				Milky		
		58 min	43.4 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic with Silic healed frac.				
	44						
394.0'							6/30/81
		1 hr 19min					7/1/81 Start 7:27 2nd 17rpm w/H20 206.7' stem kelly & DH Assy Lake Elev 548.87
	45						
		1 hr 8min					
	46						
		1 hr 12min	46.1 Dolomite - Brown - Mod Hard - Hard - Massive - Slightly Silic				
	47		46.6 Dolomite - Buff - Mod Hard - Slightly Frac with Iron Stains		Milky Brown		
		35 min					
	48						
		1 hr					
	49						
		1 hr 20min	49.2 Dolomite - Buff - Mod Hard with Iron Stains				
388.3'	50						

124

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co	SHEET 6 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P3-W-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
388.3'	50						
		1 hr 37min	Dolomite - Buff - Mod Hard with Iron Stains		Milky Brown		2nd 17rpm w/ H20 206.7 stem - kelly DH Assy Stop 3:46 Check Can Elev. Start 3:50 Stop 4:55 Air Leak
	51		51.2				
		1 hr 22min	Dolomite - Buff - Grey Mod Hard Buff with Iron Stains			Mod Smooth	
386.2'	52						7/1/81
		1 hr 41min			Milky		7/2/81 Lake Elev. 548.93 Start 9:03 2nd 17rpm w/H20 206.7' stem - kelly & DH Assy Stop 10:37 Grease swivel Start 10:46 Stop 11:31 B.O.H. (plan BOH 385
	53		53.1				
		45 min	Dolomite - Buff - Grey Mod Hard - Buff with Fe Stains & Slightly Frac Bottom of Rock Socket				
384.5'							

125

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 of 6 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P3-East-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG FROM VERT
7 Boring Method: Reverse Rotary
8 DEPTH DRILLED INTO ROCK: 53.0'
9 TOTAL DEPTH OF HOLE: 56.49'
10 SIZE AND TYPE OF BIT: 102" Smith-Rock
11 Elevation of Bottom of Hole: 384.9'
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
13 Casing Record: Depth 121 | Type 10 CD
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water: 548.8'
16 DATE HOLE: STARTED 7/7/81 | COMPLETED 7/7/81
17 ELEVATION TOP OF HOLE: 558.64 & 557.64 TOR
18 TOTAL CORE RECOVERY FOR BORING: 441.39' TOG
19 SIGNATURE OF INSPECTOR: 436.19' TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
441.39'							
	1	26 min	OVERBURDEN		Muddy	Smooth	Start 10:10 1st 7rpm w/H20 186.7 Stem - Kelly & DH Ass 6.7' 2nd 17rpm Stop 1:16 Table Repair Start 2:15 Stop 5:01 8.5 1' drop in can from 7-8' H20 Elev. 548.81
	2	10 min					
			CEMENT GROUT				
	3	7 min	OVERBURDEN				
437.9'		11 min	Average Top of Rock (Plan)				
	4		CLAY AND GRAVEL				
		7 min					
436.19'	5		Actual Top of Rock				
		33 min	5.2' Dolomite - Grey - Hard Siliceous - Slightly Fractured			Mod Rough	
	6		6.1'		Milky Brown		
		1 hr 25min	Dolomite - Buff - Mod Hard - Hard - Slightly Silic			Mod Smooth	
	7		6.7'				
		1 hr 54min	Dolomite - Grey - Mod Hard - Hard - Slightly Silic (in above dolomite) 7.0 - 7.1'				
	8		Siltstone Pod - Yellow Soft -(Est 1/8 of hole) 7.1'		Milky	Mod Rough	
432.89'		1 hr 55min	Dolomite - Milky - Sandy Highly Siliceous - Very Hard 7.6				7/7/81 7/8/81
	9					Smooth	Start 7:18 2nd 17rpm w/H20 186.7 stem - kelly & DH Ass Lake El. 548.9
		2 hr 10min	Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic - Massive				
431.39	10						

126

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P3-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
431.39	10	1 hr	Dolomite - Grey - Pink Mod Hard - Hard - Massive		Milky	Smooth	2nd 17rpm w/H20 186.7 Stem - Kelly & DH Ass'y Lake El 548.81 Stop 5:27 20.0
			10.1 Chert - Brown - Hard				
	11	1 hr 12min	11.6 Dolomite - Buff - Mod Hard - Hard - Slightly Silic - Massive				
	12	1 hr 7min					
	13	43 min	13.9 Dolomite - Buff - Mod Hard - Slightly Silic Slightly Fractured				
	14	35 min					
	15	31 min					
	16	34 min	15.8 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac.				
	17	29 min					
	18	19 min	17.7 Dolomite - Buff - Grey Mod Hard - Slightly Frac				
	19	18 min					
421.39	20						

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Maseman Construction Co.	SHEET 3 of 6 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P3-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
421.39	20						
		34 min	Dolomite - Buff - Grey Mod Hard - Slightly Frac.				7/9/81 Start 9:53 20.0' 2nd 17rpm WH20 186.7 stem - kelly & DH Assy Stop 12:13 Gear Box Repair Start 12:45
	21						
		30 min					
	22						
		26 min	22.7 Dolomite - Buff - (Fe Stained) & Grey - Mod Hard - Fractured				
	23						
		24 min	23.8 Dolomite - Buff - Grey Mod Hard - Hard - Frac Slightly Silic				
	24						
		32 min	24.9 Dolomite - Buff - Mod Hard - Frac.		Milky	Smooth	
	25						
		27 min					
	26						
		18 min					
	27						
		30 min	27.6 Chert - Black-Hard 27.7 Dolomite - Grey - Mod Hard - Hard - Silic				
	28						
		34 min	28.7 Dolomite - Light Grey Sandy - Mod Hard 29.5 Dolomite - Grey - Pink Mod Hard - Hard - Silic				
	29						
		23 min	Siltstone Pod - Yellow Soft (Est ¼ of Hole) Mod Hard		Milky	Yellow	128
411.39	30						

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 4 of 6 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: H101-P3-East-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
411.39'	30						7/9/81
		25 min	Dolomite - Grey - Pink Mod Hard - Hard - Silic Siltstone Pod - Yellow Soft (Est ½ hole) Mod Hard		Milky Yellow	Mod Smooth	2nd 17rpm w/H20 186.7 stem - kelly DH Assy Stop 3:22 Engine Check Start 3:35 32.0 1st 7rpm w/H20 Stop 4:41 Engine Check Start 5:27 Stop 7/9/81 5:36 Broke kelly Bolt
	31		31.5 Chert - Brown - ¼ Grey Hard				
		23 min	32.0 Dolomite - Pink - Grey Mod Hard - Hard - Silic (Slightly)		Milky		
	32					Mod Rough	
		38 min	and Siltstone Pod - Yellow Soft 32.4 (est 1/8 of hole)				
408.29'	33		Dolomite - Grey - Pink Mod Hard - Hard - Slightly		Red	Very Rough	7/9/81
		1 hr 17min	Silic and Clay filled cavern (est ¼ of hole) 33.5				7/10/81 Start 9:08 1st 7rpm No H20 206.7 stem - kelly & DH Assy Stop 9:30 Broken Kelly bolts Start 10:26 Stop 10:40 Gear Box out 33.8' Start 2:00 Stop 2:26 Broke Kelly bolt Start 4:01 Stop 4:03 Sheared K bolts
407.39	34		Cavity - Continues - Siltstone - Filled - Yellow - Soft		Milky Yellow		
		5 hr 32min	34.9 Chert - Brown - Grey -				
	35		Hard - (est 9/10 of hole) and Siltstone - Yellow Soft - (est 10% of hole)				
		35 min	36.0 Dolomite - Light -Grey		Yellow	Mod Smooth	
	36		Pink - Mod Hard - Hard Silic (slightly) 36.2-36.5		Milky		7/13/81 Start 34.0' 1st 7rpm No H20 No Air 206.7' stem kelly & DH Assy Stop 9:14 Gear Box Adjustment Start 9:44 Stop 10:09 GBA Start 10:33 Stop 11:20 " Start 11:50 Stop 12:29 " Start 1:25 Stop 4:35 Broke Trunnion Bolt Start 5:15 35:35 2nd 17rpm w/H20 Stop 6:2[illegible] Engine Check 36.6
404.79'		1 hr 13min	Siltstone Pod - Yellow Soft - (Est 1/8 of hole)				
	37		36.5 Chert - Grey - Brown Hard				
		1 hr 7min	36.7 Dolomite - Grey - Pink Mod Hard - Hard - Slightly				
	38		Silic 37.5				
		43 min	Dolomite - Buff - Grey Mod Hard w/Fe stains 38.5				
	39		Dolomite - Buff - Grey Mod Hard - Slightly Frac. 39.8				
		45 min	Dolomite - Buff - Grey Mod Hard - Hard - Slightly				
401.39'	40		Silic - Slightly Frac.				

129

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 5 OF 6 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P3-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotery		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
401.39	40						
		1 hr 5min	Dolomite - Buff - Grey - Mod Hard - Hard - Slightly Silic - Slightly Frac. 40.95 - 41.0 Shale Seam - Black - Soft - Mod Hard				7/14/81 2nd 17rpm w/H20 206.7' stem - kelly - DH Assy @42.0 4th 27rpm Stop 1:40 Tighten Bolts Start 1:52 @43.0 2nd 17rpm Stop 2:55 Air Leak
	41		41.0				
		1 hr 3min	Dolomite - Buff - Dark Grey - Mod Hard - Hard Slightly Silic - Slightly Fractured		Milky	Mod Smooth	
	42		41.4				
		42 min	Dolomite - Brown - Dark Grey - Hard - Silic - Slightly Fractured				
	43		43.1				
		38 min	Dolomite - Grey - Hard Highly Siliceous - Slightly Frac.				
	44		44.3				
396.99		1 hr 25min	Dolomite - Buff - Grey Mod Hard - Slightly Frac. 44.5				7/14/81 7/15/81 Start 8:30 2nd 17rpm No H20 206.7'stem - Kelly &DH Assy 4th 27rpm 9:25 44.9' @47.0 2nd 17rpm Stop 12:55 Weld Kelly bars Start 1:25
	45		Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic - Slightly Frac. 45.4				
		50 min	Dolomite - Buff - Mod Hard = Frac w/Fe Stains 46.1				
	46		Dolomite - Buff - Hard Frac w/Fe stained frac planes - Silic				
		1 hr 1min	47.3 Dolomite - Buff - Mod Hard - Slightly Frac. Fe Stained				
	47						
		46 min					
	48						
		1 hr 11min	48.6 Dolomite - Buff - Mod Hard - Fe Stained				
	49		49.7				
		1 hr 30min	Dolomite - Buff & Grey Mod Hard & Hard - Grey Slightly Silic				
391.39	50						

130

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 6 OF 6 SHEETS

1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P3-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record	Depth / Type
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
391.39	50						
		1 hr	Dolomite - Grey - Buff Mod Hard & Hard - Grey Slightly Silic				2nd 17rpm No/ H20 206.7' stem kelly & DH Assy
			30.5'		Milky	Mod Smooth	Stop 6:55
	51		Dolomite - Grey - Hard Silic - Massive				@53.5'
		50 min					
			51.9				
	52		Dolomite - Grey - Buff Mod Hard - Hard - Grey Slightly Silic				
		56 min	52.6				
			Dolomite - Buff - Mod Hard - Hard - Slightly Frac - Slightly Silic Fe Stained				
	53						
		1 hr 28min	52.9				
387.89'			Dolomite - Grey - Hard Silic				7/15/81
							7/16/81
	54						Start 7:30 2nd 17rpm No/H20 206.7' stem - kelly & DH Assy
		1 hr 37min	54.8				Stop 7:58
			Chert - Brown - Grey Hard				Platform elev check
	55		55.2				Start 8:03
		44 min	Dolomite - Buff & Grey Mod Hard - Hard - Buff Slightly Silic				Lake El 548.65' Stop 11:24 56.9 BOH
	56						
385.0'		39 min					Plan BOH 385.0'
~~384.9~~			Bottom of Rock Socket				

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 4 SHEETS
2 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102 Smith-Rock	
3 LOCATION: 101-P4-West Socket		11 Elevation of Bottom of Hole: 399.61	
5 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO:		13 Casing Record: Depth 122.7 Type 10 O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT		15 ELEVATION of Water 547.27	
		16 DATE HOLE: STARTED 8/20/81 COMPLETED 8/22/81	
7 Boring Method: Reverse Rotary		17 ELEVATION TOP OF HOLE: 558.61' TOPlatform	
8 DEPTH DRILLED INTO ROCK: 35.6		18 TOTAL CORE RECOVERY FOR BOX NO: 437.21' TOG;	
9 TOTAL DEPTH OF HOLE: 37.60		19 SIGNATURE OF INSPECTOR: 435.2 ' TOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
437.21		12 min	SAND		Muddy Brown	Mod Smooth	Start 8:45 Lake Elev. 547.27 1st 7rpm w/H20 186.3 stem-kelly & DH Assy Stop 9:19 Weld Kelly Start 10:50 @30' 2nd 17rpm
	1	9 min	CEMENT GROUT				
			Gravel				
435.2	2		Average Top of Rock				
		47 min	Dolomite - Buff - Mod Hard Fe Stained 2.3-2.5 Siltstone Pod - Yellow Soft (Est ¼ of hole)		Milky Brown	Smooth	
	3		2.5				
		49 min	Dolomite - Buff - Grey Mod Hard Fe Stained - Slightly Frac. 3.2				
	4		Dolomite - Buff - Mod Hard - Fe Stained 4.3			Mod Smooth	
		40 min	Siltstone Pod - Grey Buff - Soft (Est 1/8 of hole) in above Dolomite 4.5				
	5		Dolomite - Buff - Grey Soft - Mod Hard - Soft Weathered 5.5		Milky Yellow		
		38 min	Dolomite - Buff - Grey Soft - Mod Hard Siltstone - Yellow - Soft (Est 1/8 of hole)				
	6						
		39 min					
	7					Smooth	
		36 min	8.0				
	8		Chert - Dark Brown - Hard 8.4				
		26 min	Dolomite - Buff - Soft Mod Hard (Est 1/3 of hole) Siltstone - Yellow - Soft (Est 2/3 of hole)		Yellow		
	9						
		13 min	9.8				
427.21	10		Dolomite - Light Grey Mod Hard Frac.				

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (CHANGE 1) PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 of 4 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P4-West - Socke		11 Elevation of Bottom of Hole	
3 Geotechnition		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
427.21	10						
		15 min	Dolomite - Light Grey - Mod Hard - Frac		Milky Brown	Smooth	2nd 17rpm w/H20 186.3 stem kelly Down Hole Assy @14.0' 1st 7rpm @14.4 2nd 17rpm Stop 17.0'
	11						
		9 min					
	12						
		9 min	12.2 Dark Chert -Brown - Hard -				
	13		13.1 Chert - Grey - Hard Vuggy w/Clay filled Vugs				
		4 min					
	14		14.0 Chert - Grey - Hard (Est ½ of hole) Clay - Red - Soft (Est ½ of hole)		Red	Mod Smooth	
		17 min	14.4				
	15		Chert - Brown - Hard 14.9 Dolomite - Light Grey - Mod Hard Frac.		Milky Brown	Smooth	
		26 min					
	16						
		30 min	16.4 Siltstone Pod - Yellow Soft (Est 1/8 of hole) in above Dolomite				
420.21	17		16.8 Dolomite - Buff - Grey Mod Hard Slightly Frac with Fe stained vugs & seams				8/21/81 Lake Elev. 547. .27 Start 7:35 17.0 2nd 17rpm w/H20 186.3 stem - kelly - DH Assy 19.5 4th 27rpm
		26 min					
	18						
		32 min					
	19						
		40 min	19.3 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Frac w/Fe stained frac planes				
417.21							

133

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 4 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P4-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record ; Depth ; Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE STARTED ; COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR EACH
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
417.21	20		20.0				4th 27rpm w/H20
		37 min	Dolomite - Grey - Hard Silic - Frac w/Fe Stained Frac. Planes		Milky Brown	Mod Smooth	186.3' stem - kelly & DH Assy
	21		21.2				@20.5 2nd 17rpm
		52 min	Dolomite - Dark Grey - Hard - Silic - Slightly Frac.				@26.9 4th 27rpm
							Stop 4:19 28.0
	22		22.1				
		1 hr 11min	Dolomite - Light Grey Hard - Silic - Slightly Frac.				
	23						
		1 hr 2min					
	24		24.4				
		1 hr 10min	Dolomite - Grey - Mod Hard Hard - Slightly Frac. Hard Silic				
	25		24.9				
		44 min	Dolomite - Grey - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac				
	26		25.4				
		1 hr 44min	Chert - Rust Red - Hard 25.6 Dolomite - Light Grey Silic - Hard - Frac with Fe Stained Frac Planes				
	27		26.2				
		46 min	Dolomite - Light Grey Hard - Very Hard - Highly Silic Fe Stained				
409.21	28						8/21/81
							8/22/81
		41 min	28.8 Dolomite - Light & Dark Grey - Hard - Very Hard Highly Silic-Light Grey Fe Stained				Start 7:35 4th 27rpm w/H20 1st 3' stem - Kelly Down Hole Assy
	29						
		39 min					
407.21	30						

134

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 OF 4 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	11 Elevation of Bottom of Hole
2 LOCATION: H101-P4-West-Socket		12 MANUFACTURER'S DESIGNATION OF DRILL	
3 Geotechnician		13 Casing Record: Depth / Type	
4 HOLE NO		14 TOTAL NUMBER CORE BOXES	
5 NAME OF DRILLER		15 ELEVATION of Water	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		16 DATE HOLE: STARTED / COMPLETED	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY	19 SIGNATURE OF INSPECTOR
9 TOTAL DEPTH OF HOLE			

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Action	REMARKS
407.21	30						
		34 min	Dolomite - Light & Dark Grey - Hard - Very Hard - Highly Siliceous - Light Grey Fe Stained				4th 2 rpm w/H20 186.3' Steel - Kelly & DH Assy Stop 10:09
	31		30.3			Mod	332.0' Bear Rock
		39 min	Dolomite - Light - Dark Grey - Highly Siliceous		Milky Brown	Smooth Adv.	Start 10:12 Stop 1:52 PM
			31.5 Light Grey Fine - Fr Stained Fract Finish				
	32		Dolomite - Dark Grey - Hard - Very Hard - Highly Siliceous				
		43 min					
	33						
		35 min	33.4-33.5 Chert - Brown & Grey - Hard				
			33.5				
	34		Dolomite - Buff & Grey Hard - Very Hard - Highly Siliceous - Slightly Fractured				
		44 min					
	35						
		31 min	35.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac.				
	36						
		45 min	36.5 Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
	37						
399.61		22 min	Bottom of Rock Socket				Elev 400.0 Datum [illegible]

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | Sheet 1 of 4 Sheets

1. PROJECT: Norfork Lake Bridges
2. LOCATION: H101-P4-East-Docket
3. Geotechnician: Robert Schmoker
4. HOLE NO:
5. NAME OF DRILLER: Don Uchtman
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 43.9'
9. TOTAL DEPTH OF HOLE: 30.54
10. SIZE AND TYPE OF BIT: 10½" Smith - Rock
11. Elevation of Bottom of Hole: 399.63'
12. MANUFACTURER'S DESIGNATION OF DRILL: Steven W. Hains
13. Casing Record: Depth 122.7' | Type 10 O.D.
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION of Water: 8/25 Lake Elev 546.
16. DATE HOLE: STARTED 8/25/81 | COMPLETED 8/27/81
17. ELEVATION TOP OF HOLE: 555.80' TC Platform
18. TOTAL CORE RECOVERY FOR BORING: 136.17' TCC
19. SIGNATURE OF INSPECTOR: 433.5' TCRock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
436.17							Start 11:44 1st 7rpm w/H20 186.3 stem-kelly-DHA Stop 12:36 33.5' weld stem Start 1:23
	1	7 min	SAND				
		27 min	CEMENT GROUT		Muddy Brown	Mod Smooth	
	2		OVERBURDEN				
433.5		8 min	Average Top of Rock				
	3		Dolomite - Buff - Soft - Mod Hard				
		17 min	3.8 Dolomite - Buff - Soft - Mod Hard (Est ½ of hole)				
	4		Siltstone - Yellow - Soft				
		15 min			Yellow	Mod Rough	
	5		5.1 - 5.3 Chert - Brown - Hard - Fractured				
		5 min	5.3 Siltstone - Yellow - Soft				
	6						
		4 min					
	7						
		2 min					
	8						
		4 min					
	9		8.8 - 9.0 Chert - Grey - Hard - Vuggy - Fractured				
		5 min	9.0 Siltstone - Yellow - Soft 9.7				
426.17	10		chert - Grey - Hard - Vuggy - Siltstone Yellow				

136

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	Sheet 2 of 4 Sheets

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P4-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record: Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR HOLE NO.
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
426.17	10						
		10= min	chert - Grey - Hard - Vuggy with Siltstone filled vugs				1st 7rpm w/H20 186.3 stem-kel Down Hole Assy
			10.8		Yellow		@12.8 H20 off
	11		Chert - Grey - Hard - Vuggy - with siltstone				Broke H20 line @12.8 2nd 17rpm
		7 min	filled vugs (est 50% of hole)			Mod Rough	Stop 2:58 @13. Gear Box Adj & hose repair
			Dolomite - Grey - Mod Hard - Fractures (est 50% of hole)				Start 4:13 2nd 17rpm Stop 4:13 @14.0 1' drop in can.
	12						
		36 min	12.3				
			Chert - Grey - Hard				
			12.7				
			Dolomite - Light Grey -		Milky Brown		
	13		Mod Hard - Hard - Slightly Silic - Fractured				
422.67		1 hr 17min	13.4			Smooth	8/25/81
			Siltstone - Pod - Yellow Soft (est ½ of hole)				Lake Elev 546. .60
	14		Dolomite - Light Grey		Yellow		
			- Hard - Very Hard				8/26/81
		32 min	Highly Siliceous - ~~Slightly~~ ~~Fractured~~				Start 7:10 2nd 17rpm
			14.2		Milky Brown		186.3 stem - kelly - DH Ass
	15		Dolomite - Light Grey				Stop 7:40
			Pink - Hard - Very Hard				engine check
		28 min	Highly Siliceous - Slightly Fractured				Start 8:10 Stop 8:45 Can drop add 7.5'
	16		16.2				Start 12:25
			Dolomite - Light Grey				Stop 12:40
		33 min	Hard - Very Hard - Highly Siliceous - Fractured with Fe Stained frac planes				Engine check Start 12:45
	17						
			17.5				
		34 min	Dolomite - Grey - Mod Hard - Slightly Frac				
	18		18.0				
		13 min	Dolomite - Grey - Mod Hard - Fractured with Fe stained frac planes				
	19						
		14 min					
416.17	20						

137

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 4 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P4-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record / Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	%
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
416.17	20						
	21	12 min	Dolomite - Grey - Mod Hard - Frac w/FE stained frac planes		Milky Brown	Smooth	8/25/81 H20 Level 546.60' 2nd 17rpm w/H20 186.3' stem - kelly & DH assembly @20.2' 4th 27rpm
	22	13 min					
		12 min					
	23	24 min	23.5 - 23.7 Chert - Red & Brown - Banded - Hard				
	24	1 hr 1min	23.7 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic				
411.17							8/26/81
	25	37 min	25.6 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac.				8/27/81 Lake Elev. 546.42' Start 7:25 3rd 27rpm w/H20 186.3' stem - kelly - & DHA
	26	28 min					
	27	29 min	27.1 Dolomite - Mod Hard - Frac Buff - Grey - w/Fe Stained frac planes				
	28	35 min	28.4 Dolomite - Buff - Pink' Mod Hard - Hard - Slightly Silic - Slightly Frac.				
	29	42 min					
406.17	30		29.5 Dolomite - Light Grey Mod Hard - Hard - Slightly Silic				

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 of 4 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P4-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record / Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING %	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
406.17	30						
		51 min	Dolomite - Light Grey - Mod Hard - Hard - Slightly Silic				8/27/81 Lake Elev. 546.42' 3rd 27rpm w/H20 186.3' stem - Kelly DH Assy Stop 2:46 BOH
	31		30.2				
		39 min	Dolomite - Buff - Pink' Mod Hard - Hard - Slightly Silic		Milky Brown	Smooth	
	32						
		39 min	32.6 Dolomite - Grey - Mod Hard - Hard - Silic - Frac with F^E Stained frac planes				
	33						
		50 min	33.1 Dolomite - Buff - Mod Hard - Hard - Slightly Silic				
	34						
		36 min	34.2 Dolomite - Buff - Mod Hard				
	35						
		29 min	35.0 Dolomite - Buff - Mod Hard - Slightly Frac. 36.1 Dolomite - Grey - Mod. Hard - Slightly Silic Frac w/Fe stained frac planes				Elev. [illegible] Design BOH
	36						
		21 min					
399.63			Bottom of Rock Socket				

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

	NAO 03-79-C-0015
Norfork Lake Bridges	11 Elevation of Bottom of Hole 396.0
H101-P5-W-Socket	12 MANUFACTURER'S DESIGNATION OF DRILL Steven M. Hain
Robert Schmoker	13 Casing Record: Depth 122.5' Type 10 O.D.
14 HOLE NO	14 TOTAL NUMBER CORE BOXES
Don Uchtman	15 ELEVATION OF WATER 5/20 - 550.0
DIRECTION OF HOLE X VERTICAL ☐ INCLINED ____ DEG FROM VERT	16 DATE HOLE STARTED 5/20/81 COMPLETED 6/5/81
Boring Method: Reverse Rotary	17 ELEVATION TOP OF HOLE 562.35 TOP
18 TOTAL CORE RECOVERY FOR BORING 437.45 TOG	
19 TOTAL DEPTH OF HOLE 41.45	SIGNATURE OF INSPECTOR 435.2 TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
437.45						
	1	5 min	CLAY = MOD AND SAND	Muddy		5/20/81 Start 9:40 1st 7rpm w/H20 186.5 Stem kel and DH Assy. H20 El.550.0 1.5 - 10:27 2nd 17rpm Stop 12:19
		53 min	CEMENT GROUT		Slightly Rough	Mark Kelly Start 12:24
	2		Average Top of Rock			
435.2		17 min	Dolomite - Light Buff Hard Silic - Slightly Fractured			
	3			Milky Brown		
		11 min	3.6 Dolomite - Buff - Sft Mod Hard - Frac w/FE Stains			
	4				Rough	
		31 min	4.5 Dolomite - Buff - Mod Hard - Frac w/Fe Stains			
	5					
		18 min			Smooth	
	6					
		13 min	6.6 Dolomite - Buff - Mod Hard - Extremely Frac w/FE stains			
	7					
		11 min				
	8					
		14 min	8,8 Dolomite - Grey - Mod Hard Slightly Frac w/FE stains			
	9					
		7 min				
427.45	10					

PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | 1 of 5 SHEETS

2 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
3 LOCATION: H101-P5-W-Socket	11 Elevation of Bottom of Hole
4 HOLE NO	12 MANUFACTURER'S DESIGNATION OF DRILL
5 NAME OF DRILLER	13 Casing Record: Depth / Type
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	14 TOTAL NUMBER CORE BOXES
7 Boring Method: Rotary	15 ELEVATION of Water
8 DEPTH DRILLED INTO ROCK	16 DATE HOLE: STARTED / COMPLETED
9 TOTAL DEPTH OF HOLE	17 ELEVATION TOP OF HOLE
	18 TOTAL CORE RECOVERY FOR BORING %
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
427.45	10					
		14 min	Dolomite - Grey - Mod Hard Slightly Frac w/FE stains			2nd 17rpm w/H20 186.5 Stem kelly and DH Assy H20 el. 550.0 Stop 1:30 Engine Start 1:40 Check
	11	15 min	11.6 Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Frac w/FE stains		Smooth	7rpm w/H20 Stop 4:05 @18.5
	12	22 min				
	13	21 min		Milky Brown	Rough	
	14	26 min				
	15	25 min	14.8 Dolomite - Light Buff Mod Hard - Frac w/FE Stains			
	16	24 min				
	17	25 min			Smooth	5/18/81 5/19/81
	18	42 min				5/18/81 5/19/81 Start 8:01 186.5 Stem kelly DH Ass 2nd 17rpm w/H20 El. 550.03 @19.0 4th 27rpm
418.95						
	19	23 min	Dolomite - Light Buff Mod Hard - Hard - Slightly Silic - Frac w/FE Stains			
417.45						

141

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | PROJECT NO. DACW 03-79-C-0055 | Massman Construction Co.

Norfork Lake Bridges

H101-P5-W-Socket

Geotechnician

Boring Method: Rotary

Elevation	Depth	Drill Rate	Classification of Materials (Description)	Water Color	Drill Action	Remarks
417.45	20					
		26 min	Dolomite - Light Buff - Mod Hard - Hard - Slightly Silic	Milky Brown	Smooth	186.5' Stem Kelly DH Assy 4th 27rpm w/H20 el 550.03 @20.5 1st 7rpm
	21		20.5-21.9 Frac w/FE stains		Very Rough	Stop 9:25 @21.5 Broke off stem 57.5 off bottom of hole 5/19/81
415.95		1hr 36min	Siltstone Pod - Yellow Soft (Est. 1/3 of hole) Balance Dolomite - Buff & Pink' Hard - Very Hard - Highly	Yellow		5/21/81 Start 1:24 @21.5 1st 7rpm w/H20 186.5 Stem kelly
	22		Siliceous - Pink - Grey 21.9			
		26 min	Dolomite - - Grey Hard - Siliceous - Frac w/FE Stains	Milky Brown	Rough. Smooth	DH Assy el 550.0 Stop 2:00 gear box out @21.5 5/27/81
414.65	23		22.6			Start 11:49 @21.5
413.95		39 min	Dolomite - Buff - Grey - Hard - Siliceous - Slightly Frac w/FE stains			el 550.3 1st 7rpm w/H20
	24		23.0-23.2 Chert - Brown - Grey -Hard		Rough	Stop 1:00 @22.8 Air loss on stem 5/28/81
		38 min	23.2 Dolomite - Buff - Pink Hard - Very Hard - Highly Siliceous - Slightly Frac			Start 10:07 @22.8 st 7rpm w/H20 186.5 Stem Kelly & DH Assy
	25				Smooth	Stop 10:29 Air Loss @23.5 6/2/81
		1hr 30min	25.0 Dolomite - Buff - Light Grey - Mod Hard - Hard Slightly Silic - Frac w/FE stained Frac planes	Milky		Start 12:30 @23.5 1st 7rpm w/H20 186.5 Stem, Kelly & DH Assy el 550.0 @24.5 2nd 17rpm
	26		25.5			1:10 @26.0 4th 27rpm Stop 4:10 @ 27.0'
		1hr 15min	Dolomite - Buff - Pink Hard-Very Hard - Highly Siliceous			6/2/81 6/3/81
410.45	27		26.8			Start 7:32 @27.0
		1hr 26min	Dolomite - Buff - Hard Very Hard - Highly Siliceous - Slightly Frac.			4th 27rpm w/H20 186.5 Stem kelly DH Assy el.5550 @28.8 2nd 17rpm
	28		28.2			
		34 min	Dolomite - Buff - Hard Very Hard - Highly Siliceous - intensely frac w/FE stained frac planes	Milky Brown		
	29					
		14 min				
407.45	30					

142

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Mathews Construction Co.

Norfork Lake Bridges

H101-P5-W-Socket

Geotechnical

Boring Method: Rotary

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Color	Drill Action	REMARKS
407.45	30					
		28 min	Dolomite - Buff - Hard Very Hard - Highly Siliceous - Intensely Frac w/FE stains on Frac Planes			2nd 17rpm w/H2 186.5 Stem - Kelly+DH Assy el. 550.0 @33.8 11:08
	31		28.8			
		21 min	Dolomite - Buff - Hard - Very Hard - Highly Sicileous - Slightly Frac			1st 7rpm Stop 11:15 Add 20' joint Start 12:57 @34.0 206.5' Stem - Kelly & DH Assy
	32			Milky Brown	Smooth	1st 7rpm w/H20
		18 min				Stop 3:14 Fuel drill en Start 3:42 Stop 4:12 Air Leak
	33					
		22 min	33.8-35.1 Open Cavity (est.< 1/8 of hole) balanee - Dolomite - Buff - Hard Very Hard - Sicileous			
	34					
		1hr 1min			Very Rough	
	35					
			35.0 Cavity siltstone filled Yellow - Soft			
		34 min	35.1 Dolomite - Light Buff Buff - Pink - Hard - Very Hard - Siliceous Slightly frac		Rough	
	36					
		39 min	35.7 - 36.8 Siltstone Pod - White Soft - (est < 1/8 of hole)			
	37					
		1hr 7min	36.4 Dolomite - Sandy - Siliceous - Hard - Buff Grey (sand well rounded) Siltstone Pod continues		Very Rough	
399.45	38		37.6			6/3/81
399.15			Dolomite- Buff - Brown Hard - Silic			6/4/81 Start 4:45 1st 7rpm w/H20 206.5' Stem - Kelly & DH Ass
		1hr 30min	38.2 Dolomite - Brown - Hard Silic & Sandy Dolomite Mod Hard - Siltstone Yellow - Soft - (est 1/8 of hole)			el 549.16'
	39					Stop 5:05 38.3
		1hr 19min	38.5 Dolomite - Buff - Hard Silic - fractures		Rough	6/5/81 Start 7:15 38.3 1st 7rpm No H2O 206.5 S-K&DH As
397.45	40					el 549.9

143

FORM 1836, 1 JAN 54 ... OBSOLETE | PROJECT | HOLE NO

Hole No

DRILLING LOG | Project No. DACW 38-79-C-0055 | Contractor Wessel Construction Co | SHEET 5 of 5 Sheets

1 PROJECT: Norfork Lake Bridges
2 LOCATION: H101-P5-W-Socket
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record Depth Type
14 TOTAL NUMBER CORE BOXES
15 Elevation of Water
16 DATE HOLE STARTED COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	H20 Color	Drill Action	
397.45'	40					
		58 min	Dolomite - Buff - Hard Silic Fractures 40.3			1st 7rpm NoH20 206.5' Stem - Kelly & DH Assy Stop 10:30 BOH
	41	27 min	Dolomite - Mod Hard - Tan & Hard Brown - Silic Fractures 39.9 Dolomite - Sandy -	Milky Brown	Rough	
396.0			Bottom of Rock Socket			
			(well rounded) Mod Hard Hard - Tan - Pink			

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 of 5 SHEETS

1. Name: Norfork Lake Bridges
2. Location: 101-P5-East - Socket
3. Geotechnician: Robert Schmoker
4. Hole No.:
5. Name of Driller: Don Uchtman
6. Direction of Hole: ☒ Vertical ☐ Inclined ____ deg from vert.
7. Boring Method: Reverse Rotary
8. Depth Drilled into Rock: 41.0
9. Total Depth of Hole: 43.71
10. Size and Type of Bit: 102 Smith - Rock
11. Elevation of Bottom of Hole: 395.8'
12. Manufacturer's Designation of Drill: Steven M. Hains
13. Casing Record: Depth 122.5' Type 10.0'OD
14. Total Number Core Boxes:
15. Elevation of Water: 449.85' 6/8/81
16. Date Hole: Started 6/8/81 Completed 6/12/81
17. Elevation Top of Hole: 561.31 TOP
18. Total Core Recovery for Boring: 439.51 TOG 437.7 TOR
19. Signature of Inspector:

Elevation	Depth	Drill Rate	Classification of Materials (Description)	Water Loss	Water Color	Drill Action	Remarks
439.51							Start 12:32 1st 7rpm w/H20 186.5 Stem - Kelly - DH Assy 2nd 17rpm @1:07 @5' Stop 1:46 @2.5 Weld lugs on stem Start 2:38 1st 7rpm @3.2 3:30 2nd 17rpm @4.0' 1st 7rpm No H20 @4.5 2nd 17rpm w/H20 Stop - 5:05 @5.5
	1	42 min	SAND CEMENT GROUT OVERBURDEN		Muddy	Rough	
		6 min					
437.7'			Average Top of Rock				
	2	1 hr 3min	Dolomite - Light Grey Very Hard - Highly Siliceous w/Pods of White Quartzite 2.5			Mod Rough	
	3	25 min	Dolomite - Buff - Mod Hard - Hard - Silic - Slightly Frac. 3.3		Milky Brown	Very Rough	
	4	56 min	Dolomite - Buff - Very Hard - Intensely Frac w/Fe stained frac planes Highly siliceous. 4.0			Mod Rough Rough	
	5	46 min	Siltstone Pod - Yellow Soft (<1/8 of hole est) Balance above Dolomite 4.5			Smooth	6/8/81
434.01			Dolomite - Grey - Hard Silic - Massive 5.9-6.0				6/9/81
	6	47 min	Chert Seam - Brown - Hard 6.0 Dolomite - Buff - Grey Mod Hard - Hard - Grey Silic				Start 7:24 1st 7rpm w/H20 186.5 Stem - Kelly & DH Assy @6.4 8:04 2nd 17rpm @6.7
	7	56 min	6.4- Dolomite --Grey-- Hard Silic 6.7-7.0		Yello	Rough	1st 7rpm @7.0 2nd 17rpm Lake Elev. 6/9/81 449.7'
	8	19 min	Siltstone pod - Yellow Soft (est <1/8 of hole) in above dolomite 7.0		Milky Brown	Mod Smooth	
	9	23 min	Dolomite - Grey - Hard Silic - Slightly Frac 7.9 - 8.1 Chert seam(<1/3 of hole) Brown Hard				
429.51	10		8.1 Dolomite - Buff - Mod Hard - Hard - Frac w/Fe Stains - Silic				

145

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P5-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record: Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
Boring Method: Rotary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING %	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
429.51	10						
		1 hr 4min	Dolomite - Buff - Silic Mod Hard - Hard - Frac w/FE Stains		Milky Brown	Mod Smooth	2nd 17rpm - w/ H20 186.5 Stem Kelly & DH Assy
	10.4						
	11		Dolomite - Light Buff Buff - Hard - Very Hard Frac w/FE stains - Highly Siliceous		Milky White	Smooth	LR- EL 449.7' @12.9 - 1:36 4th 27rpm Stop 5:05 @16.4
		59 min					
	12						
	12.1						
		1 hr 33min	Dolomite - Light Buff - Very Hard - Highly Siliceous - Slightly Frac				
	13						
	13.2						
		45 min	Dolomite - Light Buff Hard - Very Hard - Siliceous - Frac w/FE Stains				
	14						
		1 hr 1min					
	15						
		1 hr 12min					
	15.9		Dolomite - Grey - Hard Silic - Slightly Frac				
	16						
423.11		1 hr 15min					6/9/81
	16.9						6/10/81 Start 7:51 @16.4 4th 27rpm w/H20
			Dolomite - Light Buff FE Stained = Hard - Very Hard - Highly Siliceous - Slightly Frac		Milky Brown	Mod Rough	186.5 St - Kelly & DH Assy Stop 8:45 Engine Check Start 8:5[illegible] @16.9 2nd 17rpm EL. 6/9/81 Lake 449.55'
	17	1 hr 1min					
	18						
	18.0		Dolomite - Buff - Mod Hard & Light Buff - Hard - Silic Frac.				
		36 min					
	19					Rough	
		53 min				Mod Smooth	
419.51	20		19.8 Dolomite - Buff - Mod Hard - Massive				

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

146

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P5-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record: Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR THIS BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drilling Action	REMARKS
419.51'	20						
		50 min	Dolomite - Buff - Mod Hard - Massive		Milky Brown	Mod Smooth	6/10/81 2nd 17rpm W/H20 186.5 Stem - Kelly & DH Assy @12:10 - 20.9 4th 27rpm @25.2 2nd 17rpm Stop @26.0 Lake Elev. 449.55
	21						
		1 hr 8min	21.1 Dolomite - Buff - Mod Hard - Slightly Silic Slightly Frac w/FE Stains on Frac planes				
	22						
		1 hr 2min					
			22.9 Dolomite - Grey - Mod Hard - Massive				
	23						
		44 min					
	24						
		45 min					
	25						
		49 min	25.2 Dolomite - Brown - Mod Hard - Massive			Rough	
413.51	26						6/10/81
		1 hr 16min	26.6 Dolomite - Buff - Grey Mod Hard - Slightly Frac w/FE Stained Frac			Smooth	6/11/81 EL 449.55 Start 7:28 2nd 17rpm W/H20 186.5 Stem - Kelly & DH Assy Lake Elev. 449.55
	27						
		58 min					
	28						
		47 min	28.8 Dolomite - Buff - Mod Hard - Massive				
	29						
		41 min	29.5 Dolomite - Grey - Mod Hard - Slightly Frac w/FE Stained Frac planes 29.7-29.9 Siltstone Bed 1/8 of 1.0ft Yellow Soft		Yellow		
	30						

147

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 4 OF 5 SHEETS
1 STATE		10 SIZE AND TYPE OF BIT	
Norfork Lake Bridges		11 Elevation of Bottom of Hole	
2 LOCATION H101-P5-East-Socket		12 MANUFACTURER'S DESIGNATION OF DRILL	
3 Geotechnician		13 Casing Record / Depth / Type	
4 HOLE NO. 1		14 TOTAL NUMBER CORE BOXES	
5 NAME OF DRILLER		15 ELEVATION of Water	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		16 DATE HOLE STARTED / COMPLETED	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING %	
9 TOTAL DEPTH OF HOLE		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
409.31	30						
		29 min	Dolomite - Grey - Mod Hard - Slightly Frac w/FE stained Frac planes 30.1-30.4		Yellow	Mod Smooth	6/11/81 Lake el 499.55 2nd 17rpm w/H20
	31		Siltstone Pod - Yellow Soft (est 1/8 of hole) 30.4		Milky White		186.5 Stem-Kelly & DH Assy @34.0 1:34 4th 27rpm
		36 min	Sandy Dolomite - White Mod Hard 31.7			Rough	Stop 2:05 Add 20' piece of st Start 3:31 2nd 17rpm w/H20
	32		Dolomite - Buff - Mod Hard Fe Stained 31.0		Milky Yellow		206.5' Stem-Kelly & DH Assy Stop 3:56 @35.5
		43 min	Sandstone - Soft - Friable - Hard - Massive 32.5			Smooth	Air Leak
	33		Dolomite - Buff - Yellow Mod Hard - Slightly Frac. 33.7		Yellow		
		36 min	Dolomite - Buff - Yellow Mod Hard - Frac.				
	34						
		31 min					
	35						
			35.4				
404.01		38 min	Silty Dolomite - Soft Mod Hard - Yellow Buff				6/11/81 6/12/81 Lake EL 549.35' Start 12:01 2nd 17rpm w/H20 206.5 Stem-Kelly-& DH Assy @38.0' 1st 7rpm No H20 @39.8 2nd 17rpm w/H20
	36					Mod Smooth	
		35 min					
	37						
		21 min					
			37.9				
	38		Siltstone Pod - Soft Yellow (est < 1/3 of hole) Goethite Clusters Balance Buff - Mod Hard Dolomite		Orange	Very Rough	
		15 min					
		20 min					
399.51	40					Rough	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) PROJECT HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Masgman Construction Co,	SHEET 5 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P5-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Drilling Method: Rotary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BOX NO
	19 SIGNATURE OF INSPECTOR

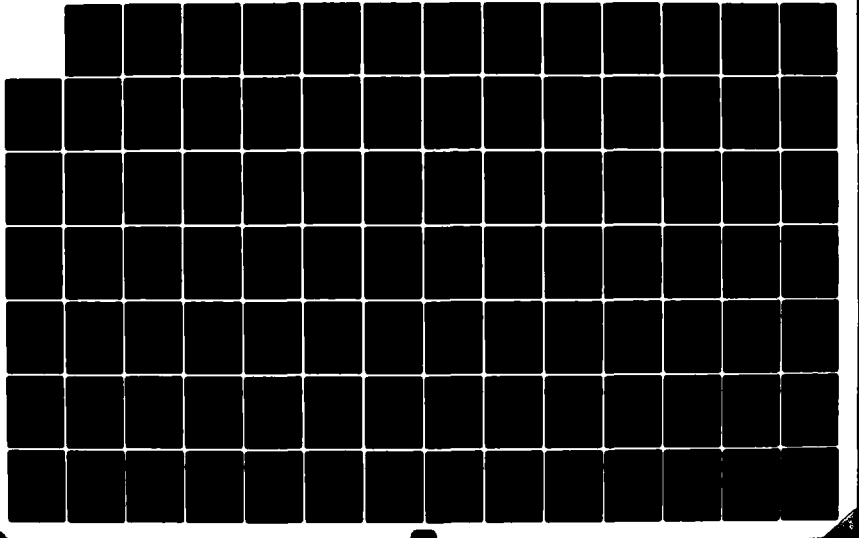
ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
399.51	40						2nd 1 rpm w/H20
		10 min	Dolomite - Mod Hard - Buff & Siltstone Pod - Yellow - Soft with Weathered Goethite - Soft (est Siltstone Pod 1/3 of hole)		Orange	Rough	206.5' Stem - Kelly & DH Assy
	41						@40.2 1st 1rpm w/H20
		20 min	40.2 Silty Dolomite - 50% Weathered - Soft & Silt stone 45% Soft & Weathered Goethite 5% est				@41.5 2nd 1rpm w/H20
	42						Stop 3:10 BOH
		30 min	41.5 Dolomite - Buff - Mod Hard		Buff	Smooth	
	43						
		15 min					
395.8			Bottom of Rock Socket				

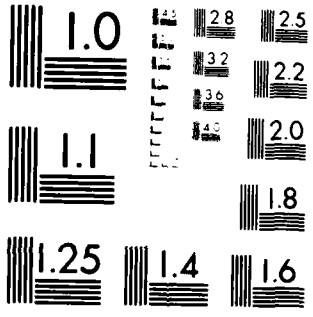
ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

AD-A130 553 NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT LITTLE ROCK ARK R L CRUTCHFIELD JUN 83 3/5

UNCLASSIFIED F/G 13/13 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: H101-P6-West-Socket		11 Elevation of Bottom of Hole: 419.2'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO:		13 Casing Record: Depth 113.5' Type 10 OD	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT.		15 ELEVATION of Water: 10/5/81 542.1'	
7 Boring Method: Reverse Rotary ary		16 DATE HOLE: STARTED 10/5/81 COMPLETED 10/6/81	
8 DEPTH DRILLED INTO ROCK: 24.5'		17 ELEVATION TOP OF HOLE: 557.83 TOPlatform	
9 TOTAL DEPTH OF HOLE: 27.33'		18 TOTAL CORE RECOVERY FOR BORING: 446.53 TOG	
		19 SIGNATURE OF INSPECTOR: 443.7' TORock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
446.53'							
	1	4 min	SAND		Grey	Smooth stem - kelly	Start 2:32 Lake Elev. 542.1' 1st 7rpm w/H20 156.3'
		37 min	CEMENT GROUT				DH Asy @1.2 2nd 17rpm @3.0' 4th 27rpm Stop 5:20
	2	15 min	OVERBURDEN				
443.7'			Average Top of Rock				
	3	39 min	Dolomite - Buff - Mod Hard - Fe Stained 3.1 Dolomite - Light Grey Mod Hard		Milky		
	4	26 min	4.2 Dolomite - Buff - Grey Mod Hard - Buff - Slightly Frac.				
	5	28 min	5.1 Dolomite - Buff - Mod Hard Slightly Fractured		Milky Brown		
	6	26 min					
440.03'			6.7 - 6.8 Chert - Brown-Hard 6.8				10/5/81
	7	25 min	Dolomite - Buff - Mod Hard - Slightly Frac. 7.1 - 8.5 Chert - Brown - Grey Hard				10/6/81 Start 7:13 Lake Elev. 541.91' 4th 27rpm w/H20 156.3' stem - kelly & DH Assembly
	8	33 min	8.5 Dolomite - Brown - Hard Silic 8.8		Milky		
	9	28 min	Dolomite - Brown - Hard Silic - Frac with Fe Stained Frac Planes 9.4 Dolomite - Grey - Hard				
436.53	10		Silic - Slightly Frac.				

150

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P6-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary dry	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
436.53	10	27 min	Dolomite - Grey - Hard Silic - Slightly Frac				4th 27rpm w/H20 156.3' stem - kelly DH Assembly Stop 9:02 Start 9:24
			10.5 Dolomite - Buff - Grey Mod Hard - Hard - Grey Silic		Milky	Smooth Grease Swivel	
	11	29 min	10.9 Dolomite - Grey - Mod Hard				
	12	26 min					
	13	35 min	13.1 Sandy Dolomite - Milky White - Light Grey Mod Hard - Hard				
	14	26 min	13.5 Dolomite - Grey - Mod Hard 14.6 Dolomite - Grey - Mod Hard - Slightly Frac.				
	15	27 min					
	16	16 min	16.4 Dolomite - Grey - Mod Hard - Frac with Fe Stained Frac Planes				
	17	17 min					
	18	19 min	18.0 Dolomite - Buff - Mod Hard - Slightly Frac.				
	19	18 min	18.9 Dolomite - Light Grey Mod Hard				151
426.53	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: H101-P6-West-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO.		13 Casing Record	Depth / Type
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotary ary		16 DATE HOLE: STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
426.53'	20		Dolomite - Grey - Mod Hard				4th 27rpm w/H2O
		17 min	20.3 - 20.4 Shale - Black - Soft				156.3' stem - kelly & DH Asy
			20.4				Stop 2:15 Add 20' stem
	21		Dolomite - Grey - Mod Hard				Start 3:10
		23 min	21.5 - 21.6 Shale - Black - Soft		Milky	Smooth	176.3' stem - kelly & DH Asy
			21.6				Stop 4:42 BOH
	22		Dolomite - Grey - Mod Hard				
		22 min	22.2 Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
	23						
		26 min					
	24						
		21 min	24.8 Dolomite - Grey - Mod Hard				
	25						
		19 min					
	26						
		18 min					
	27						419.7 Design Bottom of Socket
419.2'		7 min	Bottom of Rock Socket				

152

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS

1 PROJECT	Norfork Lake Bridges
2 LOCATION	H101-P6-East-Socket
3 Geotechnician	Don Uchtman
4 HOLE NO	
5 NAME OF DRILLER	
6 DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method	Revers&otary ary
8 DEPTH DRILLED INTO ROCK	24.6'
9 TOTAL DEPTH OF HOLE	26.61'
10 SIZE AND TYPE OF BIT	102" Smith- Rock
11 Elevation of Bottom of Hole	419.2'
12 MANUFACTURER'S DESIGNATION OF DRILL	Steven M. Hains
13 Casing Record	Depth 115.2 Type 100D
14 TOTAL NUMBER CORE BOXES	
15 ELEVATION of Water	10/7/81 541.85
16 DATE HOLE	STARTED 10/7/81 COMPLETED 10/8/81
17 ELEVATION TOP OF HOLE	558.7' TOPlatform
18 TOTAL CORE RECOVERY FOR BORING	445.81' TOG
19 SIGNATURE OF INSPECTOR	443.8' TORock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
445.81							
	1	4 min	SAND		Grey	Smooth	Start 2:44 1st 7rpm w/H20 156.3' stem - kelly & DH Assy Lake Elevation 541.85' 2nd 17rpm @2.5' @3.0' 4th 27rpm @5.0' 1st 7rpm H20 Off 4th 27rpm @5.4' w/H20 Stop 5:15 @6.8'
		10 min	Cement Grout				
443.80	2		Average Top of Rock				
		17 min	Dolomite - Buff - Weathered - Soft		Milky Brown		
	3		2.9 Dolomite - Buff - Mod Hard				
		20 min	3.5 Dolomite - Buff - Mod Hard - Slightly Frac				
	4		4.0 - 5.9 Chert - Brown & Grey - Hard				
		33 min					
	5						
		38 min	5.9 Dolomite - Brown - Mod Hard - Hard - Slightly Silic - Slightly Frac				
	6						
		47 min					
439.01							10/7/81
	7		7.2 Dolomite - Light Brown Mod Hard				10/8/81 Start 7:10 4th 27rpm w/H20 156.3' stem - kelly & DH Assy Lake Elev. 541.83'
		33 min					
	8		8.4 Dolomite - Light Grey Mod Hard				
		40 min					
	9		9.7 - 9.9 Sandy Dolomite - Mod Hard - Hard				
		24 min					
435.81	10		9.9 Dolmmite - Grey - Mod Hard - Slightly Silic				

153

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Hassman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: H101-P6-East-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary dry
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE | STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
435.81	10						
		33 min	Dolomite - Grey - Mod Hard - Slightly Frac				4th 27rpm w/H20 156.3' stem - kelly DH Assembly H20 Level 541.83' Can Drop 75' Adj 11 & 12'
	11	13 min	11.4 Dolomite - Grey - Pink Mod Hard - Hard - Slightly Silic				
	12	25 min	12.2 Dolomite - Grey - Hard Silic				
	13	13 min	13.0 Chert - Grey - Hard 13.3 Dolomite - Buff - Hard Silic - Slightly Frac		Milky Yellow	Smooth	
	14	12 min	14.4 Dolomite - Buff - Grey Mod Hard - Slightly Frac				
	15	18 min	15.5 Dolomite - Buff - Mod Hard				
	16	11 min					
	17	15 min					
	18	14 min					
	19	19 min	19.4 Dolomite - Buff - Grey Mod Hard				
425.81	20						

154

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P6-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO.	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Rotary ary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
425.81	20						4th 27rpm w/H2O
		16 min	Dolomite - Buff - Grey Mod Hard				H20 Level 541.83' stem kelly - DH A Stop 12:10
	20.6						
			Dolomite - Grey - Mod Hard				
	21.1						
	21	17 min	Dolomite - Buff - Grey Mod Hard - Slightly Frac			Smooth	Add 20' kelly Start 1:05 176.3' stem - kelly & DH Asy Stop 2:48 BOH
					Milky Yellow		
	22	18 min					
	23		23.2 Dolomite - Buff - Mod Hard				
		27 min					
	24		24,1 Dolomite - Buff - Mod Hard - Slightly Frac.			Mod Rough	
		18 min					
	25	16 min				Smooth	
	26	8 min					419.7 Design Bottom of Socket
419.2'			Bottom of Rock Socket				

155

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P7-East-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT.
7 Boring Method Reverse Rotary ~~Rotary~~
8 DEPTH DRILLED INTO ROCK 24.9'
9 TOTAL DEPTH OF HOLE 27.83'

10 SIZE AND TYPE OF BIT 102" Smith-Rock
11 Elevation of Bottom of Hole 429.9'
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
13 Casing Record: Depth 100' Type 10'O.D.
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water 542.88
16 DATE HOLE: STARTED 11/11/81 COMPLETED 11/13/81
17 ELEVATION TOP OF HOLE 555.23' T.O. Platform
18 TOTAL CORE RECOVERY FOR BORING 457.73' T.O. Grout
19 SIGNATURE OF INSPECTOR 454.8' T.O. Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
457.73'							Start 2:32 1st-7RPM-w/H_2O 146.9' Stem-Kelly+D.H.Ass't.
	1	5 Min.	Sand				@3.5' 2nd-17RPM Lake El.542.88'
		4 Min.			Brown		
	2	3 Min.					
454.8'			Cement Grout Ave Top of Rock				
	3	31 Min.	Dolomite-Light Grey-Mod. Hard-Buff-Slightly Frac.				
453.73	4						11/12/81 Start 2nd-17RPM-w/H_2O 146.9' Stem-Kelly+D.H.Ass't. Lake El. 4th-27RPM @7:27 Lake El.542.92'
		1 Hr 15 Min.	@4.6'-Dolomite-Light Grey-Mod. Hard-Slightly Frac.		Milky Brown		
	5	55 Min.					
	6	44 Min.	@6.5'-Dolomite-Buff-Grey-Mod.Hard-Frac w/ Stained Frac. Planes				
	7	43 Min.	@7.1'-Dolomite-Grey-Mod.Hard-Hard-Slightly Silic-Slightly Frac.				
	8				Milky Grey		
		53 Min.	@8.8'-Dolomite-Grey-Mod.Hard-Slightly Frac.				
	9	49 Min.					
447.73'	10						

156

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P7-East-Socket		11 Elevation of Bottom of Hole: 430.1'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO.		13 Casing Record	Depth: 100' / Type: 10'O.D.
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method Reverse Rotary ~~xxx~~		16 DATE HOLE: STARTED 11/11/81 / COMPLETED 11/13/81	
8 DEPTH DRILLED INTO ROCK: 24.7'		17 ELEVATION TOP OF HOLE: 555.23' T.O. Platform	
9 TOTAL DEPTH OF HOLE: 27.63'		18 TOTAL CORE RECOVERY FOR BORING: 457.73' T.O. Grout	
		19 SIGNATURE OF INSPECTOR: 454.8' T.O. Rock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
447.73'	10		Con't.				Con't. 11/12/81
		45 Min.	Dolomite-Grey-Mod.Hard-Slightly Frac.				4th-27RPM-w/H_2O 146.9' Stem-Kelly+D.H.Assy. Lake El.542.92'
	11		@10.9'-Dolomite-Brown-Hard-Silic				
		50 Min.	@11.5'-11.6'-Chert-Brown-Hard		Milky Grey		
			@11.6'-Dolomite-Grey-Hard-Silic-Slightly Frac.				
	12						
		53 Min.	@12.5'-Chert-Brown-Hard				
			@12.8'-Dolomite-Grey-Hard-Highly Siliceous				
444.53'	13						11/12/81
		52 Min.	@13.5'-Dolomite-Light Brown-Mod.Hard-Frac w/ Silica Healed Fracs.				11/13/81 Start 7:18 4th-27RPM-w/H_2O 146.9' Stem-Kelly+D.H.Assy. Stop 8:10 Lost Anchor Start 8:14 Lake El.542.95'
	14		@14.0'-Dolomite-Light Grey-Hard-Silic-Frac.w/ Fe Stained Frac Planes			Smooth	
		26 Min.	@14.4'-Dolomite-Buff-Soft-Mod.Hard-Frac.-Weathered				
	15		@15.2'-Dolomite-Buff-Grey-Mod. Hard		Milky Brown		
		21 Min.					
	16						
		21 Min.					
			@16.9'-Dolomite-Grey-Mod.Hard-Massive				
	17						
		43 Min.			Milky Grey		
	18						
		32 Min.					
	19						
		31 Min.					
437.73'	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith-Rock
2 LOCATION: 101-P7-East-Socket	11 Elevation of Bottom of Hole: 430.1'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO:	13 Casing Record: Depth 100' / Type 10'O.D.
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method Reverse Rotary XXXX	16 DATE HOLE: STARTED 11/11/81 / COMPLETED 11/13/81
8 DEPTH DRILLED INTO ROCK 24.7'	17 ELEVATION TOP OF HOLE 555.23' T.O. Platform
9 TOTAL DEPTH OF HOLE 27.63'	18 TOTAL CORE RECOVERY FOR BORING 457.73' T.O. Grout
	19 SIGNATURE OF INSPECTOR: 454.8' T.O. Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
437.73'	20		Con't.				Con't. 11/13/81
		21 Min.	Dolomite-Grey-Mod.Hard-Massive @20.3'-Dolomite-Dark Grey-Mod.Hard-Massive				4th-27RPMw/H$_{20}$ 146.9' Stem-Kelly+D.H.Assy. Stop 12:30 Add 20.2'Joint Start 1:14 167.1' Stem-Kelly+D.H.Assy Lake El.542.95' Stop 3:11 B.O.H.
	21	31 Min.					
	22	22 Min.					
	23	28 Min.			Milky Grey		
	24	33 Min.				Smooth	
	25	25 Min.					
	26	38 Min.					
430.6'	27	21 Min.					PlanB.O.H.
429.9'			Bottom of Rock Socket				

158

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P7-West-Socket		11 Elevation of Bottom of Hole: 430.2'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO.		13 Casing Record: Depth 97.5' Type 10'O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water 542.72	
7 Boring Method Reverse Rotary ~~xxx~~		16 DATE HOLE: STARTED 11/6/81 COMPLETED 11/10/81	
8 DEPTH DRILLED INTO ROCK 24.6'		17 ELEVATION TOP OF HOLE 553.03'T.O.Platform	
9 TOTAL DEPTH OF HOLE 25.33'		18 TOTAL CORE RECOVERY FOR BORING 455.53'T.O.Grout	
		19 SIGNATURE OF INSPECTOR: 454.8'T.O.Rock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
455.53'							
		10 Min.	Cement Grout		Brown		Start-11:35 1st-7RPM-w/H_2O 146.9'Stem-Kelly+D.H.Assy
454.8'			Ave. Top of Rock				
			Silstone-Yellow-Soft				Lake El.542.72'
	1		@1.3' Dolomite-Buff-Grey-Mod Hard-Slightly Frac.		Yellow		@12:02-2nd-17RPM
		47 Min.					@12:23-1.8'4th-27RPM
	2						
		32 Min.			Milky Brown		
			@2.8' Dolomite-Buff Mod Hard				
	3					Smooth	
		29 Min.	@3.9'Dolomite-Buff-Grey-Mod Hard-Slightly Frac w/Fe stained frac planes.				
	4	33 Min.	@4.6'Dolomite-Grey-Mod Hard-Hard-Slightly Silic.				
	5	29 Min.	@5.4' Dolomite-Grey-Mod Hard.				
	6	27 Min.	@6.3' Dolomite-Grey-Mod Hard-Slightly Frac w/FE Stained frac planes.				
	7						
448.03'		30 Min.	@7.4' Dolomite-Buff-Grey-Mod Hard-Slightly Frac.				11/6/81 11/9/81 Start-7:09@7.5' 4th-27RPM-w/H_2O 146.9'Stem-Kelly+D.H.Assy
	8	29 Min.					
	9		@9.1'Dolomite-Brown-Mod Hard-Slightly Frac.				
		39 Min.					
445.53'	10						

ENG FORM 1836 PREV EDITIONS AR OLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P7-West-Socket		11 Elevation of Bottom of Hole: 430.1'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO.		13 Casing Record: Depth 97.5'	Type 10'O.D.
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method: Reverse Rotary ☒		16 DATE HOLE: STARTED 11/6/81	COMPLETED 11/10/81
8 DEPTH DRILLED INTO ROCK: 24.7'		17 ELEVATION TOP OF HOLE: 453.03' T.O. Platform	
9 TOTAL DEPTH OF HOLE: 25.43'		18 TOTAL CORE RECOVERY FOR BORING: 455.53' T.O. Grout	
		19 SIGNATURE OF INSPECTOR: 454.8' T.O. Rock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
445.53'	10		Con't.				Con't.
		32 Min.	Dolomite-Brown-Mod. Hard-Slightly Frac. @10.4'-Chert-Brown-Grey-Hard				4th-2 RPM w/H_2O 146.9' Stem-Kelly+D.H.Ass'y Lake El.11/9/81 542.64'
11			@10.6'-Dolomite-Brown-Grey-Mod. Hard-Slightly Frac.		Milky Brown		
		32 Min.	@11.5'-11.6'-Chert-Dark Brown-Hard				
			@11.6'-Dolomite-Grey-Mod. Hard			Smooth	
12							
		31 Min.	@12.4'-12.5'-Chert-Black-Hard				
			@12.5'-Dolomite-Light Grey-Mod. Hard				
13							
		18 Min.	@13.6'-Dolomite-Buff & Dark Grey-Mod. Hard-Buff-Fe Stained				
14							
		21 Min.	@14.0'-Dolomite-Dark Grey-Mod. Hard		Milky Grey		
			@14.5'-15.0'-Shaley Dolomite-Black-Dark Grey-Soft-Mod. Hard				
15							
		32 Min.	@15.0'-Dolomite-Grey-Mod. Hard				
16							
		37 Min.					
17							
		34 Min.					
18							
		32 Min.					
19			@19.2'-Dolomite-Dark Grey-Mod. Hard				
		28 Min.					
435.53'	20						

160

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P7-West-Socket		11 Elevation of Bottom of Hole: 430.1'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO:		13 Casing Record: Depth 97.5' Type 10.0'O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method Reverse Rotary ~~XXX~~		16 DATE HOLE: STARTED 11/6/81 COMPLETED 11/10/81	
8 DEPTH DRILLED INTO ROCK: 24.7'		17 ELEVATION TOP OF HOLE: 453.03' T.O. Platform	
9 TOTAL DEPTH OF HOLE: 25.43'		18 TOTAL CORE RECOVERY FOR BORING: 455.53' T.O. Grout	
		19 SIGNATURE OF INSPECTOR: 454.8' T.O. Rock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
435.53'	20		Con't.				Con't.
		30 Min.	Dolomite-Dark Grey-Mod. Hard @20.2'-Dolomite-Grey-Mod. Hard				4th-27RPM w/$H_2$0 146.9' Stem-Kelly+D.H.Assy. Stop-2:38@22.0 Add 20.2'Joint
	21	30 Min.			Milky Grey		
433.53'	22						11/9/81
		29 Min.	@22.2'-Dolomite-Grey-Dark Grey-Mod. Hard			Smooth	11/10/81 Start 7:20 4th-27RPM w/$H_2$0 167.1' Stem Kelly+D.H.Assy Stop 8:51-B.O.H.
	23	27 Min.					
	24	24 Min.	@24.4'-Dolomite-Buff-Dark Grey- Mod. Hard-Slightly Frac.				
430.6'	25						Plan B.O.H. El.430.6'
430.2'		11 Min.	Bottom of Rock Socket				

161

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 2 1/2" Smith-Rock
2 LOCATION: 101-PS-West-Socket	11 Elevation of Bottom of Hole: 434.3'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO: 1	13 Casing Record: Depth 100' Type 10'O.D
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water 10/23/81 542.3'
	16 DATE HOLE: STARTED 10/23/81 COMPLETED 10/26/81
7 Boring Method: Reverse Rotary ☒	17 ELEVATION TOP OF HOLE: 557.93 T.O.Platform
8 DEPTH DRILLED INTO ROCK: 22.2'	18 TOTAL CORE RECOVERY FOR BORING: 461.03 T.O.Grout
9 TOTAL DEPTH OF HOLE: 26.03'	19 SIGNATURE OF INSPECTOR: 456.5 T.O.Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
461.03							10/23/81 Start-12:11
		3 Min.	Sand				1st-7rpm w/H2O Lake-EL-542.3'
	1						156.3' Stem- Kelly + D.H. Assy.
		5 Min.			Brown	Smooth	Stop-1:13- Swivel Check Start-1:32
	2						@5.4' 4th-27rpm
		34 Min.					Stop-5:15 @10.0'
	3		Cement Grout				
		28 Min.					
	4						
			Overburden				
456.5'		16 Min.	Ave Top of Rock			Rough	
	5		Chert-GREY-Hard @4.9'				
		23 Min.	Dolomite-Light Grey- Mod Hard- Hard-Slightly Silic @5.6'				
	6		Chert-Light Grey-Hard @6.0'				
		57 Min.	Dolomite-Light Buff- Mod Hard- Hard-Slightly Silic @6.8'		Milky Brown	Smooth	
	7		Sandy Dolomite-Light Buff @7.0' Mod Hard				
		44 Min.	Dolomite-Light Grey- Mod Hard- Hard-Slightly Silic @7.6'				
	8		Dolomite-Light Buff- Hard-Silic-Slightly Frac.				
		34 Min.	@8.7'				
	9		Dolomite-Buff Grey- Mod Hard- Slightly Frac.				
451.03'	10						

162

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith-Rock
2 LOCATION: 101-P8-West-Socket	11 Elevation of Bottom of Hole: 434.0'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO:	13 Casing Record: Depth 100' Type 10'O.D.
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method: Reverse Rotary	16 DATE HOLE: STARTED 10/23/81 COMPLETED 10/26/81
8 DEPTH DRILLED INTO ROCK: 22.5'	17 ELEVATION TOP OF HOLE: 557.93' T.O. Platform
9 TOTAL DEPTH OF HOLE: 27.03'	18 TOTAL CORE RECOVERY FOR BORING: 461.03' T.O. Grout
	19 SIGNATURE OF INSPECTOR: 456.5' T.O. Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
451.03'	10		Con't.				10/24/81
		36 Min.	Dolomite-Buff-Grey-Mod Hard-Slightly Frac.		Milky Brown		Start-7:44 @10.0' 4th-27rpm-w/H2O 156.3' Stem-Kelly + D.H. Assy. Lake EL-542.38
	11		@10.8' Dolomite-Light-Dark Grey-Mod Hard-Hard-Dark Grey Silic-Slightly Frac.				
		34 Min.	@11.5' Dolomite-Grey-Mod Hard-Slightly Frac.		Milky Grey		
	12					Smear	
		36 Min.					
	13						
		38 Min.					
	14						
		40 Min.	@14.6' Dolomite-Grey-Mod Hard-Slightly Frac w/FE Stained Frac Planes				
	15						
		30 Min.					
	16						
		37 Min.					
	17						
		28 Min.	@17.5' Dolomite-Grey-Mod Hard-Hard Slightly Silic-Slightly Frac w/FE Stained Frac Planes				
	18						
		28 Min.	@18.3'-18.5' Chert-Brown-Hard				
	19		@18.5' Dolomite-Light Grey-Hard Highly Siliceous				
		31 Min.	@19.4 Dolomite-Light Grey-Mod Hard				
441.03'	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P8-West-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method Reverse Rotary ~~Rotary~~
8 DEPTH DRILLED INTO ROCK: 22.5'
9 TOTAL DEPTH OF HOLE: 27.03'

10 SIZE AND TYPE OF BIT: 102" Smith-Rock
11 Elevation of Bottom of Hole: 434.0'
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
13 Casing Record: Depth 100' Type 10'O.D.
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water:
16 DATE HOLE: STARTED 10/23/81 COMPLETED 10/26/81
17 ELEVATION TOP OF HOLE: 557.93' T.O. Platform
18 TOTAL CORE RECOVERY FOR BORING: 461.03' T.O. Grout
19 SIGNATURE OF INSPECTOR: 456.5' T.O. Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
441.03'	20		Con't.				Con't.
		29 Min.	Dolomite-Light Grey-Mod Hard @20.3'-20.4'				10/24/81 4th-27rpm w/H_2O 156.3' Stem-Kelly + D.H. Assy. Lake EL-542.38'
	21		Shale-Brown-Soft @20.4'				
		22 Min.	Dolomite-Buff-Mod Hard @21.0' Dolomite-Grey-Mod Hard				
	22		@21.9'				
		33 Min.	Dolomite-Light Grey-Mod Hard-Friable @22.2'		Milky Grey		
	23		Dolomite-Dark Grey-Mod Hard-Massive			Smooth	
		29 Min.					
437.03'	24						10/24/81
		33 Min.					10/26/81 Start-7:15 4th-27rpm w/H_2O 156.3' Stem-Kelly + D.H. Assy. Stop-8:51-B.O.H.
	25						
		32 Min.					
	26						
434.5'		31 Min.					Plan B.O.H. 434.5'
434.3'			Bottom of Rock Socket				
	27						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 1 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P8-East-Socket
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Don Uchtman
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method Reverse Rotary ~~AUGER~~
8 DEPTH DRILLED INTO ROCK 21.9'
9 TOTAL DEPTH OF HOLE 26.23'

10 SIZE AND TYPE OF BIT 102" Smith-Rock
11 Elevation of Bottom of Hole 433.9'
12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
13 Casing Record: Depth 100' Type 10'O.D.
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water 10/26-542.53'
16 DATE HOLE: STARTED 10/26/81 COMPLETED 10/30/81
17 ELEVATION TOP OF HOLE 557.03' T.O. Platform
18 TOTAL CORE RECOVERY FOR BORING 460.13 T.O. Grout 455.8' T.O. Rock
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
460.13							Start-3:15 1st-7RPM-w/H_2O 156.3' Stem-Kelly & D.H. Assy. Lake EL 10/26-542.53' @2.5' 4th-2.7RPM Stop-4:18@5.0'
	1	3 Min					
		4 Min	Sand		Brown	Smooth	
	2	36 Min					
	3		Cement Grout				
		7 Min					
	4		Overburden				
455.8'			Ave Top of Rock				
		13 Min	Chert-Grey-Hard				
455.13'	5		@5.0'				
		1 hr 25 min	Dolomite-Light Grey-Hard & Siliceous @5.4' Dolomite-Buff-Mod Hard @5.8' Dolomite-Buff-Mod Hard				10/28/81 Start-2:31 1st-7RPM w/H_2O 146.9' Stem-Kelly &D.H. Assy. Lake EL-@5.1' 2nd-17RPM Stop-3:15 @5.4'
454.73'	6	30 Min	6.0-6.2 Chert-Grey-Hard 6.2 Dolomite V Hd Tan-Num healed jts & frac Fe stained		Milky Brown		10/29/81 Start 7:10@5.4' 2nd-17RPM w/H_2O 146.9' Stem-Kelly &D.H. Assy. @6.3' 3rd-25RPM w/H_2O Lake EL-542.46
	7	35 Min					
	8	35 Min					
	9	40 Min	Dolomite Mod-Hard-SL Frac-Tan-Grey				
450.13'	10						

165

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P8-East-Socket		11 Elevation of Bottom of Hole: 434.0'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO:		13 Casing Record: Depth 100' Type 10'O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT		15 ELEVATION of Water: 542.46	
7 Boring Method Reverse Rotary ~~XXX~~		16 DATE HOLE: STARTED 10/26/81 COMPLETED 10/30/81	
8 DEPTH DRILLED INTO ROCK: 21.8'		17 ELEVATION TOP OF HOLE: 557.03' T.O. Platform	
9 TOTAL DEPTH OF HOLE: 26.13'		18 TOTAL CORE RECOVERY FOR BORING: 460.13 T.O. Grout	
		19 SIGNATURE OF INSPECTOR: 455.8' T.O. Rock	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
450.13'	10						
		35 Min	Dolomite Hd Tan-Grey SL Frac				10/29/81 4th-27RPM w/H_2O 146.9' Stem-Kelly + D.H.Assy.
	11	39 Min	@11.3' Dolomite-Buff-Grey-Mod Hard-SL Frac.				
	12	31 Min	@12.3' Dolomite-Grey-Hard-Silic @12.8' Dolomite-Buff-Grey-Mod Hard				
	13	34 Min	@13.6'-13.7' Shale-Brown-Soft @13.7 Dolomite-Hard-Silic-Frac.w/FE Stained Frac Planes				
	14	31 Min	@14.8' Dolomite-Buff-Mod Hard-Grey		Light Brown	Smooth	
	15	30 Min	@15.7' Dolomite-Buff-Mod Hard-Frac.w/FE Stained Frac.Planes				
	16	38 Min	@16.8' Dolomite-Brown-Hard-Silic				
	17	37 Min	@17.0' Dolomite-Brown-Hard-Silic Frac.w/FE Stained Frac.Planes				
	18	50 Min	@17.1 Chert-Brown-Hard @17.9 Dolomite-Hard-Silic-Frac.w/FE Stained Frac Planes				
441.53							10/29/81
	19	34 Min	@18.4 Dolomite-Light Grey-Mod Hard @18.9 Dolomite-Buff-Grey-Mod Hard-SL Frac.				10/30/81 Start 4th-27RPM w/H_2O 146.9' Stem-Kelly +D.H. Assy.
440.13'	20		@19.9' Dolomite Dark Grey-Mod Hard				

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith-Rock	
2 LOCATION: 101-P8-East-Socket		11 Elevation of Bottom of Hole: 434.0'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO.		13 Casing Record: Depth 100' Type 10'O.D.	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water	
7 Boring Method Reverse Rotary ☒		16 DATE HOLE: STARTED 10/26/81 COMPLETED 10/30/81	
8 DEPTH DRILLED INTO ROCK: 21.8'		17 ELEVATION TOP OF HOLE: 557.03' T.O. Platform	
9 TOTAL DEPTH OF HOLE: 26.13'		18 TOTAL CORE RECOVERY FOR BORING: 460.13' T.O. Grout 455.8' T.O. Rock	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH 20	Drill Rate	CLASSIFICATION OF MATERIALS (Description) Con't.	Water Loss	Water Color	Drill Action	REMARKS 10/30 Con't.
		28 Min	Dolomite-Dark Grey-Mod Hard				4th-27RPM w/H_2O 146.9' Stem-Kelly + D.H. Assy. Stop-11:02-B.O.H.
	21	29 Min	@21.2' Dolomite-Light Grey-Mod Hard			Smooth	
	22	31 Min	@22.1' Dolomite-Light Grey-Mod Hard		Milky Grey		
	23	28 Min					
	24	29 Min					
	25	24 Min	@25.0' Dolomite-Grey-Mod Hard-Hard-Slightly Silic @25.4' Dolomite-Dark Grey-Mod Hard				Plan B.O.H. 434.5'
434.5'							
	26	6 Min	Bottom of Rock Socket				
433.9							

167

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith Rock
2 LOCATION: 101-P9-West-Socket	11 Elevation of Bottom of Hole: 435.2'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO.	13 Casing Record: Depth 75' Type 10' O.D.
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water 543.59' 12-04-82
7 Boring Method Reverse Rotary ~~Kelly~~	16 DATE HOLE: STARTED 12-4-81 COMPLETED 12-8-81
8 DEPTH DRILLED INTO ROCK 41.7'	17 ELEVATION TOP OF HOLE 556.03'T.O.Platform
9 TOTAL DEPTH OF HOLE 44.33'	18 TOTAL CORE RECOVERY FOR BORING 479.53'T.O.Grout 476.9'T.O.Rock
	19 SIGNATURE OF INSPECTOR

ELEVATION 479.53'	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS 12-4-81
	1	11 Min.	Overburden (Red Clay)				Start 10:00 1st-7RPM w/H_2O 146.9' Stem-Kelly + D.H. Assy. Lake El.-543.59' @2.7' 2nd-17RPM @2.9' 4th-27RPM Stop 12:29 - Tighten Kelly Bolts Start 12:36 Stop 3:15 @ 7.0'
	2	12 Min.			Red	Smooth	
476.9		38 Min.	Ave top of rock Dolomite-grey-mod.hard				
	3						
	4	44 Min.	@3.5'-Chert-milky white-hard @3.9'-Dolomite-grey-mod. hard				
		1 hr. 5 Min.	@4.6'-Dolomite-brown-grey-Mod.hard @4.9'-Dolomite-brown-Mod. hard-Hard-Slightly silic.				
	5	1 hr. 18 Min.			Milky Brown		
	6		@5.9'-Dolomite-grey-Mod.hard-Hard-Slightly silic.				
		1 hr.	@6.7'-6.8'-Shale-black-soft-pyritic				
472.53	7		@6.8'-Dolomite-light brown-grey-mod.hard				12-4-81
		1 hr. 3 Min.	@7.5'-Dolomite-Grey-mod.hard				12-5-81 Start 7:35 4th-27RPM-w/H_2O 146.9' Stem-Kelly +D.H.Assy. Stop-9:15-Weld Kelly joint Start-10:18
	8	54 Min.			Milky Grey		
	9		@9.0'-Dolomite-light grey-mod.hard-friable				
469.53	10	25 Min.					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 of 5 SHEETS

PROJECT: Norfork Lake Bridges
LOCATION: 101-P9-West-Socket
Geotechnician
HOLE NO
NAME OF DRILLER
DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT
Boring Method: Rotary Air
DEPTH DRILLED INTO ROCK
TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BORES
15 ELEVATION of Water
16 DATE HOLE STARTED COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
469.53'	10		Con't.				Con't. 12-5-81
		38 Min.	Dolomite-light grey-mod.hard-friable				4th-27RPM-w/H_{20} 146.9' Stem-Kelly +D.H.Assy. Lake El.-543.64'
	11	35 Min.			Milky Grey	Smooth	
	12	30 Min.					
	13	42 Min.	@13.1'-13.2'-Shale-black-soft @13.2'-Dolomite-dark grey-mod. hard				
	14	24 Min.	@14.5'-14.6'-Shale-black-soft @14.6'-Dolomite-dark grey-mod.hard				
	15	27 Min.					
	16	24 Min.	@16.5'-Dolomite-brown-mod. hard-slightly-frac. @16.7'-Shale-black-soft @16.8'-Dolomite-brown-mod. hard				
	17	35 Min.	@17.5'-Dolomite-hard-brown-silic-slightly frac.		Milky Brown		
461.53'	18		@18.1'-Dolomite-grey-mod.hard-hard-slightly silic				12-5-81
		34 Min.					12-7-81 Start 7:15 146.9' Stem-Kelly + D.H.Assy. 4th-27RPM-w/H_{20}
	19		@19.1'-Dolomite-grey-hard-silic				@8:10-19.6' 1st 7RPM-w/H_{20}
		47 Min.	@19.6'-22.7'-Cavern-clay filled-red (est. 1/8 of hole)		Red	Rough	
459.53'	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P9-West-Socket
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary ary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE
10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
459.53'	20		Con't.				Con't.
		30 Min.	Cavern-clay filled-red (Est. 1/8 of hole) Bal.-Dolomite-grey-hard silic				1st-7RPM w/H_{20} 146.9' Stem Kelly + D.H.Assy. @23'-4th-27RPM
	21				Red	Rough	
		39 Min.					
	22						
		23 Min.	@22.7'-Cavern Ends @22.7'-Dolomite-grey-mod.hard				
	23						
		35 Min.	@23.5'-Dolomite-light brown-mod.hard		Milky Brown	Smooth	
	24						
		49 Min.	@24.6'-Dolomite-light brown-mod.hard-hard-slightly silic				
	25						
		34 Min.					
	26						
		36 Min.	@26.6'-Dolomite-grey-hard-silic				
	27						
		50 Min.	@27.4'-Dolomite-grey-light brown-mod.hard-hard-slightly silic				
	28						
		39 Min.	@28.7'-Dolomite-dark grey & light brown-mod.hard				
	29						
		41 Min.	@29.5'-Dolomite-dark grey-mod.hard		Milky Grey		
449.53'	30						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Masman Construction Co.	SHEET 4 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P9-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water / 16 DATE HOLE / STARTED / COMPLETED
7 Boring Method: Rotary ary	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
449.53'	30		Con't.				Con't.
		38 Min.	Dolomite-Dark grey-mod.hard @30.1'-30.15-Shale-black-soft @30.15'-Dolomite-dark grey-mod.hard				4th-27RPM w/H_{20} 146.9' Stem Kelly + D.H.Assy. Lake El.-543.71' 12-7-81
	31	47 Min.	@31.8'-Dolomite-grey-hard-silic				
	32	45 Min.	@32.4'-Dolomite-grey-mod. hard				
447.03'							12-7-81
	33	1 hr. 14 Min.	@33.0'-Dolomite-light brown-light grey-mod.hard		Milky Grey	Smooth	12-8-81 Start 7:25 4th-27RPM w/H_{20} 146.9' Stem Kelly + D.H.Assy. Lake El.-543.73
	34	52 Min.					
	35	48 Min.	@35.6'-Dolomite-grey-mod. hard				
	36	35 Min.	@36.5'-Dolomite-light brown-hard-silic				
	37	30 Min.	@37.7'-37.8'-Chert-milky white-hard @37.8'-Dolomite-grey-mod.hard-weathered				
	38	46 Min.	@38.4'-Dolomite-dark grey-mod. hard-hard-slightly silic @38.9'-Chert-milky white-hard				
	39	33 Min.	@39.0'-Dolomite-light grey-hard-silic				
439.53'	40						

171

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 5 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: 101-P9-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record | Depth | Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method Rotary ary	16 DATE HOLE | STARTED | COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
439.53'	40		Con't.				Con't.
		35 Min.	Dolomite-light grey-hard-silic @40.1'-40.2'-Chert-milky white-grey-hard @40.2'-Dolomite-light grey-very hard-highly siliceous @40.9'-Dolomite-buff-mod. hard-frac w/fe stained frac planes		Milky Grey	Smooth	4th-27RPM w/H20 146.9' Stem Kelly + D.H.Assy. Lake El.-543.73' Stop-2:54-B.O.H.
	41	20 Min.					
	42	25 Min.					
	43	22 Min.					
435.5'	44						Plan B.O.H.
435.2'		12 Min.	Bottom of rock socket				

172

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102" Smith-Rock
2 LOCATION: 101-P9-East-Socket	11 Elevation of Bottom of Hole: 435.3'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO:	13 Casing Record: Depth 75' Type 10'O.D.
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water: 11-24 - 543.23'
7 Boring Method: Reverse Rotary ~~Auger~~	16 DATE HOLE: STARTED 11-24-81 COMPLETED 12-2-81
8 DEPTH DRILLED INTO ROCK: 42.00'	17 ELEVATION TOP OF HOLE: 556.33'T.O.Platform
9 TOTAL DEPTH OF HOLE: 44,53'	18 TOTAL CORE RECOVERY FOR BORING: 479.83'T.O.Grout
	19 SIGNATURE OF INSPECTOR: 477.3'T.O.Rock

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
479.83'							Start 7:49
		9 Min.					1st-7RPM w/H20
	1		Overburden (Clay)		Red		146.9' Stem Kelly + D.H.Assy.
		7 Min.				Smooth	@2.6' 2nd-17RPM
	2						@3.4' 4th-27RPM
		1 hr. 7 Min.					Stop 3:17
477.3'			Ave top of rock				
			Quartzite-Milky white-hard-very hard				
	3		@2.8'-Dolomite-buff-mod.hard				
		1 hr. 2 Min.	@3.7'-Dolomite-light grey-mod.hard				
	4				Milky Brown		
		41 Min.	@4.6'-Dolomite-dark grey & brown-mod.hard				
	5		@5.2'-Dolomite-brown-mod. hard-hard-slightly silic				
		1 hr. 19 Min.					
	6						
		1 hr. 16 Min.	@6.7'-Chert-brown-hard				
			@6.8'-Dolomite-light brown-mod.hard				
	7		@7.1'-7.3'-Chert-milky white-light grey-hard				
		1 hr. 5 Min.	@7.3'-Dolomite-brown-mod.hard				
			@7.9'-Dolomite-buff-mod.hard				
	8						
		34 Min.	@8.5'-Dolomite-grey-mod. hard				
470.73'	9				Milky Grey		11-23-81
		44 Min.					11-24-81 Start 7:42 4th-27RPM-w/H20 146.9' Stem Kelly + D.H. Assy. Lake El.-543.25'
469.83'	10						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 101-P9-East Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record / Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 ELEVATION of Water	
7 Boring Method: Rotary dry		16 DATE HOLE STARTED / COMPLETED	
8 DEPTH DRILLED INTO ROCK		17 ELEVATION TOP OF HOLE	
9 TOTAL DEPTH OF HOLE		18 TOTAL CORE RECOVERY FOR BORING	
		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
469.83'	10		Con't.				11-25 Con't.
			Dolomite-Grey-Mod. Hard				4th-27RPM-w/H_{20} 146.9' Stem-Kelly & D.H. Assy. Lake El-543.25'
		36 Min.					
	11						
		32 Min.			Milky Grey		
	12					Smooth	
		34 Min.					
	13		@13.1'-13.2' Shale-Black-Soft @13.2' Dolomite-Grey-Mod. Hard				
		32 Min.					
	14						
		27 Min.	@14.6'-Shale-Black-Soft @14.7' - Dolomite-Grey-Mod. Hard				
	15		@15.3' - Dolomite-Buff-Mod. Hard				
		23 Min.					
	16				Milky Brown		
		25 Min.					
	17						
		20 Min.	@17.4'-Shale-Brown-Soft @17.5'-Dolomite-Buff-Mod.Hard-Slightly Frac w/Fe stained Fracs				
	18		@17.8'-Sandy Dolomite-Buff-Mod. Hard FRIABLE				
		28 Min.					
	19		@19.0'-Dolomite-Light Grey-Mod. Hard-Hard-Slightly Silic				
		38 Min.			Milky Grey		
459.83'	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 5 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT	
2 LOCATION: 101-P9-East-Socket		11 Elevation of Bottom of Hole	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL	
4 HOLE NO		13 Casing Record / Depth / Type	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 ELEVATION of Water	
		16 DATE HOLE: STARTED / COMPLETED	
7 Boring Method: Rotary dry		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	
9 TOTAL DEPTH OF HOLE		19 SIGNATURE OF INSPECTOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
459.83'	20		Con't.				11-25 Con't.
		26 Min.	Dolomite-Light Grey-Mod.Hard-Hard-Slightly Silic @20.4'-Dolomite-Light Grey-Mod. Hard				4th-27RPM w/H20 146.9' Stem-Kelly & D.H.Assy. Lake El - 543.25'
	21	37 Min.					
	22				Milky Grey		11-25-81
457.63'		44 Min.					12-1-81 Start 7:30 4th-27 RPM w/H20 146.9' Stem-Kelly & D.H. Assy. Lake El - 543.50'
	23	1 hr. 2 Min.	@23.1'-Dolomite-Brown-Grey-Hard Silic @23.8'-Dolomite-Grey-Mod.Hard			Smooth	
	24	53 Min.	@24.4'-Dolomite-Buff-Mod.Hard				
	25	58 Min.			Milky Brown		
	26	1 hr. 2 Min.	@26.5'-Dolomite-Brown-Mod. Hard-Hard-Slightly Silic				
	27	1 hr. 3 Min.					
	28	1 hr. 2 Min.	@28.5'-Dolomite-Light Brown-Mod. Hard				
	29	55 Min.					
449.83'	30						

175

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 4 OF 5 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P9-East-Socket
3 Geotechnician
4 HOLE NO: 1
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary Air
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION OF WATER
16 DATE HOLE: STARTED ____ COMPLETED ____
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
449.83'	30		Con't.				12-1-81 Con't.
449.53'			Dolomite-Light Brown-Mod.Hard				4th-27RPM w/H20 146.9' Stem-Kelly & D.H. Assy. Stop 3:17
		59 Min.			Milky Brown		
	31		@30.7'-Dolomite-Light Brown-Grey-Mod.Hard-Slightly Frac			Smooth	12-2-81 Start 7:16@30.3' 4th-27RPM w/H20 146.9' Stem-Kelly & D.H. Assy. Lake El - 543.54'
		54 Min.					
	32						
		38 Min.	@32.6'-Dolomite-Grey-Mod.Hard				
	33		@33.1'-Dolomite-Buff-Grey-Mod.Hard-Friable		Milky Grey		
		19 Min.					
			@33.8'-Dolomite-Buff-Mod.Hard				
	34				Milky Brown		
		13 Min.					
	35		@35.0'-Dolomite-Grey-Pink-Hard Silic				
		23 Min.	@35.6'-Dolomite-Buff-Mod.Hard				
	36		@36.3'-36.4'-Chert-Grey-Brown-Hard				
		43 Min.	@36.4'-Dolomite-Buff-Mod.Hard				
	37		@37.2'-Dolomite-Grey-Mod.Hard				
		20 Min.					
	38		@37.9'-Dolomite-Grey-Mod.Hard-Vuggy w/Quartz+Chert filled Vugs.				
		31 Min.	@38.4'-Dolomite-Brown-Grey-Mod.Hard				
			@38.8'-Chert-Grey-Hard				
	39		@38.9'-Dolomite-Light Brown-Grey-Mod.Hard-Hard-Slightly Silic				
		29 Min.	@39.5'-Dolomite-Buff-Hard-Silic				
439.83'	40						

176

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor: Massman Construction Co. | SHEET 5 OF 5 SHEETS

PROJECT: Norfork Lake Bridges
2 LOCATION: 101-P9-East-Socket
3 Geotechnician:
4 HOLE NO:
5 NAME OF DRILLER:
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK:
9 TOTAL DEPTH OF HOLE:

10 SIZE AND TYPE OF BIT:
11 Elevation of Bottom of Hole:
12 MANUFACTURER'S DESIGNATION OF DRILL:
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES:
15 ELEVATION of Water:
16 DATE HOLE STARTED ____ COMPLETED ____
17 ELEVATION TOP OF HOLE:
18 TOTAL CORE RECOVERY FOR BORING:
19 SIGNATURE OF INSPECTOR:

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
439.83'	40		Con't.				12-2 Con't.
		52 Min.	Dolomite-Buff-Hard-Silic @40.3'-40.5'-Chert-Grey-Hard @40.5'-Dolomite-Buff-Mod.Hard				4th-27RPM w/H 20 146.9' Stem-Kelly & D.H.Assy. Lake El-543.54'
	41		@40.9'-Chert-Grey-Hard @41.0'-Dolomite-Buff-Mod.Hard-Hard-Slightly Silic				@2:35 1st-7RPM (Cavity)
		30 Min.			Milky Brown	Smooth	@2:45 4th-27RPM Stop-3:11-B.O.H.
	42						
		25 Min.	@42.5'-Chert-Light Brown-Hard @42.7'-Dolomite-Light Brown-Hard Silic				
	43						
		35 Min.	@43.4'-Dolomite-Buff-Mod. Hard-Frac w/Fe stained frac planes @43.5'-Cavity (est.<1/8 of hole)in above Dol.			Rough Smooth	
	44						
435.5		21 Min.	Bottom of Rock Socket				Plan B.O.H.
435.3							

177

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 of 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: 102 Smith-Rock
2 LOCATION: H101-P10-West-Socket	11 Elevation of Bottom of Hole: 462.4'
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains
4 HOLE NO: 1	13 Casing Record: Depth 62.5, Type 10 OD
5 NAME OF DRILLER: Don Uchtman	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water: 9/28/81 542.44'
7 Boring Method: Reverse Rotary ary	16 DATE HOLE: STARTED 9/29/81, COMPLETED 10/1/81
8 DEPTH DRILLED INTO ROCK: 26.67	17 ELEVATION TOP OF HOLE: 552.97 TOP
9 TOTAL DEPTH OF HOLE: 26.67	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR: 489.07 TOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
489.07							
		36 min	Chert - Grey - Brown Hard				Start 10:39
			.9		Clay Red	Mod Smooth	1st 7rpm w/H20 117.1' stem kelly & DH
	1		Dolomite - Pink - Grey Hard - Very Hard - Highly Siliceous				H20 level 9/29/81 542.34' 2nd 17rpm @10' @2:00 - 4.6'
		31 min	1.4 Chert - Milky White - Hard				4th 27rpm Stop 5:15 @8.2'
	2		1.8				
		39 min	Dolomite - Buff - Grey Mod Hard - Hard - Slightly Silic - Slightly Frac with Iron stained Fractured planes				
	3				Milky Brown	Smooth	
		41 min	2.5 Chert - Brown - Hard				
			2.8				
	4		Dolomite - Grey - Brown Mod Hard				
		1 hr 18min	3.4 Dolomite - Grey - Hard Silic - Slightly Frac with Fe stained frac planes				
	5						
			3.6				
		52 min	Dolomite - Grey - Mod Hard - Frac with Fe stained frac planes				
	6						
			4.2				
		42 min	Dolomite - Grey - Hard Very Hard - Highly Siliceous				
			5.4				
	7		Dolomite - Buff - Mod Hard				
		1 hr 7min	5.5-5.55 Shale-Black-Soft				
			5.55 Dolomite - Buff - Mod Hard				
480.87	8		6.2				9/29/81 9/30/81
			Dolomite - Buff - Grey				Start 7:22
		50 min	Mod Hard 7.1 Dolomite - Brown Grey - Hard - Silic				Lake Elev. 542.25'
	9		7.8-8.0 Chert Pod - Brown Hard (EST ½ hole)				4th 27rpm w/H20 117.1' stem kelly & DH Assembly
		55 min	8.0 Dolomite - Grey Hard Very Hard - Highly Siliceous				
470.07	10		8.4 Dolomite - Grey - Mod Hard				

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P10-West-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water / 16 DATE HOLE STARTED COMPLETED
7 Boring Method Rotary 6TY	17 ELEVATION TOP OF HOLE
8 DEPTH DRILLED INTO ROCK	18 TOTAL CORE RECOVERY FOR BORING
9 TOTAL DEPTH OF HOLE	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
479.07	10						
		36 min	9.1 Dolomite - Light Grey Mod Hard - Hard - Slightly Silic 9.6				4th 27rpm w/H2 117.1' stem - kelly & DH A
	11	26 min	Dolomite - Light Grey Mod Hard Dolomite - Light Grey Mod Hard 10.3		Milky Brown	Smooth.	
	12	27 min	Dolomite - Buff - Grey Mod Hard 11.1 Dolomite - Buff - Mod Hard 12.6				
	13	12 min	Dolomite - Buff - Mod Hard Frac with Fe stained frac planes 13.4				
	14	17 min	Dolomite - Buff - Grey Mod Hard - Extremely Frac				
	15	46 min	15.0 Dolomite - Grey - Mod Hard - Slightly Frac 15.9				
	16	39 min	Dolomite - Grey - Mod Hard - Hard - Slightly Silic - Slightly Frac				
	17	48 min	17.2 Dolomite - Grey - Hard Very Hard - Highly Siliceous - Slightly Frac 17.8 - 17.85				
	18	53 min	Shale - Black - Soft 17.85 Dolomite - Hard - Very Hard - Highly Siliceous Slightly Frac.				
	19	58 min	18.6 Dolomite - Brown - Hard Silic - Slightly Frac 19.5 Dolomite - Grey - Hard - Very Hard - Highly Siliceous				
469.07	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 of 3 SHEETS

PROJECT: Norfork Lake Bridges
2 LOCATION: H101-P10-West-Socket
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT
7 Boring Method: Rotary air
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT
11 Elevation of Bottom of Hole
12 MANUFACTURER'S DESIGNATION OF DRILL
13 Casing Record | Depth | Type
14 TOTAL NUMBER CORE BOXES
15 ELEVATION of Water
16 DATE HOLE STARTED COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
469.07	20						
		42 min	Dolomite - Grey - Hard Very Hard - Highly Siliceous 20.4 - 20.6 Chert - Grey & Brown Hard				4th 27rpm w/H20 117.1' stem - kelly & DHA Lake Elev. 9/30/81 542.25' Stop 5:15 @23.2'
	21	37 min	20.6 Dolomite - Grey - Hard Silic - Fractured		Milky Brown	Smooth	
	22	50 min	22.5 Dolomite - Light Grey Mod Hard 22.9 Dolomite - Buff - Light Grey - Mod Hard				
465.87'	23	42 min	23.4 Dolomite - Buff - Mod Hard Slightly Fractured				9/30/81 10/1/81 Start 7:16 Lake Elev. 542.22' 4th 27rpm W/H20 117.1' stem kelly & DH Assy Stop 9:30 BOH
	24	39 min					
	25	41 min	25.2 Dolomite - Buff - Mod Hard				
462.7	26	35 min	26.5 Dolomite - Buff - Grey = Mod Hard - Slightly Frac.				Plan BOH 462.[illegible]0'
462.4			Bottom of Rock Socket				

180

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 1 OF 3 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: 102" Smith Rock	
2 LOCATION: H101-P10-East-Socket		11 Elevation of Bottom of Hole: 462.8'	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Steven M. Hains	
4 HOLE NO:		13 Casing Record: Depth 62.7; Type 10 OD	
5 NAME OF DRILLER: Don Uchtman		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15 ELEVATION of Water 543.09	
7 Boring Method Reverse Rotary ary		16 DATE HOLE: STARTED 9/21/81; COMPLETED 9/25/81	
8 DEPTH DRILLED INTO ROCK: 26.42		17 ELEVATION TOP OF HOLE: 553.22 TOP	
9 TOTAL DEPTH OF HOLE: 26.42		18 TOTAL CORE RECOVERY FOR BORING	
		19 SIGNATURE OF INSPECTOR: 489.22 TOR	

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
489.22							
		46 min	Chert - Grey - Hard .6 Dolomite - Grey - Hard Silic				Start 12:48 Lake Elev. 543.09'
	1		.9		Milky Grey	Smooth	1st 7rpm w/H20 116.9' stem -
		1 hr 50 min	Chert - Light Brown - Hard 1.5 Dolomite - Grey - Mod Hard 1.9 Dolomite - Grey - Hard -				kelly - DH A @1.0' 2nd 17rpm @1.1' 4th 27rpm
	2		Silic				Stop 3:05 Back Flush Return Line Start 4:15
486.72'		1 hr 27min	2.3 Dolomite - Grey - Mod Hard - Hard - Slightly Silic				9/21/81
	3						9/22/81 Lake Elev. 543.02'
		57 min	3.4 Dolomite - Grey - Mod Hard				Start 7:33 4th 27rpm w/H20 116.9'
	4						stem - kelly - DH Assembly
		1 hr 3 min	4.6 Dolomite - Grey - Mod Hard Hard - Hard Silic & Slightly Fractured.				Stop 5:15 @10.0'
	5		5.0-5.1 Shale - Black - Soft				
		1 hr 8min	5.1 Dolomite - Grey - Mod Hard				
	6		5.9 Dolomite - Dark Grey - Hard Silic				
		1 hr 13min	6.5 Dolomite - Grey - Mod Hard Hard - Slightly Silic				
	7		7.1				
		1 hr 15min	Dolomite - Brown - Grey Mod Hard - Hard Slightly Silic				
	8		7.5 Dolomite - Brown - Hard Silic		Milky Brown		
		1hr 32min	8.8 Dolomite - Grey - Hard Very Hard - Highly Siliceous				
	9		9.5				
		1 hr 52min	Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
479.22'	10						

181

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Masgwan Construction Co.	SHEET 2 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P10-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 ELEVATION of Water
7 Boring Method Rotary ary	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
479.22'							
		1 hr 45min	Dolomite - Grey - Mod Hard - Hard - Slightly Silic				9/23/81 Start 7:20 @10.0' 4th 27rpm w/H20 116.9' stem kelly - DH A Lake Elev. 542.90' @14.6 1st 7rpm H20 Off @15.4 4th 27rpm w/H20 Stop 5:15 @18.2
	11		10.2 Dolomite - Grey - Hard Silic		Milky Brown	Smooth	
		1 hr 10min	10.8 Dolomite - Grey - Mod Hard - Hard - Slightly Silic				
	12		11.9 Dolomite - Light Brown Hard - Silic				
		1 hr 35min	12.5 Dolomite - Blue Grey Mod Hard - Hard - Hard Silic				
	13	1 hr 8min	13.4 Dolomite - Grey - Light Brown - Mod Hard - Hard - Brown Slightly Silic				
	14	44 min	14.2 Dolomite - Light Grey Mod Hard - Hard - Hard Slightly Silic				
	15	46 min	14.6 - 15.4 Siltstone Pod - Yellow Soft (est ½ of hole)		Yellow	Rough	
			15.4 Dolomite - Light Grey Hard - Silic - Slightly Frac with Fe stained frac planes				
	16	1 hr 17min	15.8 Dolomite - Grey - Hard Highly Siliceous		Milky Brown	Smooth	
	17	1 hr 15min	16.7 Dolomite - Brown - Hard Very Hard - Highly Siliceous				
471.02	18	1 hr 24min	17.1 - 17.15 Shale Seam - Black - Soft 17.15 Dolomite - Grey - Hard Very Hard - Highly Siliceous				9/23/81 9/24/81 Start 7:25 Lake Elev. 542.72' 4th 27rpm w/H20 116.9' stem - Kelly DH Assembly
	19	1 hr 14min	18.3 Dolomite - Grey - Mod Hard Hard Slightly Silic 18.9 Dolomite - Hard Very Hard - Grey - Brown Highly Siliceous				
469.22'	20						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor: Massman Construction Co.	SHEET 3 OF 3 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT
2 LOCATION: H101-P10-East-Socket	11 Elevation of Bottom of Hole
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL
4 HOLE NO	13 Casing Record / Depth / Type
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.	15 ELEVATION of Water
7 Boring Method: Rotary dry	16 DATE HOLE STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING
	19 SIGNATURE OF INSPECTOR

ELEVATION	DEPTH	Drill Rate	CLASSIFICATION OF MATERIALS (Description)	Water Loss	Water Color	Drill Action	REMARKS
469.22'	20						9/24/81 con't
		1 hr 11min	Dolomite - Grey - Brown Hard - Very Hard - Highly Siliceous 20.9-21.1				Lake Elev. 542.72' 4th 27rpm w/H20 116.9' stem - kelly
	21		Chert - Grey - Hard 21.7		Milky Brown	Smooth	& DH Assembly Stop 5:15 @26.0
		1 hr 10min	Dolomite - Light Brown Hard - Very Hard - Highly Siliceous 21.1				
	22		Dolomite - Grey - Hard Silic				
		1 hr 23min					
	23		23.5				
		1 hr 24min	Dolomite - Grey - Light Brown - Mod Hard - Hard Silic				
	24						
		1 hr 11min					
	25		25.6				
		1 hr 7min	Dolomite - Grey - Mod Hard - Hard - Silic Slightly Frac with Fe Stained Frac Planes				
463.22	26						9/24/81
							9/25/81
462.8		1 hr 2min	Bottom of Rock Socket				Lake Elev. 542.62' Start 7:40 4th 27rpm w/H20 116.9' stem - kelly & DH Assembly Stop 8:42 BCH
	27						

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

APPENDIX C

CORE HOLE DRILLING LOGS

Pages 184 thru 282

DRILLING LOG — Project No. — Contractor: Massman Construction Company — SHEET 1 OF 2 SHEETS

1. Norfork Lake Bridges
2. Location of Boring: 2.5' E & 1.5' S of center of footing
3. Geotechnician: Robert Schmoker
4. Hole No.: H52-P1-N1
5. Name of Driller: Bob Walsh
6. Direction of Hole: X Vertical ☐ Inclined ____ deg. from vert.
7. Boring Method: Rotary
8. Depth Drilled into Rock: 11.0
9. Total Depth of Hole: 11.0
10. Size and Type of Bit: HQ3- Diamond Wireline
11. Boring No.
12. Manufacturer's Designation of Drill: Longyear HC-150
13. Water Depth: N/A
14. Total Number Core Boxes: 1
15. Depth of Bottom of Hole
16. Date Hole: Started 21 May 1980 Completed 22 May 1980
17. Elevation Top of Hole: 542.5
18. Total Core Recovery for Boring: 100%
19. Casing Record: Depth 0.5 Type H"

Elevation	Depth	Legend	Classification of Materials (Description)	% Core Recovery	Box or Sample No.	Remarks (Drilling time, water loss, depth of weathering, etc., if significant)
			Top of Hole, Top of Rock			21 May 1980
			Broken			Set of Cas. 22 May 80 0700
			DOLOMITE, Hard, tan gray, num healed fracs & Joints, Fe stained			Run #1 HQ Bit - w/5' Core Bar Start 0810 Stop 0825 Amt Drilled 5.1 Amt Rec'd 5.1 Core Loss 0.0
			Vuggy			Drill Action - Smooth Core in good shape
			Chert	100%	1	Water return leaking out from under casing
			DOLOMITE, mod hd, gray tan, num healed joints, Fe stained			D.D. 5.1
			Shly			Run #2 HQ Bit Start 10:45 Stop 11:10 Amt. Drilled 5.1 Amt. Received 5.1 Core Loss 0.0
			DOLOMITE, hard, med gray, num healed fracs, Fe stained			Drill Action - Smooth
			Chert Nodule	100%		Water return leaking out from under casing
			Siliceous Vuggy			
			Chert			

184

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE — PROJECT Hwy 62 Pier 1 — H52-P1-N1

DRILLING LOG | Project No. [illegible] | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 2.5' E & 1.5' S of center of footing
3. Geotechnician: Robert Schmoker
4. HOLE NO: H62-P1-N1
5. NAME OF DRILLER: Bob Walsh
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 11.8
9. TOTAL DEPTH OF HOLE: 11.8
10. SIZE AND TYPE OF: HQ3- Diamond Wireline
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150
13. Water Depth: N/A
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Bottom of Hole
16. DATE HOLE: STARTED 21 May 1980 COMPLETED 22 May 1980
17. ELEVATION TOP OF HOLE: 542.5
18. TOTAL CORE RECOVERY FOR BORING: 100%
19. Casing Record: Depth 0.5, Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	11		DOLOMITE (Cont.) Chert, Vuggy	100%	1	D.D. 10.2 Run #3 HQ Bit Start 11:30 Stop 11:40 Amt Drilled 1.6 Amt Received 1.6 Core Loss 0.0
	12					BOH 11.8 D.D. 11.5 Initial TV Inspection of hole made 22 May 1980

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT Hwy 62 Pier 1 | 62-P1-N1

DRILLING LOG — Project No. — Data on Separate Sheets

Contractor: Massman Construction Company

SHEET 1 OF 2 SHEETS

1 TITLE: Norfork Lake Bridges

2 LOCATION of Boring: 2' South of Center of Footing

3 Geotechnician: Robert Schmoker

4 HOLE NO: 62-P1-S1

5 NAME OF DRILLER: Bob Walsh

6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT

7 Boring Method: Rotary

8 DEPTH DRILLED INTO ROCK: 11.6

9 TOTAL DEPTH OF HOLE: 11.6

10 SIZE AND TYPE OF BIT: HQ - Diamond

11 Boring No.

12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear

13 Water Depth: N/A

14 TOTAL NUMBER CORE BOXES: 1

15 Depth of Bottom of Hole

16 DATE HOLE: STARTED 27 May 1980 COMPLETED 27 May 1980

17 ELEVATION TOP OF HOLE: 542.7

18 TOTAL CORE RECOVERY FOR BORING: 100%

19 Casing Record: Depth 0.2 Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS Description (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (f)
542.7	0		DOLOMITE, HD, Gray, num healed fracs, Fe stained			Run #1 Bot. of Casing HQ Bit, 5' Core Bar Start 11:10 Stop 11:30 Amt Drilled 4.7 Amt Rec'd 4.7 Core Loss 0.0 Drill action - Smooth
	1		DOLOMITE, Mod hd, tan gray, num healed jts & fracs, Fe stained	100		
	2		-Shly. Sl. wea.			
	3		-Broken		1	
	4			100		D.D. 4.7' Run #2 HQ Bit Start 12:55 Stop 1:00 Amt. Drilled 0.3' Amt. Rec'd 0.3' Core Loss 0.0 Drill Action Smooth -Malfunction in Mud pump
	5		DOLOMITE, mod hd, siliceous, med gray, num healed fracs, Fe stained, Sl. wea.			D.D. 5.0'
	6		Soft			
	7		DOLOMITE, hd, siliceous, med gray, num healed jts & fracs.	100		Run #3 HQ Bit Start 2:20 Stop 2:35 Amt Drilled 4.6' Amt Rec'd 4.6' Core Loss 0.0 Drill Action - Smooth
	8		- Vuggy			
	9		DOLOMITE, mod. hd, tan gray, num fracs & jts., Fe stained			D.D. 9.6'
	10		-Broken			

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT Hwy 62 Pier 1 HOLE 62-P1-S1

DRILLING LOG | Project No. DACW 65-80-0055 | Contractor Massman Construction Company | SHEET 2 of 2 SHEETS

1 PROJECT: Norfork Lake Bridges

2 LOCATION of Boring: 2' South of Center of Footing

3 Geotechnician: Robert Schmoker

4 HOLE NO: 62-P1-S1

5 NAME OF DRILLER: Bob Walsh

6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT

7 Boring Method: Rotary

8 DEPTH DRILLED INTO ROCK: 11.8

9 TOTAL DEPTH OF HOLE: 11.8

10 SIZE AND TYPE OF BIT: HQ - Diamond

11 Boring No.

12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear

13 Water Depth: N/A

14 TOTAL NUMBER CORE BOXES: 1

15 Depth of Bottom of Hole

16 DATE HOLE: STARTED 27 May 1980 | COMPLETED 27 May 1980

17 ELEVATION TOP OF HOLE: 542.7

18 TOTAL CORE RECOVERY FOR BORING: 100%

19 Casing Record: Depth 0.2 Type HW

ELEVATION c	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Chert DOLOMITE (Cont.)	100	1	Run #4 HQ Bit Start 3:00 Stop 3:10 Amt Drilled 2.2 Amt Rec'd 2.2 Core Loss 0.0
531.4	11.3				11.3	
			Core Discarded			Drill Action - Smooth
530.9						M.D. 11.8' D.D. 11.8'
						BOH
						TV Inspection of core hole made 28 May 1980.

187

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT Hwy 62 Pier 1 | 62-P1-S1

DRILLING LOG	Project No. DACW 0)-C-0055	Contractor Massman Const: ion Company	SHEET 1 OF 2 SHEETS
1. PROJECT Norfork Lake Bridges		10. SIZE AND TYPE OF BIT HQ - Diamond	
2. LOCATION of Boring 62-P2-N-1-Core		11. Boring No.	
3. Geotechnician Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150	
4. HOLE NO		13. Water Depth	
5. NAME OF DRILLER Bob Walsh		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole 471.75	
7. Boring Method Rotary		16. DATE HOLE STARTED 12/2/80 COMPLETED 12/3/80	
8. DEPTH DRILLED INTO ROCK 10.45'		17. ELEVATION TOP OF HOLE 553.5 Platform	
9. TOTAL DEPTH OF HOLE 81.65'		18. TOTAL CORE RECOVERY FOR BORING %	
		19. Casing Record Depth 71.0 Type HW	

ELEVATION a	DEPTH 70+ b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	71					
482.3			Bottom of Rock Socket			
	72		Dolomite, mod. hd, lt. gray to tan, mod. fractured with partings along thin, tan to brown shale seams, some fe stains.			Run #1 Start: 12/2/80 @2.25 M.D. Start: 71.2' Stop: 2:45 M.D. Stop 75.15 D.D. 3.95' Rec 3.90'-99%
			Shale, mod. soft, gry-brn, 1/4" thick			
	73			99		
			Very shaley			
	74					
					1	
	75		Dolomite, mod. hd, occ. fractures and joints, lt. gray to gray, occ. dk. gray shale interbeds.			
478.35						12/3/80 Start: 7:35 M.D. Start: 75.15 Stop: 7.55 M.D. Stop: 79.88 D.D. 4.93' Rec.- 4.73' - 100%
	76		Very shaley			
			Very shaley			
	77		Fe staining			
	78			100		
	79					
473.62'						Run #3

188

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT 82-P2-N-1-Co

DRILLING LOG | Project No. DACW 09-79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P2-N-1-Core
3 Geotechnician:
4 HOLE NO:
5 NAME OF DRILLER:
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK:
9 TOTAL DEPTH OF HOLE:

10 SIZE AND TYPE OF BIT: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole:
16 DATE HOLE: STARTED ____ COMPLETED ____
17 ELEVATION TOP OF HOLE:
18 TOTAL CORE RECOVERY FOR BORING: %
19 Casing Record: Depth ____ Type HW

ELEVATION a	DEPTH 80 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite, as above.			Run#3 Start: 8:22 M.D. Start: 79.88 Stop: 8:28 M.D. Stop: 81.65 D.D 1.77' Rec. 1.77'- 100%
	81		Shale, dk gray, 1/4" thick	100	1	
471.85			Bottom of Core Hole			

189

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT 62-P2-N-1-C

DRILLING LOG	Project No. DACW 79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 62-P2-S-1-Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO		13. Water Depth	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole: 472.2	
		16. DATE HOLE: STARTED 12/4/80 COMPLETED 12/4/80	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE: 553.29	
8. DEPTH DRILLED INTO ROCK: 10.165'		18. TOTAL CORE RECOVERY FOR BORING: %	
9. TOTAL DEPTH OF HOLE: 80.89'		19. Casing Record: Depth 71.45' Type HW	

ELEVATION a	DEPTH 70's	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
482.52			**Bottom of Rock Socket**			
	71		Dolomite, mod. hd, lt. gray to gray, occ. minute vugs with calcite crystals, moderately fractured.			**Run#1** Start - 9:42 M.D. Start - 70.725 Stop: 10.12 M.D. Stop - 75.25 D.D. - 4.525' Rec. - 4.325' C.L. - .2'
			- Broken			
	72		- Cherty			
				96		
	73		Vertical joint is cemented and tightly healed.			
			Shale, firm to soft, lt. gray to tan to brown, fissile, air-slaked.			
	74		- Broken along bedding planes of soft, fissile, air-slaked shale. 0.2' C.L.			
			Sandstone, mod. hd, fn grn, angular to subangular, tan, slightly rough texture.			
	75					
478.04					1	
			Dolomite, mod. hd, gray, occ. fractures, sandy with small dolomitic sandstone layer from 76.55 to 76.80 and dk. gray to black shale from 76.80 to 76.98.			**Run#2** Start - 10.29 M.D. Start - 75.25 Stop - 10:40 M.D. Stop - 80.15 D.D. - 4.9' Rec. - 4.9' C.L. - 0.0'
	76					
			- Sandstone interbed			
	77		- Shale interbed			
				100		
	78		Shaley, dk. gray			
			Dolomite, mod. hd, lt. gray to gray to buff, occ. fractures on nearly horizontal bedding planes, smooth texture.			
	79		- Sandy, rough texture			
	80					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO 62-P2-S-1-Co

DRILLING LOG | Project No. DACW 5 79-C-0055 | Contractor Hagman Const tion Company | OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P2-S-1-Core
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE O: T HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 Casing Record: Depth ____ Type HW

ELEVATION a	DEPTH 80	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
473.14			Dolomite, as above.	100	1	Start: 10.5' M.D. Start 80.15 Stop: 11.01 M.D. Stop: 80.89 D.D. 74' M.D. 74'
472.4	81		Bottom of Core Hole			C.L. 0.0'

191

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P2-S-1-Co

Hole No. 62-P3-N3

DRILLING LOG	Project No. DACW 0 9-C-0055	Contractor Massman Const: ion Company	SHEET 1 OF 2 SHEETS

1. PROJECT	Norfork Lake Bridges	10. SIZE AND TYPE OF BIT	HQ - Diamond
2. LOCATION of Boring	Pier 3, North Socket, Near Center	11. Boring No.	62-P3-N3
3. Geotechnician	Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear HC-150
4. HOLE NO.	62-P3-N3	13. Water Depth	
5. NAME OF DRILLER	Bob Walsh	14. TOTAL NUMBER CORE BOXES	1
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. Depth of Bottom of Hole	126.55
		16. DATE HOLE STARTED	7-8-80
		16. DATE HOLE COMPLETED	7-8-80
7. Boring Method	Rotary	17. ELEVATION TOP OF HOLE	564.94 (Top/Casing)
8. DEPTH DRILLED INTO ROCK	11.7	18. TOTAL CORE RECOVERY FOR BORING	94.02 %
9. TOTAL DEPTH OF HOLE	126.55	19. Casing Record	Depth ____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Top of Casing = Top of Hole			8 a.m. Lake Surface Elevation 550.43
	111					
	112					
	113					
	114					
450.1			Bottom of Rock Socket			Begin Coring 114.85
	115		0.7' C.L.			Run #1 HQ Bit, 5' Core Barrel Start 8:44 Stop 8:53 Amt Cored 1.7' Amt Rec'd 1.0' C.L. 0.7' Loss of water when pull down is used d.d. 116.55
	116		Dolomite, Hd, med gray, num healed jts & fracs Fe stained,	58.8		
	117		— Broken		1	Run #2 Start 9:30 (No pull down - control in float pos'tion) Stop 10:50 Amt Cored 5.0' Amt Rec'd 5.0' HD Dolomite - Core fractured where jointed.
	118					
	119			100		
	120					

192

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT

HOLE NO 62-P3-N3

DRILLING LOG	Project No. DACW 0 9-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring
3. Geotechnician
4. HOLE NO. 62-P3-N3
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT HQ - Diamond
11. Boring No. 62-P3-N3
12. MANUFACTURER'S DESIGNATION OF DRILL Longyear
13. Water Depth
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE STARTED COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. Casing Record Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	121		Dolomite (cont)			Drill Action Smooth D.D. 116.55
	122		Broken		1	Run#3 Start 11:35 Stop 12:30 Amt Cored 3.0' Amt Recd 3.0' Drill action Smooth
	123		Vuggy, w/Calcite Crystals	100		No pull down
	124					D.D. 124.55 MD 124.55
	125		Scatt. Vugs			Run #4 Start 1:50 Stop 2:15
	126			100		Amt Cored 2.0' Amt Rec'd 2.0' Drill action smooth HD Dolomite - Num Healed Fracs
438.39						D.D. 126.55 MD 126.55
	127					Bottom of Hole TV Inspection made of Core Hole 7-9-80 @ 11:30 a.m.
	128					
	129					
	130					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO. 62-P3-N3

DRILLING LOG	Project No. DACW C 9-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HQ - Diamond
2. LOCATION of Boring: Pier 3, South Socket, Near Center	11. Boring No.
3. Geotechnician: Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
4. HOLE NO.: 62-P3-S1	13. Water Depth
5. NAME OF DRILLER: Bob Walsh	14. TOTAL NUMBER CORE BOXES: 1
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. Depth of Bottom of Hole: 440.0'
7. Boring Method: Rotary	16. DATE HOLE: STARTED 7/10/80 COMPLETED 7/11/80
8. DEPTH DRILLED INTO ROCK: 12.8'	17. ELEVATION TOP OF HOLE: 566.32 (Top casing)
9. TOTAL DEPTH OF HOLE: 127.0'	18. TOTAL CORE RECOVERY FOR BORING: 98.3 %
	19. Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	110.0		Top of Hole = Top of Casing			
	111					
	112					
	113					
	114					
	115					
451.12						Begin Coring 115.2'
451.0 Bottom of Rock Socket	116		DOLOMITE, Hd, Tan-Gray, num healed fracs & jts., Fe stained, Scattered Vugs	86.7		Run #1 HQ Bit - 5' Core Barrel Start 1:55 Stop 2:10 Amt Cored 1.5' Amt Rec'd 1.3' C.L. 0.2' Drilled in float Muddy water & fast drill rate @.6' - 1.0' D.D. 116.9 M.D. 116.7
			- 0.2' C.L.			
	117				1	
	118			100		Run #2 Start 2:42 Stop 3:05 Amt Cored 5.1' Amt Rec'd 5.1' C.L. 0.0 Drilled in pull-down
	119					
	120					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

194

DRILLING LOG	Project No. DACW 0 9-C-0055	Contractor Massman Constr tion Company	SHEET 2 OF 2 SHEETS
1. PROJECT Norfork Lake Bridges		10. SIZE AND TYPE OF f HQ - Diamond	
2. LOCATION of Boring		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED	COMPLETED
7. Boring Method Rotary		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE		19. Casing Record Depth ____ Type HW	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	120.0		DOLOMITE (Cont)			
	121		Num Vugs Lined w/ Qtz & Dolo X-tls			D.D. 131.8 M.D. 121.8
	122				1	Run #3 Start 7:43 Stop 7:55 @ 3' (Add 5' joint) Start 8:00 Stop 8:09 Amt Cored 5.2' Amt Rec'd 5.2' C.L. 0.0'
	123					
	124		DOLOMITE, Hd. med gray, num healed fracs & jts Fe stained	100		
	125					
	126		Num Small Vugs			
439.3'	127		Bottom of Hole 127.0'			D.D. 127.0 M.D. 127.0
	128					Made TV Inspection of core hole 11 July '80 @ 11:30 a.m.
	129					
	130					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

Hole No.

DRILLING LOG	DIVISION DA 03-79-C-0055	INSTALLATION Contractor Massman Construction CO.	SHEET 1 OF 2 SHEETS

1. PROJECT	Norfork Lake Bridges
2. LOCATION (Coordinates or Station)	H62-P4 -N-Core
3. DRILLING AGENCY	
4. HOLE NO. (As shown on drawing title and title number)	
5. NAME OF DRILLER	Bob Walch
6. DIRECTION OF HOLE	X VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN	
8. DEPTH DRILLED INTO ROCK	10.15'
9. TOTAL DEPTH OF HOLE	141.0 '
10. SIZE AND TYPE OF BIT	HQ - Diamond
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear HC - 150
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES	
15. ELEVATION GROUND WATER	
16. DATE HOLE	STARTED 1/14/81 COMPLETED 1/14/81
17. ELEVATION TOP OF HOLE	557.78' Platform
18. TOTAL CORE RECOVERY FOR BORING	%
19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	130					
426.93			Bottom of Rock Socket			
	131		Dolomite, mod. hd. to hd., lt. gray to gray with a few dk. gray 1/16" to 1/8" thick shale layers, mod. fractured for most part, greatly fractured from 138.2 to 139.9, joints mostly healed with calcite, vuggy and drusy from 136.55 to 139.70, occ. Fe stains along joints and in vugs.	94		Run #1 Start 7:41 Stop 8:18 M.D. Start 130.85' M.D. Stop 133.3 ' D.D. 2.45' REC 2.30' C.L. .15'
	132					
	133					
424.48						
	134					Run #2 Start 8:42 Stop 9:18 fuel pu Start 9:29 Stop 9:41 M.D. Start 133.3' M.D. Stop 138.2' D.D. 4.9' REC 4.9' C.L. 0.0'
	135					
	136		broken	100	1	
	137		druses with dolomite crystals			
	138		vugs with quartz crystals			
419.58			broken			Run #3 Start 10:00 Stop 10:40 M.D. Start 138.2' M.D. Stop 141 0' D.D. 2.8' REC 2.8' C.L. 0.0'
	139		druse with dolomite crystal			
			broken	100		
	140					

196

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT HOLE NO

Hole No.

DRILLING LOG	DIVISION	INSTALLATION	SHEET OF SHEETS

1. PROJECT		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station) 62-P4-N-1-Core		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
		16. DATE HOLE	STARTED / COMPLETED
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	%
9. TOTAL DEPTH OF HOLE		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH 140	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite as above.	100	1	Run #3 Start 10:00 Stop 10:40 MD Start 138.2' MD Stop 141.0' DD 2.8' REC 2.8' CL 0.0'
416.78	141		Bottom of Hole			

197

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT)

PROJECT | HOLE NO

Hole No.

DRILLING LOG	Proje No. DACW 03-79-C-0055	Contractor Massman Construction Co.	SHEET 1 OF 2 SHEETS
1. PROJECT	Norfork Lake Bridges	10. SIZE AND TYPE OF BIT	HQ - Diamond
2. LOCATION of Boring	H62-P4-S-1	11. Boring No.	
3. Geotechnician	Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear HC 150
4. HOLE NO.		13. Water Depth	DISTURBED 115.30 / UNDISTURBED
5. NAME OF DRILLER	Bob Walsh	14. TOTAL NUMBER CORE BOXES	1
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. Depth of Bottom of Hole	
		16. DATE HOLE	STARTED 1/21/81 / COMPLETED 1/21/81
7. Boring Method	Rotary	17. ELEVATION TOP OF HOLE	558.28' TOP
8. DEPTH DRILLED INTO ROCK	10.03'	18. TOTAL CORE RECOVERY FOR BORING	%
9. TOTAL DEPTH OF HOLE	141.35	19. Casing Record	Depth 132' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	130					
	131					
426.96'			Bottom of Rock Socket			
	132		Dolomite, hd. to mod. hd., lt. gray to gray with buff banding from 135.55 to 136.00, occ. 1/16" thick dk. gray shaly layers, moderately fractured and jointed, joints mostly healed, vuggy or drusy in places.			Run #1 M.D. Start 131 32' M.D. Stop 135.09' Start 12:53 Stop 1:19 D.D. 3.77' REC. 3.77' C.L. 0.0 '
	133			100		
	134					
423.19	135				1	
	136		druses with dolomite crystals			Run #2 M.D. Start 135.09' M.D. Stop 140.1 ' Start 1:33 Stop 1:52 D.D. 5.01 REC. 4.9 C.L. .11
	137		broken vugs with quartz crystals	98		
	138		druse with dolomite crystals			
	139		broken, drusy with dolomite crystals			@138.6 - 138.7 Small clay filled cavern.
	140		0.11' core loss in clay-filled cavity.			

198

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO.

Hole No.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Co.	SHEET 2 of 2 SHEETS

1 PROJECT Norfork Lake Bridges		10 SIZE AND TYPE OF BIT HQ - Diamond	
2 LOCATION of Boring H62-P4-S-1		11 Boring No.	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4 HOLE NO		13. Water Depth	DISTURBED / UNDISTURBED
5 NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16 DATE HOLE	STARTED / COMPLETED
		17 ELEVATION TOP OF HOLE	
7 Boring Method Rotary		18 TOTAL CORE RECOVERY FOR BORING	%
8 DEPTH DRILLED INTO ROCK		19. Casing Record	Depth ____ Type
9. TOTAL DEPTH OF HOLE			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
418.18	140½		Dolomite as above.			Run #2
						Run #3
						M.D. Start 140.1
						M.D. Stop 141.35
				100	1	Start 2:07
	141					Stop 2:12
416.93'			Bottom of Hole			RD 1.25' REC 1.25' CL 0.0

199

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT HOLE NO

DRILLING LOG	Project No. DACW 79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: Hwy 62-Pier 5-N Socket - Near Center
3. Geotechnician: Robert Schmoker
4. HOLE NO.: 62-P5-N1
5. NAME OF DRILLER: Bob Walsh
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 11.4
9. TOTAL DEPTH OF HOLE: 11.4
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES:
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED 7/31/80 COMPLETED 8/1/80
17. ELEVATION TOP OF HOLE: 562.1' Top of casing & Top of platform
18. TOTAL CORE RECOVERY FOR BORING: %
19. Casing Record: Depth 156.45' Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
407.1	155		Bottom of Rock Socket			
			Dolomite, Hd, Med gray, num healed jts & fracs, occ Fe staining			Run #1 Start 1:28 Stop 1:34 Amt Cored 2.0' Amt Rec'd 1.8' MD 155.0 - 156.8' DD 155.0 - 157.0'
	156		Broken	100		
	157					
				100	1	Run #2 Start 2:01 Stop 2:07 Amt Cored 1.0' Amt Rec'd 1.2' MD 156.8 - 158.0 DD 157.0 - 158.0
	158					
	159		Broken			Run #3 Start 8:48 Stop 9:08 Amt Cored 5.2' Amt Rec'd 5.2' MD 163.2 DD 163.2
	160			100		
	161					
	162		Vuggy			

200

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT Norfork Lake Bridges	10. SIZE AND TYPE OF BIT HQ - Diamond
2. LOCATION of Boring	11. Boring No.
3. Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL Longyear
4. HOLE NO. 62-P5-N1	13. Water Depth
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method Rotary	16. DATE HOLE STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. Casing Record Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite (Cont.)			
	163		Scattered Vugs	100		
					1	Run #4 Start 9:48 Stop 10:04 Amt Cored 3.2' Amt Rec'd 2.9'
	164		Frac, w/Calcite crystals			MD 166.4' DD 166.4'
			Vuggy	91		
	165					
	166		0.3' C.L.			
395.7			Bottom of Hole			

201

DRILLING LOG	Project No. DACW 1 79-C-0055	Contractor Massman Constr ion Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: Pier 5 - South Socket - Near Center		11. Boring No.: 62.P5-S1	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150	
4. HOLE NO.: 62-P5-S1		13. Water Depth	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED 7/29/80 COMPLETED	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE: 567.45'T.O. Casing	
8. DEPTH DRILLED INTO ROCK: 11.0'		18. TOTAL CORE RECOVERY FOR BORING: 100 %	
9. TOTAL DEPTH OF HOLE: 11.0'		19. Casing Record: Depth 161.45 Type HW	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
406.75	160		Bottom of Rock Socket			Begin Boring 160.7
	161		0.2' C.L. Dolomite, mod Hd w/soft chalky seams and swirls, med gray to buff, mottled, broken w/nearly horizontal jts, some Fe staining	80		Run #1 Start 8:05 Stop 8:10 Amt Cored 1' Amt Rec'd 1' DD 161.7' MD 161.7'
	162		Dolomite, Hd, med gray, num jts and fracs mostly healed, frequent Fe stained, occ vugs w/calcite crystals			Run #2 Start 9:12 Stop 9:36 Amt Cored 4.5' Amt Rec'd 4.5' DD 166.2 MD 166.2
	163			100	1	
	164					
	165					
	166			100		Run #3 Start 10:30 Stop 10:45 Amt Cored 2.0' Amt Rec'd 2.0' DD 168.2 MD 168.2
	167					

202

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT HOLE NO

DRILLING LOG	Project No. DACW 1 79-C-0055	Contractor Massman Constr ion Company	SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF B.T: HQ - Diamond
2 LOCATION of Boring	11 Boring No.
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4 HOLE NO: 62-P5-S1	13 Water Depth
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 Depth of Bottom of Hole
	16 DATE HOLE: STARTED / COMPLETED
	17 ELEVATION TOP OF HOLE
7 Boring Method: Rotary	18 TOTAL CORE RECOVERY FOR BORING %
8 DEPTH DRILLED INTO ROCK	19 Casing Record: Depth ____ Type HW
9 TOTAL DEPTH OF HOLE	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite (Cont)			**Run #4** **Start 11:12** **Stop 11:45** **Amt Cored 3.5'** **Amt Rec'd 3.5'** **DD 171.7'** **MD 171.7'**
	168		Scatt. vugs w/calcite crystals			
			Fracture, irregular to vertical, contains Fe stain & calcite crystals			
	169				1	
			Scatt. vugs w/calcite crystals	100		
	170					
			Vuggy w/Calcite crystals			
	171					
			Bottom of Hole 395.75			

203

Hole No.

DRILLING LOG	Project No. DACW -79-C-0055	Contractor Massman Construction Co.	SHEET 1 OF 2 SHEETS

1. PROJECT	Norfork Lake Bridges
2. LOCATION of Boring	62-P6-N-1-Core
3. Geotechnician	Robert Schmoker
4. HOLE NO.	
5. NAME OF DRILLER	Bob Walsh
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method	Rotary
8. DEPTH DRILLED INTO ROCK	10.2
9. TOTAL DEPTH OF HOLE	156.85
10. SIZE AND TYPE OF BIT	HQ - Diamond
11. Boring No.	
12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear HC-150
13. Water Depth	DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES	1
15. Depth of Bottom of Hole	
16. DATE HOLE	STARTED 2/5/81 COMPLETED 2/5/81
17. ELEVATION TOP OF HOLE	556.46' Platform
18. TOTAL CORE RECOVERY FOR BORING	%
19. Casing Record	Depth 147.0' Type HW

ELEVATION a	DEPTH 140	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	141					
	142					
	143					
	144					
	145					
	146					
409.81			Bottom of Rock Socket			
	147		Dolomite, mod. hd., lt. gray with occ. buff to gray-white mottling, frequently fractured and jointed with some FE staining and calcite crystals.			Run #1 MD Start 146.65' MD Stop 150.32' Start 9:45 Stop 10:25 DD 3.67' REC 3.57' CL .10'
	148		Shale, 1/16" thick, brown. Vugs with quartz crystals Flint, black to dk. brown	97	1	
	149					
	150					

204

ENG. FORM 1836 — PROJECT — HOLE NO.

Hole No.

DRILLING LOG	Project No. DACW -79-C-0055	Contractor Massman Construction Co.	SHEET 2 OF 2 SHEETS
1. PROJECT Norfork Lake Bridges		10. SIZE AND TYPE OF BIT HQ - Diamond	
2. LOCATION of Boring 62-P6-N-1-Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4. HOLE NO.		13. Water Depth DISTURBED	UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED	COMPLETED
7. Boring Method Rotary		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE		19. Casing Record Depth ____ Type	

ELEVATION a	DEPTH 150 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
406.14'			Dolomite, as above.			Run #1
	151		Broken			Run #2 MD Start 150.32' MD Stop 155.23' Start 10:43 Stop 11:03 DD 4.91' REC 4.91' CL 0.0 '
	152			100	1	
	153					
	154					
			Broken			
	155					
401.23'						Run #3 MD Start 155.23' MD Stop 156.85' Start 11:20 Stop 11:30 DD 1.62' REC 1.62' CL 0.0 '
	156			100		
399.61'			Bottom of Core Hole			
	157					
	158					
	159					
	160					

205

ENG FORM 1836 — PREVIOUS EDITIONS ARE OBSOLETE — PROJECT — HOLE NO.

Hole No.

DRILLING LOG	Project No. DACW 1-79-C-0055	Contractor Massman Construction Co.	SHEET 1 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P6-S-1-Rock Core
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Bob Walsh
6 DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK: 10.0'
9 TOTAL DEPTH OF HOLE: 157.85'
10 SIZE AND TYPE OF BIT: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole: 397.98'
16 DATE HOLE: STARTED 2/13/81 COMPLETED 2/13/81
17 ELEVATION TOP OF HOLE: 555.83' TOP
18 TOTAL CORE RECOVERY FOR BORING: 100 %
19 Casing Record: Depth 148.45' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE No.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	140					
	141					
	142					
	143					
	144					
	145					
	146					
	147					
407.98'			Bottom of Rock Socket			
	148		Dolomite, mod. hd., gray to lt. gray with occ. gray-white to buff mottling, frequently fractured and jointed with some dolomite and calcite healing, occ. slight FE staining along joint planes, druses and vugs in places.	100	1	Run #1 MD Start 147.85' MD Stop 150.45' Start 8:11 Stop 8:38 DD 2.6 REC 2.6 CL 0.0
	149					
	150					

206

Hole No.

DRILLING LOG	Project No. DACW 21-79-C-0055	Contractor Massman Construction Co.	SHEET 2 OF 2 SHEETS
1 PROJECT Norfork Lake Bridges		10 SIZE AND TYPE OF BIT HQ - Diamond	
2 LOCATION of Boring 62-P6-S-1-Rock Core		11 Boring No.	
3. Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4. HOLE NO		13 Water Depth DISTURBED / UNDISTURBED	
5. NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT		15. Depth of Bottom of Hole	
		16 DATE HOLE STARTED / COMPLETED	
7. Boring Method Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE		19 Casing Record Depth / Type	

ELEVATION a	DEPTH 150	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
405.38'			Dolomite, as above.	100		Run #1 - con't.
	151					Run #2 MD Start 150.45' MD Stop 155.40' Start 8:52 Stop 9:12 DD 4.95 REC 4.95 CL 0.0
	152					
			Druses with dolomite crystals	100	1	
	153					
	154		Broken			
			Druses with dolomite crystals			
	155					
400.43'			Broken			Run #3 MD Start 155.4 MD Stop 157.85 Start 9:29 Stop 9:38 DD 2.45 REC 2.45 CL 0.0
	156			100	1	
	157		Broken			
397.98			Vugs with quartz crystals Bottom of Hole			
	158					
	159					

207

ENG FORM 1836 — PREVIOUS EDITIONS ARE OBSOLETE. — PROJECT — SHEET NO

DRILLING LOG	Project No. DACW 79-C-0055	Contractor Massmen Construction Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 62-P7-N -1-Core		11. Boring No.: 1	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER: Mike Troxel		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED 9/17/80 COMPLETED 9/19/80	
		17. ELEVATION TOP OF HOLE: 554.94'	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING: %	
8. DEPTH DRILLED INTO ROCK: 10.95'		19. Casing Record: Depth 147.45, Type HW	
9. TOTAL DEPTH OF HOLE: 157.0'			

ELEVATION a	DEPTH b	LEGEND c.	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	141					
	142					
	143					
	144					
	145					
408.89'	146		Bottom of Rock Socket			
	147		Dolomite, mod hd., gray to lt. gray, num tight fracs and jts., occ thin shale layers of 1/16" thickness w/ small pyrite crystals.	100	1	Run #1 Start 9/17/80 - Float @ 3:25 Stop - 4:20 @ 1.0' Start - 9/18/80 - Float @ 7:50 Stop - 9:20 @ 1.48' MD 1.48' 146.07' DD 1.48' 147.53' CL 0.0'
407.41'			Broken			
	148					Run #2 Start: 10:44 Stop: 12:05 M.D. 4.66' DD 4.66'
	149			100	1	147.53' - 152.19'
	150					

208

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO 62-P7-N-1-C

DRILLING LOG | Project No. DACW C 79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 62-P7-N-1-Core
3. Geotechnician: Robert Schmoker
4. HOLE NO:
5. NAME OF DRILLER: Mike Troxel
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.95'
9. TOTAL DEPTH OF HOLE: 157.0'
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No. 1
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES:
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED 9/17/80 COMPLETED 9/19/80
17. ELEVATION TOP OF HOLE: 554.94'
18. TOTAL CORE RECOVERY FOR BORING: %
19. Casing Record: Depth 147.45' Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	151		Dolomite, as above, gray to buff w/Fe stains on jts & fracs. Shale Layers, 1/16" thick, num.	100	1	
402.75'	152					
	153		Dolomite, mod hd to hd, gray to lt. gray, num.fracs. mostly healed with calcite, occ. tight jts., scattered chert w/occ. layers 1/16"-1/4" thick.	100	1	Run #3 Start: 1:22 Stop: 2:50 M.D. 1.46 D.D. 1.46 152.19' - 153.65'
401.29'	154		Very Broken, frac.chert zone. Vug w/calcite			Run #4 Start: 3:40 Stop: 4:10 Start: 7:20 (9/19/80) Stop: 7:30 @ 3.35' B.O.H.
	155			100	1	M.D. 3.35' D.D. 3.35' C.L. 0.0 153.65' - 157.0'
	156		Vugs and irregular fracs. w/calcite			
397.94	157		Bottom of Hole			

209

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO 62-P7-N-1-Co

DRILLING LOG	Project No. DACW 07-79-C-0055	Contractor Massman Construction Company	SHEET 1 of 2 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HC - Diamond
2. LOCATION of Boring: 62-P7-S-3	11. Boring No.: 3
3. Geotechnician: Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
4. HOLE NO	13. Water Depth
5. NAME OF DRILLER: Mike Troxel	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method: Rotary	16. DATE HOLE: STARTED 9/16/80 COMPLETED 9/16/80
8. DEPTH DRILLED INTO ROCK: 10.4'	17. ELEVATION TOP OF HOLE: 555.43'
9. TOTAL DEPTH OF HOLE: 398.16'	18. TOTAL CORE RECOVERY FOR BORING: %
	19. Casing Record: Depth 147.45' Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	141					
	142					
	143					
	144					
	145					
	146					
408.56	147		Dolomite, mod hd, gray to lt. gray, occ. tight jts. and fracs. w/Fe stains, occ. vugs			Run #1 M.D. 146.87' Start: 11:33 Float Stop: 12:30 Start: 1:05 Down Stop: 1:20 Add 5' @ 4'0" Start: 1:35 Stop 1:45 @ 5'
	148		Broken			
	149		Small Vugs	100	1	M.D. 152.07 D.D. 152.07 C.L. 0.0

210

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO

DRILLING LOG	Project No. DACW 0[illegible]-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT	Norfork Lake Bridges	10. SIZE AND TYPE OF BIT	HQ - Diamond
2. LOCATION of Boring	62-P7-S-3	11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED	COMPLETED
7. Boring Method	Rotary	17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	%
9. TOTAL DEPTH OF HOLE		19. Casing Record	Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Shale, mod soft, gray, 1/8" thk			
			Dolomite, mod hd, lt. gray to buff, occ. tight jts. and fracs. w/Fe stains.			
			Vug	100	1	
	151					
403.36	152					Run #2
						Start: 2:30
						Stop: 2:30 - Stem Adj
						Start: 2:34
			Dolomite, mod hd., lt. gray w/ soft buff chalky mottling, jts. and fracs. as above.			Stop: 3:00 - Stem Adj
	153					Start: 3:04
						Stop: 3:36
			Very broken w/chert nodules			M.D. 5.2'
						D.D. 5.2'
						C.L. 0.0'
	154			100	1	
			Vug			
	155					
			Vuggy			
			Dolomite, mod hd, gray to lt. gray, occ. jts. and fracs., vuggy, calcite in vugs and along healed fracs.			
	156					
	157					
398.16			Bottom of Hole			

211

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE	PROJECT	HOLE NO 62-P7-S-3

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 62-P8-N-1-Rock Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole: 395.28'	
		16. DATE HOLE: STARTED 3/28/81	COMPLETED 3/28/81
		17. ELEVATION TOP OF HOLE: 560.18 TBP	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING: %	
8. DEPTH DRILLED INTO ROCK: 10.25'		19. Casing Record: Depth 155.45' Type HW	
9. TOTAL DEPTH OF HOLE: 164.9 '			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	150					
	151					
	152					
	153					
	154					
405.53'			Bottom of Rock Socket			
	155		0.05 Core loss			Run #1 Start 9:59 Stop 10:35 MD Start 154.65' MD Stop 159.35' DD 4.70 REC 4.65 CL .05
			Broken			
	156		Dolomite, mod. hd., light gray to gray, frequent fractures and joints often healed with calcite, occ. vugs with calcite crystals.			
				99	1	
	157					
			Vugs with calcite crystals			
	158					
400.83'	159					
				100		Run #2 Con't on page two
	160					

212

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 62-P8-N-1-Rock Core
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE

10. SIZE AND TYPE BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH 160 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Vugs with calcite crystals Dolomite as above.			Run #2 159.35' - 164.0' Start 10:54 Stop 11:14 MD Start 159.35 MD Stop 164.0 DD 4.65 REC 4.65 CL 0.0
	161					
			Vug with calcite crystals.			
				100	1	
	162		Vug with calcite crystals.			
	163					
396.18	164					
				100		Run #3 Start 11:35 Stop 11:40 DD9' REC. .9 CLO.0 MD Start 164.0 MD Stop 164.9'
395.28'			Bottom of Core Hole			

213

ENG FORM 1836 OBSOLETE EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 07-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P8-S-Rock Core
3 Geotechnician: Robert Schmoker
4 HOLE NO.
5 NAME OF DRILLER: Bob Walsh
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK: 10.24
9 TOTAL DEPTH OF HOLE: 161.05
10 SIZE AND TYPE: 17 HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE: STARTED 3/26/81 COMPLETED 3/26/81
17 ELEVATION TOP OF HOLE: 556.59
18 TOTAL CORE RECOVERY FOR BORING: %
19 Casing Record: Depth 151.45, Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
405.78	150		Bottom of Rock Socket			
	151		0.09 Core loss Broken Dolomite, Mod. hd., light gray to gray with some buff mottling from 150.81 to 152.20, frequent fractures and joints often healed with calcite or iron, occ. druses or vugs.			Run #1 MD Start 150.81 MD Stop 155.2 DD 4.39 REC 4.3 CL .09
	152					
	153			98	1	
	154					
401.39	155					Run #2 MD Start 155.2 MD Stop 159.95 DD 4.75 REC 4.75 CL 0.0
	156					
	157		Broken	100		
	158					
	159		Druses with dolomite crystals			
396.64	160					

214

PROJECT Run #3 HOLE NO

DRILLING LOG | Project No. DACW 07-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P8-S-Rock Core
3 Geotechnician:
4 HOLE NO:
5 NAME OF DRILLER:
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK:
9 TOTAL DEPTH OF HOLE:
10 SIZE AND TYPE BIT: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole:
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE:
18 TOTAL CORE RECOVERY FOR BORING: %
19 Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	160					con't 396.64 - 395.54
			Dolomite as above.	100	1	Run #3 MD Start 159.95 MD Stop 161.05 DD 1.1 REC 1.1 CL 0.0
395.54	161		Bottom of Rock Core			

215

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Proje[illegible] No. DACW 1-79-C-0055	Contractor Massman Con[illegible]ruction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: 62-P9-M-1 - Rock core		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150	
4 HOLE NO		13. Water Depth	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED 11/13/80	COMPLETED 11/13/80
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE: 557.42' platform	
8 DEPTH DRILLED INTO ROCK: 10.18'		18 TOTAL CORE RECOVERY FOR BORING: 100 %	
9 TOTAL DEPTH OF HOLE: 164.53'		19. Casing Record: Depth 154.45' Type HW	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	151					
	152					
	153					
	154					
403.07'			Bottom of Rock Socket			
	155		Dolomite, mod. hd, lt. gray with buff mottling, 1/8" chert layer at upper and lower contact, occ. vugs			Run #1 M.D. Start: 154.35 Start: 11:00 Stop: 11:45 M.D. Stop: 157.55 D.D. 3.2' 100% Rec.
	156		Dolomite, mod. hd, lt. gray to gray, frequent fractures and joints often healed with calcite, vuggy zones as shown with occ. vugs throughout.	100		
			vuggy			
	157					
399.87'					1	Run #2 M.D. Start: 157.55 Start: 2:22 Stop: 2:34 M.D. Stop: 160.32 D.D. 2.77 100% Rec
	158		broken			
				100		
	159					
	160					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO 62-P9-M-1

DRILLING LOG	Project No. DACW [79-C-0055	Contractor Massman Const :tion Company	SHEET 2 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: 62-P9-N-1 - Rock Socket		11 Boring No.	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4 HOLE NO.		13 Water Depth	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED / COMPLETED	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING %	
9 TOTAL DEPTH OF HOLE		19 Casing Record: Depth ____ Type HW	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
397.10'			vugs with calcite crystals			Run #2 - End
	161			100	1	Run #3 M.D. Start: 160.32 Start: 3:00 Stop: 3:25 M.D. Stop: 164.53 D.D. 4.21 100% Rec.
	162					
			vugs with quartz crystals			
	163					
	164					
392.89'			Bottom of Hole			

217

DRILLING LOG	Project No. DACW 79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 62-P9-S-1		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO		13. Water Depth	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED 11/10/80 COMPLETED 11/10/80	
		17. ELEVATION TOP OF HOLE: 555.29' platform	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING: 100 %	
8. DEPTH DRILLED INTO ROCK: 9.92		19. Casing Record: Depth 154.45, Type HW	
9. TOTAL DEPTH OF HOLE: 162.565'			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	151					
	152					
403.14'			**Bottom of Rock Socket**			
			Dolomite, mod hd to hd, gray, frequent fractures, contains a few thin shale layers near bottom			**Run #1** **Start: 11:29** **M.D. - start 152.175** **Stop: 12:08** **M.D. End run #1 156.72** **D.D. 4.545'** **0.0' C.L.**
	153		broken			
	154			100	1	
	155					
	156					
			Shale, dark gray, 1/16" thick			
398.59			broken, shaly			
	157		Dolomite, mod hd, gray to buff, with fractures and joints relatively frequent.			**Run #2** **Start: 1:13** **M.D. - start 156.72'** **Stop: 1:30** **M.D. Stop 158.95'** **D.D. 2.23'** **0.0' C.L.**
	158		vug with Fe staining	100	1	
396.36'	159					
			Dolomite, mod hd, gray with buff mottling, numerous frac. and jts. mostly healed and tight, numerous small vugs with quartz crystals, cherty, and some Fe staining.	100	1	**Run #3 Cont. on page 2**

DRILLING LOG	Project No. DACW -79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 62-P9-S-1
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	161		Dolomite as above.	100	1	Run #3 Start: 1:51 M.D. Start 158.95' Stop: 2:13 M.D. Finish 162.09' D.D. 3.14' 0.0' C.L.
393.22	162		Bottom of Core Hole			

219

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | Sheet 1 of 2 sheets

1. Name and Location of Boring: Norfork Lake Bridges H62-P10-N-Rock Core
2. Geotechnician: Robert Schmoker
3. Hole No.
4. Name of Driller: Bob Walsh
5. Direction of Hole: ☒ Vertical ☐ Inclined ____ deg. from vert.
6. Boring Method: Rotary
7. Depth Drilled into Rock: 10.28
8. Total Depth of Hole: 164.23
9. Size and Type of Bit: HQ - Diamond
10. Boring No.
11. Manufacturer's Designation of Drill: Longyear HC 150
12. Water Depth
13. Total Number Core Boxes
14. Depth of Bottom of Hole: 164.23 EL392.95
15. Date Hole: Started 4/13/81 Completed 4/13/81
16. Elevation Top of Hole: 557.18 TOP
17. Total Core Recovery for Boring: %
18. Casing Record: Depth 155.45 Type HW

Elevation (a)	Depth	Legend (c)	Classification of Materials (Description) (d)	% Core Recovery (e)	Box or Sample No (f)	Remarks (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	150					Run #1 MD Start 153.95 MD Stop 154.05 Start 8:45 Stop 9:15 DD .1 REC .1 CL 0.0
	151					
	152					
	153					
403.23	154		Bottom of Rock Socket	100		Run #2 MD Start 154.05 MD Stop 159.0 Start 9:33 Stop 9:59 DD 4.95 REC 4.95 CL 0.0
403.13			Dolomite, mod.hd. to hd. in occ. silicious zones of 1/2" to 1" thickness, mostly light gray to occ. gray, buff from 154.3 to 154.5, frequent fractures and joints often healed by calcite, dolomite, or iron, occ. vugs with quartz crystals			
	155					
	156			100	1	
	157		Broken			
			Vugs with quartz crystals			
	158		Vugs with quartz crystals			
398.18	159		Vugs with quartz crystals	100		Run #3 (con't on sheet 2)
	160					

220

Project | Hole No

ENG FORM 1836, PREVIOUS EDITIONS ARE OBSOLETE

DRILLING LOG | Project No. DACW [illegible]-79-C-0055 | Contractor Massman Construction Company | Sheet 2 of 2 Sheets

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: H62-P10-N-Rock Core
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	160		Dolomite as above.			Run #3
		o	← Vugs with quartz crystals			MD Start 159.0
						MD Stop 164.23
						Start 10:14
	161					Stop 10:39
						DD 5.23
						REC 5.23
						CL 0.0
	162			100	1	
	163					
	164					
392.95			Bottom of Rock Core			

221

ENG FORM 1836, PREVIOUS EDITIONS ARE OBSOLETE. | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | OF 2 SHEETS

PROJECT: Norfork Lake Bridges

2 LOCATION of Boring: H62-P10-S-Rock Core

3 Geotechnician: Robert Schmoker

4 HOLE NO.

5 NAME OF DRILLER: Bob Walsh

6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.

7 Boring Method: Rotary

8 DEPTH DRILLED INTO ROCK: 10.33

9 TOTAL DEPTH OF HOLE: 164.56

10 SIZE AND TYPE BIT: HQ - Diamond

11 Boring No.

12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150

13 Water Depth

14 TOTAL NUMBER CORE BOXES

15 Depth of Bottom of Hole: 164.56 EL393.03

16 DATE HOLE: STARTED 4/9/81 COMPLETED 4/10/81

17 ELEVATION TOP OF HOLE: 557.59

18 TOTAL CORE RECOVERY FOR BORING: %

19 Casing Record: Depth 155.45, Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	150					
	151					
	152					
	153					
	154					
403.36			Bottom of Rock Socket			
			Dolomite, mod. hd., gray, fractured.			Run #1 4/9/81 MD Start 154.23 MD Stop 157.33 Start 8:38 Stop 10:16 DD 3.1 REC 3.1 CL 0.0
	155		Dolomite, mod. hd., buff with occ. 1/16"± thick tan shale seams, fractures appear fresh and mechanical or along shale seams, some slight iron staining.	100	1	
	156					
	157		Dolomite, hd., gray to buff, silicious with flint.			
400.26			Broken			
			Flint, hd., dk. gray-brn to blk.			Run #2 MD Start 157.33 MD Stop 159.58 Start 10:35 Stop 10:56 DD 2.25 REC 2.25 CL 0.0
	158		Broken			
			Broken and vuggy with calcite crystals.	100	1	
	159		Dolomite, mod.hd., lt. gray to gray frequently fractured and jointed with some healing by calcite, dolomite, and iron, occ. minute vugs or druses.			
398.01						222
	160					Run #3 (see sheet two)

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HQ - Diamond
2. LOCATION of Boring: H62-P10-S-Rock Core	11. Boring No.
3 Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4 HOLE NO	13 Water Depth
5. NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT	15 Depth of Bottom of Hole
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 Casing Record: Depth ____ Type HW

ELEVATION a	DEPTH 160	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	161		Dolomite as above.			Run #3 MD Start 159.58 MD Stop 162.70 Start 11:10 Stop 11:45 DD 3.12 REC 3.05 CL .07
	162			98	1	
394.89						4/9/81
	163					4/10/81 Run #4 MD Start 162.7 MD Stop 164.56 Start 7:46 Stop 8:01 DD 1.86 REC 1.86 CL 0.0
	164			100	1	
393.03			Bottom of Core Hole			

223

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO

...LL LOG	...ject No. -79-C-0055	Contractor Wagner Construction Co.	SHEET 1 of 2 SHEETS
1. PROJECT Dirfork Lake Bridges		10. SIZE AND TYPE OF BIT HQ - Diamond	
2. LOCATION of Boring 62-P11-N-2-Core		11. Boring No.	
3. Geotechnician Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150	
4. HOLE NO.		13. Water Depth: DISTURBED	UNDISTURBED
5. NAME OF DRILLER Bob Walsh		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED 3/4/81	COMPLETED 3/4/81
		17. ELEVATION TOP OF HOLE 552.18 TOP	
7. Boring Method Rotary		18. TOTAL CORE RECOVERY FOR BORING 100 %	
8. DEPTH DRILLED INTO ROCK 10.08'		19. Casing Record: Depth 147.45	Type HW
9. TOTAL DEPTH OF HOLE 157.08'			

ELEVATION a	DEPTH 140	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	141					
	142					
	143					
	144					
	145					
	146					
405.18'	147		Bottom of Rock Socket			
	148		Dolomite, mod. hd., light grey, frequent fractures and joints often healed by dolomite, calcite and iron cementation, occ. druses with dolomite crystals.			Run #1 MD Start 147.0' MD Stop 150.2' Start 10:30 Stop 11:05 DD 3.2' REC 3.2' CL 0.0'
	149		- Broken	100	1	
	150					

DRILLING LOG | Project No. D&CW [illegible] | Contractor Massman Construction Co. | SHEET 2 of 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 62-P11-n-2-Core
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE

10. SIZE AND TYPE BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING
19. Casing Record: Depth _____ Type

ELEVATION a	DEPTH 150 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
401.98			Dolomite as above.			Run #1
			Druses with dolomite crystals			Run #2 MD Start 150.2 MD Stop 155.05 Start 11:26 Stop 11:50 DD 4.85 REC 4.85 CL 0.0
	151					
	152		Druse with dolomite crystals			
				100	1	
	153					
	154					
397.13	155					Run #3 MD Start 155.05' MD Stop 157.08' Start 12:01 Stop 12:19 DD 2.03 REC 2.03 CL 0.0
	156			100		
395.10'	157		Bottom of Core Hole			

DRILLING LOG | Weidlinger Construction Co. | SHEET 1 OF 2 SHEETS

1. PROJECT: Mirboro Lake Bridges
2. LOCATION of Boring: 62-P11-6-1-Core
3. Geotechnician: Robert Schmoker
4. HOLE NO:
5. NAME OF DRILLER: Bob Walsh
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.09'
9. TOTAL DEPTH OF HOLE: 156.44'
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150
13. Water Depth: DISTURBED ____ UNDISTURBED ____
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Borrom of Hole
16. DATE HOLE: STARTED 3/6/81 COMPLETED 3/6/81
17. ELEVATION TOP OF HOLE: 552.08' Platform
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. Casing Record: Depth 147.0' Type HW

ELEVATION a	DEPTH	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	140					
	141					
	142					
	143					
	144					
	145					
	146					
405.73'			Bottom of Rock Socket			
	147		Dolomite, mod. hd., light grey, frequent fractures and joints with Fe staining, occ. druses with dolomite crystals.			Run #1 Start 9:05 Stop 9:50 MD Start 146.3 MD Stop 150.3 DD 4.03' REC 3.89 CL 0.14
			-0.14 core loss -Broken			
	148			97	1	
	149					
			-Druses with dolomite crystals			
	150					

DRILLING LOG | Corps of Engineers, Wasmar Construction Co. | SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HQ - Diamond
2. LOCATION of Boring 62-P11-S-1-Core	11. Boring No.
3. Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4. HOLE NO.	13. Water Depth — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method: Rotary	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. Casing Record — Depth _____ Type _____

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	150		Dolomite as above.			con't Run #1
401.70			Druse with dolomite crystals			Run #2 Start 10:10 Stop 10:37 MD Start 150.38' MD Stop 155.27' DD 4.89' REC 4.71' CL 0.18'
	151					
	152			96	1	
	153					
	154					
	155		0.18 core loss			
396.81'			Broken			Run #3 Start 10:55 Stop 11:04 MD Start 155.27' MD Stop 156.44' DD 1.17' REC 1.17' CL 0.0'
	156			100		
395.64'			Bottom of Core Hole			

· DRILLING LOG | Project No. DACW 0?. ?-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P12-N-1-Rock
3 Geotechnician: Robert Schmoker
4 HOLE NO.:
5 NAME OF DRILLER: Bob Walsh
6 DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK: 10.3
9 TOTAL DEPTH OF HOLE: 143.15
10 SIZE AND TYPE: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole Elev. 420.29'
16 DATE HOLE: STARTED 4/29/81 COMPLETED 4/29/81
17 ELEVATION TOP OF HOLE: 563.44 TOP
18 TOTAL CORE RECOVERY FOR BORING:
19 Casing Record: Depth 134.45, Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	130					
	131					
	132					
430.59	133		Bottom of Rock Socket Broken Shale, firm, black, 1/16" thick. Dolomite, mod. hd. to hd. in silicious zone from 133.32' to 133.78', lt. gray to gray with occ. buff mottling, frequent fractures and joints mostly along bedding planes, occ. black shale seams of about 1/16" thickness, some vugs with calcite crystals.	100	1	Run #1 Start 10:00 Stop 10:45 MD Start 132.85 MD Stop 135.15 DD 2.3 REC 2.3 CL 0.0
	134					
428.29	135					
	136					Run #2 Start 10:58 Stop 11:42 MD Start 135.15 MD Stop 140.0 DD 4.85 REC 4.85 CL 0.0
	137		Shale, firm, black, 1/16" thickness Vugs with calcite crystals Shale, firm, black, 1/16" thickness			
				100	1	
			Vugs with calcite crystals. Vugs with calcite crystals.			
	138		Vug with calcite crystals. Shale, firm, black, 1/16" thickness			
	139					
423.44	140					

228

ENG. FORM 1836 ... PROJECT ... HOLE NO.

DRILLING LOG | Project No. DACW [illegible]79-C-0055 | Contractor Massman Construction Company | SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P12-N-1-Rock Core
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE BIT: HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 Casing Record: Depth _____ Type RW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
423.44	140		Dolomite as above.			Run #3 Start 11:51 Stop 12:18 MD Start 140.0 MD Stop 143.15 DD 3.15 REC 3.15 CL 0.0
	141			100	1	
	142					
			Vug with calcite crystals.			
420.29	143		Bottom of Core Hole			

229

ENG FORM 1836 [illegible] OBSOLETE | PROJECT | HOLE NO

Hole No.

DRILLING LOG	Project No. DACW 3-79-C-0055	Contractor Massman Construction Co.	SHEET 1 OF 2 SHEETS
1 PROJECT Norfork Lake Bridges		10 SIZE AND TYPE OF BIT HQ - Diamond	
2 LOCATION of Boring 62-P12-S-Rock Core		11 Boring No.	
3 Geotechnician Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150	
4. HOLE NO.		13. Water Depth 129.45 HW	DISTURBED / UNDISTURBED
5. NAME OF DRILLER Bob Walsh		14. TOTAL NUMBER CORE BOXES 1	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole 419.34	
		16. DATE HOLE	STARTED 4/27/81 / COMPLETED 4/27/81
7. Boring Method Rotary		17. ELEVATION TOP OF HOLE 557.59 TOP	
8. DEPTH DRILLED INTO ROCK 10.2		18. TOTAL CORE RECOVERY FOR BORING 100 %	
9. TOTAL DEPTH OF HOLE 138.25		19. Casing Record Depth 129.45 Type HW	

ELEVATION a	DEPTH 120	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	121					
	122					
	123					
	124					
	125					
	126					
	127					
429.54	128		Bottom of Rock Socket			
			~ Broken			Run #1 Start 12:53 Stop 1:10 MD Start 128.05 MD Stop 130.15 DD 2.1 REC 2.1 CL 0.0
	129		Dolomite, mod. hd., lt. gray to gray, occ. brown shale seams of 1/16" to 1/8" thickness, frequent fractures and joints often healed with calcite or iron, occ. vugs.	100 %		
427.59	130		Vugs with calcite crystals.			230 con't on sheet 2

Hole No.

DRILLING LOG | SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: HQ - Diamond
2 LOCATION OF BORING: 62-12-S-Rock Core	11 Boring No.
3 Section/Meridian	12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4 HOLE NO.	13 Water Depth — DISTURBED — UNDISTURBED
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 Depth of Bottom of Hole
7 Boring Method: Rotary	16 DATE HOLE — STARTED — COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 Casing Record — Depth — Type

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
427.44	130		Dolomite as above.			Run #1 con't
			Broken			Run #2 Start 1:24 Stop 1:47 MD Start 130.15 MD Stop 135.35 DD 5.2 REC 5.2 CL 0.0
	131					
	132		Shale, firm, brown, 1/16" thick.	100	1	
	133					
	134					
	135					
422.24						
	136		Vugs with calcite crystals.	100	1	Run #3 Start 1:59 Stop 2:11 MD Start 135.35 MD Stop 138.25 DD 2.9 REC 2.9 CL 0.0
	137		Shale, firm, brown, 1/8" thick			
	138					
419.34			Bottom of Hole			
	139					

231

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 09-79-C-0055	Contractor Massman Construction Company	Sheet 1 of 2 sheets
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: 62-P13-N-1		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER: Bob Walsh		14 TOTAL NUMBER CORE BOXES: 1	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED 3/14/81	COMPLETED 3/14/81
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE: 556.96 TOP	
8 DEPTH DRILLED INTO ROCK: 9.99'		18 TOTAL CORE RECOVERY FOR BORING	
9 TOTAL DEPTH OF HOLE: 52.75'		19 Casing Record: Depth 43, Type HW	

ELEVATION a	DEPTH 40	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	41					
	42					
514.20			Bottom of Rock Socket			
	43		Dolomite, mod. hd., light grey to dark grey in a few shaly zones with occ. 1/16" thick shale seams, massive with a few fractures mostly along bedding planes.	100		Run #1 Start 12:29 Stop 12:48 MD Start 42.76 MD Stop 44.78 DD 2.02 REC 2.02 CL 0.0
	44					
512.18'			0.10 Core loss			
	45		Broken			Run #2 Start 1:45 Stop 2:00 MD STart 44.78 MD Stop 50.15 DD 5.37 REC 5.27 CL .10
	46					
	47			98	1	
	48					
	49					
	50					

ENG FORM 1836 ... PROJECT ... HOLE NO

- DRILLING LOG | Project No. DACW 07-79-C-0055 | Contractor Massman Construction Company | OF SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 62-P13-N-1-Core
3 Geotechnician
4 HOLE NO
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE OF BIT: HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING %
19 Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
~~506.81~~	50					
			Dolomite as above.			Run #3 Start 2:17 Stop 2:30 MD Start 50:15 MD Stop 52.75 DD 2.60 REC 2.60 CL 0.0
	51			100	1	
	52					
504.21			Bottom of Core Hole			

233

ENG FORM 1836 ... PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG | Project No. DACW 07 79-C-0055 | Contractor Massman Construction Company | of 10f2 SHEETS

1 Norfork Lake Bridges
2 LOCATION of Boring H62-P13-S-1-Core
3 Geotechnician Robert Schmoker
4 HOLE NO
5 NAME OF DRILLER Bob Walsh
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method Rotary
8 DEPTH DRILLED INTO ROCK 10.22'
9 TOTAL DEPTH OF HOLE 52.0 '

10 SIZE AND TYPE OF BIT HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150
13 Water Depth
14 TOTAL NUMBER CORE BOXES 1
15 Depth of Bottom of Hole
16 DATE HOLE STARTED 3/16/81 COMPLETED 3/16/81
17 ELEVATION TOP OF HOLE 555.96 TOP
18 TOTAL CORE RECOVERY FOR BORING %
19 Casing Record Depth 43.0' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	40					
	41					
514.18			Bottom of Rock Socket			
	42		Dolomite, mod. hd., light grey to dark grey in a few shaly zones with occ. 1/16" to 1/4" thick shale seams, massive with a few fractures along bedding planes.			Run #1 Start 11:07 Stop 11:45 MD Start 41.78 MD Stop 45.14 DD 3.36 REC 3.36 CL 0.0
	43			100		
	44					
	45					
510.82					1	Run #2 Start 11:55 Stop 12:26 MD Start 45.14 MD Stop 50.22 DD 5.08 REC 5.08 CL 0.0
	46					
	47			100		
	48					
	49					
	50					

234

ENG FORM 1836 ... PROJECT ... HOLE NO

DRILLING LOG	Project No. DACW [illegible]-79-C-0055	Contractor Massman Construction Company	OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE BIT: HQ - Diamond	
2 LOCATION of Boring: 62-P13-S-1-Core		11 Boring No.	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED / COMPLETED	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	%
9 TOTAL DEPTH OF HOLE		19 Casing Record: Depth _____ Type HW	

ELEVATION a	DEPTH 50 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
505.74'			Dolomite as above.			Run #3
	51			100	1	Start 12:33 Stop 12:45 MD Start 50.22 MD Stop 52.0 DD 1.78 REC 1.78 CL 0.0
503.96	52		Bottom of Core Hole			

ENG FORM [illegible] PROJECT HOLE NO

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | Sheet 2

1 Norfork Lake Bridges
2 LOCATION of Boring 101-P1-West-Rock Core
3 Geotechnician Robert Schmoker
4 HOLE NO.
5 NAME OF DRILLER Bob Walsh
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method Rotary
8 DEPTH DRILLED INTO ROCK 10.23'
9 TOTAL DEPTH OF HOLE 72.48'
10 SIZE AND TYPE BIT HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE STARTED 8/7/81 COMPLETED 8/7/81
17 ELEVATION TOP OF HOLE 559.33 TOP
18 TOTAL CORE RECOVERY FOR BORING 100%
19 Casing Record Depth 63 Type HW

ELEVATION a	DEPTH 60 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
497.08'	61 / 62		Bottom of Rock Socket			
	63		Broken Vugs with calcite crystals.	100	1	Run #1 Start 9:26 Stop 9:46 MD Start 62.25' MD Stop 64.9 ' DD 2.65' REC 2.65' CL 0.0
494.43'	64		Shale, mod. hd., brown. Vug with calcite crystals Dolomite, mod. hd. to hd., gray, frequent fractures and joints with some iron staining, occ. vugs, trace of shale			
	65 / 66					Run #2 Start 10:00 Stop 10:21 MD Start 64.9' MD Stop 70.0' DD 5.1' REC 5.1' CL 0.0'
	67		Vugs with calcite crystals. Broken	100	1	
	68 / 69		Broken			
489.33	70					

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	of 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: 101-P1-West-Rock Core		11 Boring No.	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4 HOLE NO.		13 Water Depth	
5. NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16. DATE HOLE: STARTED / COMPLETED	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE	
8 DEPTH DRILLED INTO ROCK		18 TOTAL CORE RECOVERY FOR BORING	
9 TOTAL DEPTH OF HOLE		19. Casing Record: Depth ____ Type Rw	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
489.33	70		Dolomite, as above.			Run #3 Start 10:40 Stop 10:58 MD Start 70.0' MD Stop 72.48' DD 2.48' REC 2.48' CL 0.0 '
	71			100	1	
	72					
486.85'			Bottom of Rock Core			

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	Sheet 3 of 3 Sheets
1 PROJECT Norfork Lake Bridges		10 SIZE AND TYPE OF BIT HQ - Diamond	
2 LOCATION of Boring 101-P1-East-Rock Core		11 Boring No.	
3 Geotechnician Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL Longyear HC 150	
4 HOLE NO.		13 Water Depth	
5 NAME OF DRILLER Bob Walsh		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE	STARTED 8/6/81 / COMPLETED 8/6/81
		17 ELEVATION TOP OF HOLE 555.98 TOP	
7 Boring Method Rotary		18 TOTAL CORE RECOVERY FOR BORING	
8 DEPTH DRILLED INTO ROCK 18.2'		19 Casing Record Depth 60' Type HW	
9 TOTAL DEPTH OF HOLE 77.4'			

ELEVATION a	DEPTH 50 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	51					
	52					
	53					
	54					
	55					
	56					
	57					
	58					
	59					
496.78			Bottom of Rock Socket			
			Dolomite, as described below.	100	1	Run #1 See Sheet #2
			Broken			

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | 1 of 3 SHEETS

1 PROJECT: Norfork Lake Briages
2 LOCATION of Boring: 101-P1-East-Rock Core
3 Geotechnician:
4 HOLE NO.:
5 NAME OF DRILLER:
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK:
9 TOTAL DEPTH OF HOLE:

10 SIZE AND TYPE OF BIT: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole:
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE:
18 TOTAL [illegible] OF CASING:
19 Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH 60 b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Broken			Run #1 Start 9:40 Stop 10:25 MD Start 59.2' MD Stop 64.05' DD 4.85' REC 4.85' CL 0.0 '
			Shale, mod hd., tan.			
			Dolomite, as described below.			
	61		Vugs with Fe coating.			
			Chert, hd., gray.	100	1	
	62					
			Dolomite, mod. hd. to hd., gray to buff-gray, frequent fractures and joints sometimes with calcite or iron healing, occ. vugs, occ. slight to mod. reaction to HCl indicating transition to limestone, trace of shale.			
	63					
491.93'	64					
			Broken			Run #2 Start 10:43 Stop 10:53 MD Start 64.05' MD Stop 69.15' D.D. 5.1' REC 4.8' CL .3'
	65					
			0.3 C. L.			
	66					
				94	1	
			Chert, hd., gray.			
	67					
	68					
	69					
486.83'						Run #3 See sheet #3
				100	1	
	70		Vug with calcite crystals.			

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Masaman Construction Company	of 3 SHEETS
1 FR E: Norfork Lake Bridge		10 SIZE AND TYPE BIT HQ - Diamond	
2 LOCATION of Boring 101-P1-East-Rock Core		11 Boring No.	
3 Geotechnician		12 MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4 HOLE NO		13 Water Depth	
5. NAME OF DRILLER		14 TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED / COMPLETED	
		17 ELEVATION TOP OF HOLE	
7 Boring Method Rotary		18 TOTAL CORE RECOVERY F	
8 DEPTH DRILLED INTO ROCK		19 Casing Record Depth _____ Type	
9 TOTAL DEPTH OF HOLE			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	70		Vugs with calcite crystals.			Run #3 Start 12:26 Stop 12:49 MD Start 69.15' MD Stop 74.2 ' DD 5.05' REC 5.05' CL 0.0 '
			Dolomite, as above.			
	71					
			Shale, mod.hd., brown.	100	1	
			Vug with calcite crystals.			
	72					
			Broken with calcite crystals.			
	73					
	74					
481.78						Run #4 Start 1:13 Stop 1:31 MD Start 74.2' MD Stop 77.4' DD 3.2' REC 3.2' CL 0.0'
	75					
				100	1	
	76					
	77					
478.58			Bottom of Rock Core			
	78					
	79					

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: H101-P2-West-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schmoker		MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER: Mike Gilley		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG FROM VERT.		15 Depth of Bottom of Hole 401.44'	
		16 DATE HOLE: STARTED 9/17/81	COMPLETED 9/17/81
		17 ELEVATION TOP OF HOLE 564.44' TOP	
7 Boring Method: Rotary		18 TOTAL CORE RECOVERY FOR BORING 100%	
8 DEPTH DRILLED INTO ROCK: 10.16'		19 Casing Record: Depth 153' Type HW	
9 TOTAL DEPTH OF HOLE: 163.0'			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	150					
	151					
	152					
411.6'			Bottom of Rock Socket			
	153		Dolomite, Mod. hd. to hd., gray, Frequent fractures and joints, occ. iron staining on fracture planes.			Run #1 Start 11:05 Stop 11:19 MD Start 152.84' MD Stop 157.7 ' DD 4.86' REC 4.86' CL 0.0 "
	154					
	155			100	1	
	156					
	157					
406.74						
	158					Run #2 See sheet #2
	159			100	1	
	160					

241

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: H101-P2-W-Rock Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED / COMPLETED	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING: %	
9. TOTAL DEPTH OF HOLE		19. Casing Record: Depth _____ Type HW	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	160		Dolomite, as above.			Run #2 Start 11:44 Stop 11:58 MD Start 157.7' MD Stop 163.0' DD 5.3' REC 5.3' CL 0.0
	161			100	1	
	162					
401.44'	163		Bottom of Rock Core			

242

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1 PROJECT	Norfork Lake Bridges
2 LOCATION of Boring	H101-P2-E-Rock Core
3 Geotechnician	Robert Schmoker
4 HOLE NO.	
5 NAME OF DRILLER	Mike Gilley
6 DIRECTION OF HOLE	XX VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method	Rotary
8 DEPTH DRILLED INTO ROCK	10.46'
9 TOTAL DEPTH OF HOLE	161.52'
10 SIZE AND TYPE OF BIT	HQ - Diamond
11 Boring No.	
12 MANUFACTURER'S DESIGNATION OF DRILL	Longyear HC 150
13 Water Depth	
14 TOTAL NUMBER CORE BOXES	
15 Depth of Bottom of Hole	401.14'
16 DATE HOLE STARTED	9/18/81
16 DATE HOLE COMPLETED	9/18/81
17 ELEVATION TOP OF HOLE	562.66 TOP
18 TOTAL CORE RECOVERY FOR BORING	100%
19 Casing Record	Depth 152.0' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	150					
411.6'	151		Bottom of Rock Socket			
			Broken Dolomite, Mod. hd. to hd., gray to buff, frequent factures and joints, some iron stains on fracture planes	100	1	Run #1 Start 10:25 Stop 10:36 MD Start 151.06' MD Stop 154.86' DD 3.8' REC 3.8' CL 0.0'
407.8'	155			100	1	Run #2 Start 10:51 Stop 11:04 MD Start 154.86' MD Stop 159.6' DD 4.74' REC 4.74' CL 0.0
403.6'	159					243 Run #3 See sheet 2

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 of 2 SHEETS

1. PROJECT Norfork Lake Bridges	10. SIZE AND TYPE OF BIT HQ - Diamond
2. LOCATION of Boring H101-P2=E-Rock Core	11. Boring No.
3. Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL Longyear
4. HOLE NO.	13. Water Depth
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method Rotary	16. DATE HOLE STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. Casing Record Depth ____ Type HW

ELEVATION a	DEPTH 160	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite, as above.	100	1	Run #3 Start 11:17 Stop 11:23 MD Start 159.6' MD Stop 161.52' DD 1.92' REC 1.92' CL 0.0
	161					
401.14'			Bottom of Rock Core			

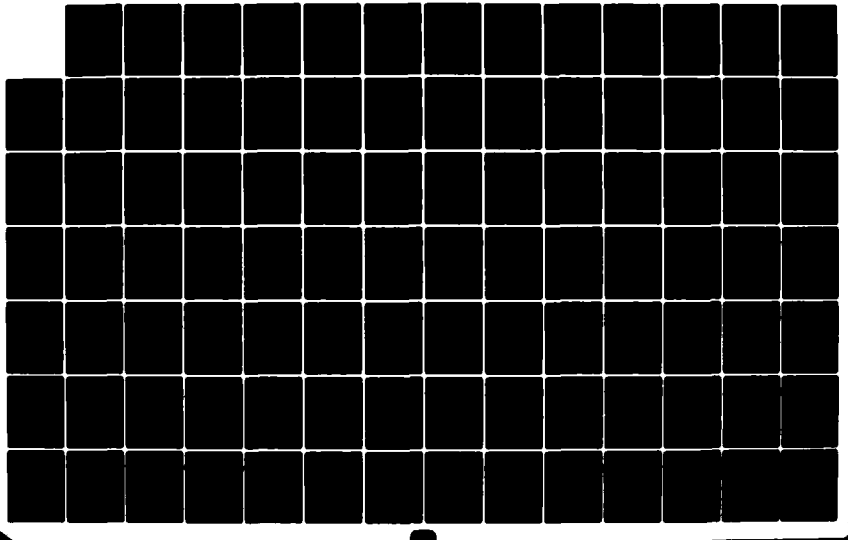
244

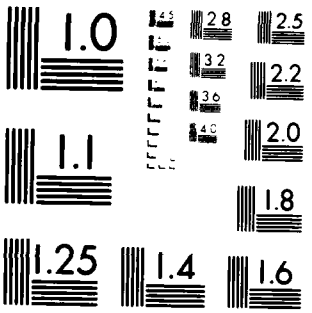
ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE PROJECT

AD-A130 553 NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT LITTLE ROCK ARK R L CRUTCHFIELD JUN 83

4/5

UNCLASSIFIED F/G 13/13 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DRILLING LOG | Project No. DACW [illegible]3-79-C-0055 | Contractor Massman Construction Company | SHEET 1 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 101-P3-West-Rock Core
3. Geotechnician: Robert Schmoker
4. HOLE NO.:
5. NAME OF DRILLER: Bob Walsh
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: [illegible]
8. DEPTH DRILLED INTO ROCK: 10.06'
9. TOTAL DEPTH OF HOLE: 185.0'
10. SIZE AND TY[illegible] OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES:
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED 7/28/81 COMPLETED 7/28/81
17. ELEVATION TOP OF HOLE: 559.5 TOP
18. TOTAL CORE RECOVERY FOR BORING: 100%
19. Casing Record: Depth 186.0' Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	170					
	171					
	172					
	173					
	174					
384.46'	175		Bottom of Rock Socket			
			Broken Dolomitic Limestone, hd., gray to pinkish-gray, frequent fractures and joints with some healing of calcite occ. chert seams, slight to mod. reaction to HCl.	100	1	Run #1 Start 4:23 Stop 4:45 MD Start 174.94' MD Stop 176.5 ' DD 1.56' REC 1.56' CL 0.0 '
	176					
382.90'			Chert, hd, gray-brown			
	177		Chert, hd, gray-brown			Run #2 MD Start 176.5' MD Stop 179.65 DD 3.15' REC 3.15' CL 0.0 Start 5:44 Stop. 6:03
	178			100	1	
	179					
379.75'						245
	180					Run #3 See sheet #2

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	of 2 sheets
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P3-West-Rock Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED / COMPLETED	
7. Boring Method		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		TOTAL CORE RECOVERY FOR BORING	%
9. TOTAL DEPTH OF HOLE		19. Casing Record: Depth ____ Type HW	

ELEVATION a	DEPTH 180	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomitic Limestone as above.			Run #3 Start 6:15 Stop 6:42 MD Start 179.65' MD Stop 184.5' DD 4.85' REC 4.85' CL 0.0 '
	181		Broken			
	182			100	1	
	183					
	184					
374.9'				100	1	Run #4 Start 7:50 Stop 7:53 MD Start 184.5' MD Stop 185.0' DD .5' REC .5' CL 0.0'
374.4'	185		Bottom of Rock Core			

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	of 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: H101-P3-East-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4 HOLE NO.		13 Water Depth: 548.3'	
5 NAME OF DRILLER: Bob Walsh		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED 7/25/81 COMPLETED 7/25/81	
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE: 561.48 TOP	
8 DEPTH DRILLED INTO ROCK: 10.14'		18 TOTAL CORE FOR BORING	
9 TOTAL DEPTH OF HOLE: 187.12'		19 Casing Record: Depth 178.0' Type HW	

ELEVATION a	DEPTH 170	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	171					
	172					
	173					
	174					Run #3 Start 3:06 Stop 3:26 MD Start 179.0' MD Stop 179.26' DD .26' REC .26' CL 0.0 '
	175					Run #1 MD Start 176.98' MD Stop 177.11' DD .13' REC .13' CL 0.0 ' Start 12:12 Stop 12:30
	176					
384.5'	177		Bottom of Rock Socket			
384.37'			Dolomite Limestone (described below)	100		Run #1
	178		Broken Shale, dark gray, mod. hd.	100	1	Run #2 Start 12:48 Stop 1:40 MD Start 177.11' MD Stop 179.0 ' DD 1.89' REC 1.89' CL 0.0
382.48	179		Dolomitic Limestone, mod hd to hd, gray to pinkish gray, frequent fractures and joints, some vugs and fractures containing calcite crystals, slight to mod-strong reaction to HCl			
382.22				100		Run #3 See above
	180			100		Run #4 See sheet #2

DRILLING LOG | Project No. DACW 01-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 101-P3-East Rock Core
3. Geotechnician
4. HOLE NO.
5. NAME OF DRILLER
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE BIT: HQ - Diamond
11. Boring No.
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth
14. TOTAL NUMBER CORE BOXES
15. Depth of Bottom of Hole
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	180		Dolomitic Limestone as above.			Run #4 Start 3:40 Stop 4:10 MD Start 179.26' MD Stop 184.3 ' DD 5.04' REC 5.04' CL 0.0 '
	181					
	182			100	1	
	183		Broken			
377.18	184					
			Broken			Run #5 Start 4:23 Stop 4:46 MD Start 184.3' MD Stop 187.12' DD 2.82' REC 2.82' CL 0.0 '
	185		Vug with calcite crystals			
			Fractures with calcite crystals	100	1	
	186					
			Broken			
374.36'	187		Bottom of Rock Core			

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: H101-P4-West-Rock Core
3. Geotechnician: Robert Schmoker
4. HOLE NO.:
5. NAME OF DRILLER: Mike Gilley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.65'
9. TOTAL DEPTH OF HOLE: 173.95'
10. SIZE AND T* OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES:
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED 9/1/81 | COMPLETED 9/1/81
17. ELEVATION TOP OF HOLE: 563.0' TOPlatform
18. TOTAL CORE RECOVERY FOR BORING: 100%
19. Casing Record: Depth 164, Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	160					
	161					
	162					
	163					
399.7'			Bottom of Rock Socket			
			Broken			Run #1 Start 11:24 Stop 11:53 MD Start 163.3' MD Stop 167.7' DD 4.4' REC 4.4' CL 0.0
	164		Dolomite, mod. hd. to hd., gray to gray-buff, frequent fractures and joints with occasional iron stains.			
	165			100	1	
	166					
	167					
395.3'						
	168					Run #2 Start 12:07 Stop 12:22 MD Start 167.7' MD Stop 172.77' DD 5.07' REC 5.07' CL 0.0
			Broken			
	169			100	1	
	170					

249

PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: H101-P4-West-Rock Core
3. Geotechnician:
4. HOLE NO.:
5. NAME OF DRILLER:
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE:
10. SIZE AND T[illegible] OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth:
14. TOTAL NUMBER CORE BOXES:
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED | COMPLETED
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	170		Dolomite, as above.			Run #2 con't (See sheet #1)
	171			100	1	
	172					
390.23'						
	173			100	1	Run #3 Start 12:30 Stop 12:35 MD Start 172.77' MD Stop 173.95' DD 1.18 REC 1.18 CL 0.0
389.05			Bottom of Rock Core			

250

PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW-03-79-C-0055	Contractor Massman Construction Company	of 2 SHEETS

1. PROJECT Norfork Lake Bridges	10. SIZE AND TYPE OF BIT HQ - Diamond
2. LOCATION of Boring HF01-P4-East-Rock Core	11. Boring No.
3. Geotechnician Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL Longyear HC-150
4. HOLE NO.	13. Water Depth
5. NAME OF DRILLER Mike Gilley	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method Rotary	16. DATE HOLE STARTED 8/31/81 COMPLETED 8/31/81
8. DEPTH DRILLED INTO ROCK 10.22'	17. ELEVATION TOP OF HOLE 560.7' TOPlatform
9. TOTAL DEPTH OF HOLE 171.33'	18. TOTAL CORE RECOVERY FOR BORING 100%
	19. Casing Record Depth 162' Type HW

ELEVATION a	DEPTH 160	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
399.6'	161		Bottom of Rock Socket			
			Broken			Run #1 Start 8:55 Stop 9:10 MD Start 161.1' MD Stop 161.97 DD .87' REC .87' CL 0.0
398.73	162		Dolomite, mod. hd. to hd., gray to buff, frequent fractures and joints often iron stained, siliceous and quite hd. from 168.81 to 170.25.	100		
398.1				100	1	Run #2 Start 9:31 Stop 9:41 MD Start 161.97' MD Stop 162.6 DD & REC .63' CL 0.0
397.55	163			100		Run #3 Start 11:00 Stop 11:15 MD Start 162.6' MD Stop 163.15 DD & REC .55' CL 0.0
			Broken			
	164					Run #4 Start 11:45 Stop 2:15 MD Start 163.15' MD Stop 168.38' DD 5.23' REC 5.23' CL 0.0 '
	165			100	1	
	166					
	167					
	168		Broken			
392.32'						
	169			100	1	Run #5 See sheet #2
	170					

PROJECT HOLE NO.

DRILLING LOG	Project No. DACW 09-79-C-0055	Contractor Massman Construction Company	of 2 SHEETS
1. PROJECT Norfork Lake Bridges		10. SIZE AND TYPE OF BIT HQ - Diamond	
2. LOCATION of Boring 101-P4-East-Rock Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED / COMPLETED	
		17. ELEVATION TOP OF HOLE	
7. Boring Method Rotary		18. TOTAL CORE RECOVERY FOR BORING	
8. DEPTH DRILLED INTO ROCK		19. Casing Record Depth _____ Type HW	
9. TOTAL DEPTH OF HOLE			

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	170		Dolomite as above.	100	1	Run #5 Start 2:30 Stop 2:40 MD Start 168.38' MD Stop 171.33' DD 2.95' REC 2.95' CL 0.0
389.38'	171		Moderately weathered. Bottom of Rock Core			

399.4
389.4
10.2

PROJECT HOLE NO

DRILLING LOG	Project No. DACW 07-79-C-0055	Contractor Massman Construction Company	1 of 3 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P5-W-Rock Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC-150	
4. HOLE NO.		13. Water Depth Level: 548.80'	
5. NAME OF DRILLER: Bob Walsh		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED 6/15/81 COMPLETED 6/15/81	
		17. ELEVATION TOP OF HOLE: 561.79' TOP	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING: 51%	
8. DEPTH DRILLED INTO ROCK: 16.51'		19. Casing Record: Depth 183' Type HW	
9. TOTAL DEPTH OF HOLE: 182.25'			

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	160					
	161					
	162					
	163					
	164					
	165					
396.05'			Bottom of Rock Socket			
	166		Broken Dolomite, Mod. hd., gray-buff, frequent joints and fractures with Fe stains.			Run #1 Start 12:15 Stop 12:45 MD Start 165.74' MD Stop 170.02' DD 4.28' REC 2.25' CL 2.03' 396.05' - 391.77'
	167					
	168		Broken	53	1	
	169		2.03 C.L.			
391.75	170					

DRILLING LOG	Project No. DACW 07-79-C-0055	Contractor Massman Construction Company	of 3 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P5-W-Rock Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED / COMPLETED	
		17. ELEVATION TOP OF HOLE	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING	%
8. DEPTH DRILLED INTO ROCK		19. Casing Record: Depth _____ Type HW	
9. TOTAL DEPTH OF HOLE			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
391.75'	170					Run #2 Start 1:10 Stop 1:40 MD Start 170.02' MD Stop 175.20' DD 5.18' REC 2.15' CL 3.03'
391.77						
	171					
	172			42	1	
	173					
			3.21' C.L. (Red clay on bottom of core at 171.99.)			
	174					
	175					
386.55'			Dolomite, mod soft but firm, weathered, silty, extremely fractured with Fe stains.			Run #3 Start 12:30 Stop 12:40 MD Start 175.20' MD Stop 179.56' DD 4.36' REC 2.36' CL 2.0
	176		Broken			
	177			54	1	
	178					
			2. ' C.L.			
	179					
382.19						
381.75	180		Broken			Run #4 (See sheet 3)

254

DRILLING LOG	Project No. DACW 09-79-C-0055	Contractor Massman Construction Company	OF 3 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P5-W-Rock Core		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE STARTED / COMPLETED	
		17. ELEVATION TOP OF HOLE	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING %	
8. DEPTH DRILLED INTO ROCK		19. Casing Record Depth ____ Type HW	
9. TOTAL DEPTH OF HOLE			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
381.75'	180		Dolomite, as above.			Run #4 Start 3:05 Stop 3:10 MD Start 179.56' MD Stop 182.25'
			Broken			
	181			63	1	DD 2.69' REC 1.69' CL 1.0 '
	182		1.0' C.L. (Red clay on weight rod of measuring tape at BOH.)			
379.54						

DRILLING LOG | Project No. DACW 03-79-C-0055 | Mason Construction Company | of 3 sheets

1 Project: Norfork Lake Bridge
2 Location of Boring: 101-P&-W-2-Rock Core 5
3 Geotechnician: Robert Schmoker
4 Hole No:
5 Name of Driller: Bob Walsh
6 Direction of Hole: ☒ Vertical ☐ Inclined ____ deg. from vert.
7 Boring Method: Rotary
8 Depth Drilled into Rock: 16.6 '
9 Total Depth of Hole: 182.65'
10 Size and Type: Bit HQ - Diamond
11 Boring No.:
12 Manufacturer's Designation of Drill: Longyear HC 150
13 Water Depth:
14 Total Number Core Boxes: 1
15 Depth of Bottom of Hole:
16 Date Hole: Started 6/17/81 Completed 6/18/81
17 Elevation Top of Hole: 561.79 TOP
18 Total Core Recovery for Boring:
19 Casing Record: Depth 167, Type HW

Elevation	Depth	Legend	Classification of Materials (Description)	% Core Recovery	Box or Sample No.	Remarks (Drilling time, water loss, depth of weathering, etc., if significant)
	160					
	161					
	162					
	163					
	164					
	165					
395.7'	166		Bottom of Rock Socket			
			Broken			Run #1 Start 4:30 Stop 5:00 MD Start 166.05' MD Stop 168.30' DD 2.25' REC 2.25' CL 0.0 '
	167		Broken	100	1	
	168		Broken			
393.49'			Dolomite, mod. hd., gray-buff, frequent fractures and joints with Fe stains silty in places.			Run #2 Start 7:44 Stop 7:54 MD Start 168.3' MD Stop 169.65' DD 1.35' REC 1.35' CL 0.0 '
	169			100	1	
392.14						Run #3 see sheet 2
	170		Broken			

Project | Hole No.

256

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 3 SHEETS

1 PROJECT: Norfork Lake Bridge

2 LOCATION of Boring: 101-P5-W-2-Rock Core

3 Geotechnician

4 HOLE NO

5 NAME OF DRILLER

6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.

7 Boring Method: Rotary

8 DEPTH DRILLED INTO ROCK

9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE BIT: HQ - Diamond

11 Boring No.

12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear

13 Water Depth

14 TOTAL NUMBER CORE BOXES

15 Depth of Bottom of Hole

16 DATE HOLE: STARTED | COMPLETED

17 ELEVATION TOP OF HOLE

18 TOTAL CORE RECOVERY FOR BORING

19 Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	170		Dolomite, as above. Broken			Run #3 Start 8:14 Stop 8:20 MD Start 169.65' MD Stop 174.42' DD 4.77' REC .77' CL 4.0 ' (silt bed - 391.37' -387.37 ')
	171					
	172		4.0' C. L.			
	173			16	1	
	174					
387.27'			Broken			Run #4 Start 8:41 Stop 8:57 MD Start 174.42' MD Stop 179.69' DD 5.27' REC 5.27' CL 0.0
	175					
	176					
	177			100	1	
	178					
	179					
382.10'			Broken			Run #5 see sheet 3
	180					

257

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Maseman Construction Company | of 3 sheets

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 101-P5-W-2-~~Rock Core~~
3 Geotechnician
4 HOLE NO.
5 NAME OF DRILLER
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK
9 TOTAL DEPTH OF HOLE

10 SIZE AND TYPE BIT: HQ - Diamond
11 Boring No.
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth
14 TOTAL NUMBER CORE BOXES
15 Depth of Bottom of Hole
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE
18 TOTAL CORE RECOVERY FOR BORING
19 Casing Record: Depth _____ Type HW

ELEVATION a	DEPTH 180	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite, as above.			Run #5
			Broken			Start 9:13
						Stop 9:27
						MD Start 179.69'
	181			22	1	MD Stop 182.65'
						DD 2.96'
						REC .66'
						CL 2.3 '
			2.30 C.L.			(381.44' - 379.14'
			(Red drill water in this zone.)			2.3' clay filled
	182					cavern)
						(Drill water turned red
379.14'			Bottom of Hole			in last 2.3' of hole.)

PROJECT | HOLE NO.

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 sheets

1. Project: Norfork Lake Bridges
2. Location of Boring: Core 101-P5-E-Rock Hole →
3. Geotechnician: Robert Schmoker
4. Hole No.:
5. Name of Driller: Bob Walsh
6. Direction of Hole: ☒ Vertical ☐ Inclined _____ deg. from vert.
7. Boring Method: Rotary
8. Depth Drilled into Rock: 10.13'
9. Total Depth of Hole: 175.14'
10. Size and Typ: Bit NQ - Diamond
11. Boring No.:
12. Manufacturer's Designation of Drill: Longyear HC-150
13. Water Depth:
14. Total Number Core Boxes:
15. Depth of Bottom of Hole:
16. Date Hole: Started 6/19/81 Completed 6/19/81
17. Elevation Top of Hole: 560.76 TOP
18. Total Core Recovery for Boring: %
19. Casing Record: Depth 167.0' Type HW

Elevation (a)	Depth (b)	Legend (c)	Classification of Materials (Description) (d)	% Core Recovery (e)	Box or Sample No (f)	Remarks (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	160					
	161					
	162					
	163					
	164					
395.76	165		Rock Bottom of Socket			
	166		Broken Dolomite, Mod. Hd., buff to gray-buff, frequent fractures and joints with Fe staining.	100	1	Run #1 Start 3:00 Stop 3:37 MD Start 165.01 MD Stop 169.1 DD 4.09 REC 4.09 CL 0.0
	167					
	168					
391.66'	169		Broken			
	170					Run #2 See sheet #2

259

DRILLING LOG | Project No. DACW 03-79-C-0055 | Contractor Massman Construction Company | of 2 SHEETS

1 PROJECT: Norfork Lake Bridge
2 LOCATION of Boring: 101-P5-E-Rock Core
3 Geotechnician:
4 HOLE NO:
5 NAME OF DRILLER:
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK:
9 TOTAL DEPTH OF HOLE:
10 SIZE AND TYPE BIT: HQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth:
14 TOTAL NUMBER CORE BOXES:
15 Depth of Bottom of Hole:
16 DATE HOLE: STARTED | COMPLETED
17 ELEVATION TOP OF HOLE:
18 TOTAL CORE RECOVERY FOR BORING: %
19 Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	170		Dolomite, as above.			Run #2 Start 3:56 Stop 4:27 MD Start 169.1 MD Stop 173.93 DD 4.83' REC 4.83' CL 0.0
			Broken			
	171					
			Broken			
	172			100	1	
	173					
386.83	174		Chert, gray-green			Run #3 Start 4:35 Stop 4:50 MD Start 173.93' MD Stop 175.14' DD 1.21 REC 1.0 CL .21
			Vug, lined with hematite-limonite	83	1	
	175		0.21' C.L.			
385.62'			Bottom of Rock Core			

DRILLING LOG	Project No. NACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: H101-P6-West-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER: Mike Gilley		14 TOTAL NUMBER CORE BOXES: 1	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole: 408.6'	
7 Boring Method: Rotary		16 DATE HOLE: STARTED 10/13/81 COMPLETED 10/13/81	
8 DEPTH DRILLED INTO ROCK: 10.41'		17 ELEVATION TOP OF HOLE: 561.8 TOPlatform	
9 TOTAL DEPTH OF HOLE: 153.2'		18 TOTAL CORE RECOVERY FOR BORING: 100%	
		19 Casing Record: Depth 143.4' Type HW	

ELEVATION a	DEPTH	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	140					
	141					
	142					
419.01'			Bottom of Rock Socket			
	143		Dolomite, mod. hd., gray, mod. fracturing and jointing, slightly shaly in places.	100	1	Run #1 Start 11:15 Stop 11:25 MD Start 142.79' MD Stop 144.68' DD 1.89' REC 1.89' CL 0.0 '
	144					
417.12						
	145					Run #2 Start 11:36 Stop 11:49 MD Start 144.68' MD Stop 149.66' DD 4.98' REC 4.98' CL 0.0 '
	146					
	147			100	1	
	148					
	149		Dolomite, mod. hd., buff with slight amount of brown shale, mod. fracturing and jointing. Flint, dark gray-brown			
412.14'			Dolomite, hd., lt. gray, mod. fracturing and jointing with some iron staining, siliceous.			261 Run #3 See sheet 2
	150					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HQ - Diamond
2. LOCATION of Boring: HI01-P6-West-Rock Core	11. Boring No.
3. Geotechnician	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4. HOLE NO.	13. Water Depth
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT.	15. Depth of Bottom of Hole
7. Boring Method: Rotary	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. Casing Record: Depth _____ Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	150		Dolomite, as above.			Run #3 Start 12:02 Stop 12:13 MD Start 149.66' MD Stop 153.20' DD 3.54' REC 3.54' CL 0.0
	151			100	1	
	152		Flint, dark gray-brown.			
			Flint, dark gray-brown.			
408.6'	153		Bottom of Rock Core			

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 of 2 SHEETS

1. PROJECT	Norfork Lake Bridges
2. LOCATION of Boring	H101-P6-East-Rock Core #1
3. Geotechnician	Robert Schmoker
4. HOLE NO.	
5. NAME OF DRILLER	Mike Gilley
6. DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method	Rotary
8. DEPTH DRILLED INTO ROCK	11.2'
9. TOTAL DEPTH OF HOLE	154.1'
10. SIZE AND TYPE OF BIT	HQ - Diamond
11. Boring No.	
12. MANUFACTURER'S DESIGNATION OF DRILL	Longyear
13. Water Depth	
14. TOTAL NUMBER CORE BOXES	1
15. Depth of Bottom of Hole	407.8'
16. DATE HOLE	STARTED 10/10/81 COMPLETED 10/10/81
17. ELEVATION TOP OF HOLE	561.9' TOPlatform
18. TOTAL CORE RECOVERY FOR BORING	%
19. Casing Record	Depth 143.4' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	140					
	141					
	142					
419.0'			Bottom of Rock Socket			
	143		1.43' C.L.			Run #1 Start 12:14 Stop 12:26 MD Start 142.9' MD Stop 148.93' DD 6.03' REC 4.6 ' CL 1.43'
	144					
	145		Dolomite, firm to mod. hd., gray-buff, frequent fractures and joints with iron staining.	76	1	
	146					
	147					
	148					
412.9'	149					Run #2 See sheet #2
	150					

263

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT

HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: H101-P6-East-Rock Core #1		11. Boring No.	
3. Geotechnician		12. MANUFACTURER'S DESIGNATION OF DRILL: Lungyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole	
		16. DATE HOLE: STARTED / COMPLETED	
		17. ELEVATION TOP OF HOLE	
7. Boring Method: Rotary		18. TOTAL CORE RECOVERY FOR BORING: %	
8. DEPTH DRILLED INTO ROCK		19. Casing Record: Depth ____ Type HW	
9. TOTAL DEPTH OF HOLE			

ELEVATION a	DEPTH 150	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Dolomite, as above.			Run #2
			Vug without crystals.			Start 12:50
						Stop 1:06
						MD Start 148.93'
	151					MD Stop 154.10'
						DD 5.17'
						REC 5.17'
			Dolomite, mod. hd. to hd., light gray, frequent fractures and joints with some iron staining.	100	1	CL 0.0
	152	▽	Vug with calcite crystals.			
	153					
407.8'	154		Bottom of Rock Core			

264

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 of 2 SHEETS

1. PROJECT: Norfork Lake Bridges	10. SIZE AND TYPE OF BIT: HQ - Diamond
2. LOCATION of Boring: H101-P6-East-Rock Core #2	11. Boring No.
3. Geotechnician: Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4. HOLE NO	13. Water Depth
5. NAME OF DRILLER: Mike Gilley	14. TOTAL NUMBER CORE BOXES: 1
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. Depth of Bottom of Hole: 408.75'
7. Boring Method: Rotary	16. DATE HOLE: STARTED 10/12/81 COMPLETED 10/12/81
8. DEPTH DRILLED INTO ROCK: 10.2'	17. ELEVATION TOP OF HOLE: 561.9' TOPlatform
9. TOTAL DEPTH OF HOLE: 153.15'	18. TOTAL CORE RECOVERY FOR BORING: 100%
	19. Casing Record: Depth 143.45' Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	140					
	141					
	142					
418.95'	143		Bottom of Rock Socket			
	143		Dolomite, firm to mod. hd., buff, slightly weathered, frequent fractures and joints, traces of iron	100	1	Run #1 Start 11:37 Stop 11:42 MD Start 142.95' MD Stop 145.1' DD 2.15' REC 2.15' CL 0.0 '
	144		Broken			
416.8'	145					Run #2 Start 11:50 Stop 12:13 MD Start 145.1' MD Stop 150.0' DD 4.9' REC 4.9' CL 0.0'
	146		Dolomite, mod. hd., gray, shaly, frequent fractures and joints.			
	147			100	1	
	148					
	149		Dolomite, mod.hd. to hd., light gray, frequent fractures and joints with some calcite healing and iron staining.			
411.9	150		Fracture at 150'.			

265

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: H101-P6-East-Rock Core #2
3. Geotechnician:
4. HOLE NO.:
5. NAME OF DRILLER:
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE:
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth:
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Bottom of Hole: 408.75'
16. DATE HOLE: STARTED 10/12/81 COMPLETED 10/12/81
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. Casing Record: Depth _____ Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
411.9'	150		Dolomite, as above.			Run #3 Start 12:25 Stop 12:37 MD Start 150.0' MD Stop 153.15' DD 3.15' REC 3.15' CL 0.0 '
	151		Broken	100	1	
	152					
408.75	153		Bottom of Rock Core			

266

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P7-West-Rock Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER: Mike Gilley		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole: 419.92' El.	
		16. DATE HOLE: STARTED 11/17/81 COMPLETED 11/18/81	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE: 564.96' T.O. Platform	
8. DEPTH DRILLED INTO ROCK: 10.2'		18. TOTAL CORE RECOVERY FOR BORING: 100 %	
9. TOTAL DEPTH OF HOLE: 145.04'		19. Casing Record: Depth 135, Type HW	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	130					
	131					
	132					
	133					
	134					Run#1 11/17/81 Start 2:45 Stop 2:56
430.12			Bottom of Rock Socket			
	135		Dolomite, mod. hd., light gray to gray, mod. fractured and jointed, somewhat shaly, traces of pyrite.			M.D. Start 134.84' M.D. Stop 139.98' D.D. 5.14' Rec. 5.14' Cl. 0.0'
	136					
	137			100	1	
	138					
	139					
424.98'	140					

267.

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT Norfork Lake Bridges	10. SIZE AND TYPE OF BIT HQ - Diamond
2. LOCATION of Boring 101-P7-West-Rock Core	11. Boring No.
3. Geotechnician Robert Schmoker	12. MANUFACTURER'S DESIGNATION OF DRILL Longyear
4. HOLE NO.	13. Water Depth
5. NAME OF DRILLER Mike Gilley	14. TOTAL NUMBER CORE BOXES 1
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. Depth of Bottom of Hole 419.92' El.
7. Boring Method Rotary	16. DATE HOLE STARTED 11/17/81 COMPLETED 11/18/81
8. DEPTH DRILLED INTO ROCK 10.2'	17. ELEVATION TOP OF HOLE 564.96' T.O. Platform
9. TOTAL DEPTH OF HOLE 145.04'	18. TOTAL CORE RECOVERY FOR BORING 100 %
	19. Casing Record Depth 135' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	140		Dolomite, as above.	100	1	Con't. 11/18/81 Run #2 Start 7:26 Stop 7:34 M.D. Start 139.98' M.D. Stop 142.0' D.D. 2.02' Rec. 2.02' C.L. 0.0'
	141					
422.96	142					
	143			100	1	Run #3 Start 7:45 Stop 7:59 M.D. Start 142.0' M.D. Stop 145.04' D.D. 3.04' Rec. 3.04' C.L. 0.0'
	144					
419.92'	145		Bottom of Rock Core			

268

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 01-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: HQ - Diamond
2 LOCATION of Boring: 101 p7-East-Rock Core	11 Boring No.
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4 HOLE NO	13 Water Depth
5 NAME OF DRILLER: Mike Gilley	14 TOTAL NUMBER CORE BOXES: 1
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG FROM VERT.	15 Depth of Bottom of Hole: El. 419.56'
	16 DATE HOLE: STARTED 11/17/81 COMPLETED 11/17/81
7 Boring Method: Rotary	17 ELEVATION TOP OF HOLE: 559.56' T.O. Platform
8 DEPTH DRILLED INTO ROCK: 10.44'	18 TOTAL CORE RECOVERY FOR BORING: 100 %
9 TOTAL DEPTH OF HOLE: 140.0'	19 Casing Record: Depth 130' Type HW

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	120					
	121					
	122					
	123					
	124					
	125					
	126					
	127					
	128					
	129					
430.0'			Bottom of Rock Socket			269
	130		Dolomite, as described below.			Run #1 See Sheet #2

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P7-East-Rock Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER: Mike Gilley		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. Depth of Bottom of Hole: El. 419.56'	
		16. DATE HOLE: STARTED 11/17/81 COMPLETED 11/17/81	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE: 559.56' T.O. Platform	
8. DEPTH DRILLED INTO ROCK: 10.44'		18. TOTAL CORE RECOVERY FOR BORING: 100 %	
9. TOTAL DEPTH OF HOLE: 140.0'		19. Casing Record: Depth 130' Type HW	

ELEVATION	DEPTH 130	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	131		Dolomite, mod. hd., light gray to gray, occasional fractures and joints, shaly, smooth texture, traces of pyrite.	100	1	Run #1 Start 7:45 Stop 7:58 M.D. Start 129.56' M.D. Stop 134.35' D.D. 4.79' Rec. 4.79' C.L. 0.0'
	132					
	133					
	134					
425.21'						
	135					Run #2 Start 8:11 Stop 8:22 M.D. Start 134.35' M.D. Stop 139.43' D.D. 5.08' Rec. 5.08' C.L. 0.0'
	136					
	137			100	1	
	138					
	139					Run #3 Start 8:38 Stop 8:40 M.D. Start 139.43' M.D. Stop 140.0' D.D. .57' Rec. .57' C.L. 0.0'
420.13'						
419.56'	140		Bottom of Rock Core	100	1	

270

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 of 2 SHEETS

1 PROJECT	Norfork Lake Bridges	10 SIZE AND TYPE OF BIT	HQ - Diamond
2 LOCATION of Boring	101-P8-West-Rock Core	11 Boring No.	
3 Geotechnician	Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL	Longyear
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER	Mike Gilley	14 TOTAL NUMBER CORE BOXES	1
6 DIRECTION OF HOLE	☒ VERTICAL ☐ INCLINED ____ DEG FROM VERT	15 Depth of Bottom of Hole	424.01'
		16 DATE HOLE STARTED	11/4/81
		COMPLETED	11/4/81
7 Boring Method	Rotary	17 ELEVATION TOP OF HOLE	562.14' T.O. Platform
8 DEPTH DRILLED INTO ROCK	10.03'	18 TOTAL CORE RECOVERY FOR BORING	100 %
9 TOTAL DEPTH OF HOLE	138.13'	19 Casing Record	Depth 128.43' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	120					
	121					
	122					
	123					
	124					
	125					
	126					
	127					
434.04	128		Bottom of Rock Socket			Run#1 Start 8:14 Stop 8:18 M.D. Start 128 M.D. Stop 128.4 D.D. .3' Rec. .3' C.L. 0.0'
433.74			Dolomite, mod. hd., light gray to gray, mod. fracturing and jointing, shaly, smooth texture.	100		Run #2 Start 9:48 Stop 10:07 M.D.Start 128.4' M.D.Stop 133.31' D.D. 4.91' Rec. 4.91' C.L. 0.0'
	129		Broken	100	1	
	130					

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges
2 LOCATION of Boring: 101-P8-West-Rock Core
3 Geotechnician: Robert Schmoker
4 HOLE NO:
5 NAME OF DRILLER: Mike Gilley
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7 Boring Method: Rotary
8 DEPTH DRILLED INTO ROCK: 10.03'
9 TOTAL DEPTH OF HOLE: 138.13'
10 SIZE AND TYPE OF BIT: BQ - Diamond
11 Boring No.:
12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13 Water Depth:
14 TOTAL NUMBER CORE BOXES: 1
15 Depth of Bottom of Hole 424.01'
16 DATE HOLE: STARTED 11/4/81 COMPLETED 11/4/81
17 ELEVATION TOP OF HOLE 562.14' T.O. Platform
18 TOTAL CORE RECOVERY FOR BORING: 100 %
19 Casing Record: Depth 128.43' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	130		Dolomite, as above.			Con't. Run #2 (see sheet #1)
	131			100	1	
	132					
	133					
428.83'						Run #3 Start 10:22 Stop 10:35 M.D. Start 133.31' M.D. Stop 138.13' D.D. 4.82' Rec. 4.82' C.L. 0.0'
	134					
	135			100	1	
	136					
	137					
	138					
424.01'			Bottom of Rock Core			

272

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: BQ - Diamond	
2 LOCATION of Boring: 101-P8-East-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schomoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear	
4 HOLE NO.		13 Water Depth	
5 NAME OF DRILLER: Mike Gilley		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole	
		16 DATE HOLE: STARTED 11/2/81 COMPLETED 11/2/81	
		17 ELEVATION TOP OF HOLE 561.53' T.O. Platform	
7 Boring Method: Rotary		18 TOTAL CORE RECOVERY FOR BORING 100 %	
8 DEPTH DRILLED INTO ROCK: 10.25'		19 Casing Record: Depth 127.45' Type HW	
9 TOTAL DEPTH OF HOLE: 137.5'			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	120					
	121					
	122					
	123					
	124					
	125					
	126					
	127					
434.28			Bottom of Rock Socket			
	128		Dolomite, mod. hd., light gray to gray, frequent fractures and joints, shaly, smooth texture.	100	1	Run#1 Start 12:38 Stop 12:45 M.D. Start 127.25' M.D. Stop 130.1' D.D. 2.85' Rec. 2.85' C.L. 0.0'
	129					
	130					

273

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massmen Construction Company	SHEET 2 of 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 101-P8-East-Rock Core
3. Geotechnician: Robert Schmoker
4. HOLE NO:
5. NAME OF DRILLER: Mike Gilley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.25'
9. TOTAL DEPTH OF HOLE: 137.5
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear
13. Water Depth:
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Bottom of Hole:
16. DATE HOLE: STARTED 11/2/81 COMPLETED 11/2/81
17. ELEVATION TOP OF HOLE: 361.53' T.O. Platform
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. Casing Record: Depth 127.45' Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	130					Run#1-See Sheet 1
431.43			Dolomite, as above.			Run #2 Start 12:58 Stop 1:08 M.D. Start 130.1' M.D. Stop 135.15' D.D. 5.05' Rec. 5.05' C.L. 0.0'
	131					
	132			100	1	
	133					
	134					
			Broken			
	135					
426.38						Run #3 Start 1:22 Stop 1:28 M.D. Start 135.15' M.D. Stop 137.5' D.D. 2.35' Rec. 2.35' C.L. 0.0'
	136			100	1	
	137					
424.03'			Bottom of Rock Core			

274

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: HQ - Diamond
2 LOCATION of Boring: 101-P9-West-Rock Core	11 Boring No.
3 Geotechnician: Robert Schmoker	12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear -Hc-150
4 HOLE NO	13 Water Depth
5 NAME OF DRILLER: Mike Gilley	14 TOTAL NUMBER CORE BOXES: 1
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 Depth of Bottom of Hole El: 425.15'
7 Boring Method: Rotary	16 DATE HOLE: STARTED 12-14-81 COMPLETED 12-14-81
8 DEPTH DRILLED INTO ROCK: 10.0'	17 ELEVATION TOP OF HOLE: 560.4' T.O. Platform
9 TOTAL DEPTH OF HOLE: 135.25'	18 TOTAL CORE RECOVERY FOR BORING: 100 %
	19. Casing Record: Depth 126' Type HW

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
	120					
	121					
	122					
	123					
	124					
	125					
435.15'			Bottom of Rock Socket			
	126		Dolomite, mod. hd., buff to light gray, mod. frac. and joints, traces of shale, occ. chert or flint.			Run #1 Start 12:00 Stop 12:11 M.D. Start 125.25' M.D. Stop 130.11' D.D. 4.86' Rec. 4.86' C.L. 0.0'
	127			100	1	
	128					
	129					
430.40'	130					

275

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Maggman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: 101-P9-West-Rock Core
3. Geotechnician: Robert Schmoker
4. HOLE NO.:
5. NAME OF DRILLER: Mike Gilley
6. DIRECTION OF HOLE: XX VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.0'
9. TOTAL DEPTH OF HOLE: 135.25'
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear -HC-150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Bottom of Hole: El: 425.15'
16. DATE HOLE: STARTED 12-14-81; COMPLETED 12-14-81
17. ELEVATION TOP OF HOLE: 560.4' T.O. Platform
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. Casing Record: Depth 126'; Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
430.40'	130					Run #1 See Sheet #1
430.29'			Dolomite, as above.			Run #2
						Start 12:26
						Stop 12:40
						M.D. Start 130.11'
	131					M.D. Stop 135.25'
						D.D. 5.14'
						Rec. 5.14'
	132					C.L. 0.0'
				100	1	
	133		Chert, hd., light gray.			
	134					
			Flint, hd, dark gray-brown Vugs with quartz crystals			
	135					
425.15'			Bottom of Rock Core			

276

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1. PROJECT: Norfork Lake Bridges		10. SIZE AND TYPE OF BIT: HQ - Diamond	
2. LOCATION of Boring: 101-P9-East-Rock Core		11. Boring No.	
3. Geotechnician: Robert Schmoker		12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear-HC-150	
4. HOLE NO.		13. Water Depth	
5. NAME OF DRILLER: Mike Gilley		14. TOTAL NUMBER CORE BOXES: 1	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. Depth of Bottom of Hole: El: 424.66'	
		16. DATE HOLE: STARTED 12-11-81 COMPLETED 12-11-81	
7. Boring Method: Rotary		17. ELEVATION TOP OF HOLE: 560.76' T.O. Platform	
8. DEPTH DRILLED INTO ROCK: 10.7'		18. TOTAL CORE RECOVERY FOR BORING: 100 %	
9. TOTAL DEPTH OF HOLE: 136.1'		19. Casing Record: Depth 126 Type HW	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	120					
	121					
	122					
	123					
	124					
	125					
435.36			Bottom of Rock Socket			
	126		Dolomite, mod. hd., buff to light gray, mod. to frequent fractures and joints as depth increases, occ. trace of shale and chert.			Run #1 Start 10:41 Stop 10:59 M.D. Start 125.4' M.D. Stop 130.2' D.D. 4.8' Rec. 4.8' C.L. 0.0'
	127			100	1	
	128					
	129					
430.76	130					

277

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1. PROJECT: Norfork Lake Bridges
2. LOCATION of Boring: H101-P9-East-Rock Core
3. Geotechnician: Robert Schmoker
4. HOLE NO.:
5. NAME OF DRILLER: Mike Gilley
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. Boring Method: Rotary
8. DEPTH DRILLED INTO ROCK: 10.7'
9. TOTAL DEPTH OF HOLE: 136.1'
10. SIZE AND TYPE OF BIT: HQ - Diamond
11. Boring No.:
12. MANUFACTURER'S DESIGNATION OF DRILL: Longyear-Hc-150
13. Water Depth:
14. TOTAL NUMBER CORE BOXES: 1
15. Depth of Bottom of Hole: EL. 424.66'
16. DATE HOLE: STARTED 12-11-81; COMPLETED 12-11-81
17. ELEVATION TOP OF HOLE: 560.76' T.O. Platform
18. TOTAL CORE RECOVERY FOR BORING: 100 %
19. Casing Record: Depth 126.0', Type HW

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
430.76'	130					Con't.
430.56'			Dolomite, as above.			Run #1-See sheet #1
				100	1	Run #2 Start 11:10 Stop 11:15 M.D. Start 130.2' M.D. Stop 131.45' D.D. 1.25' Rec. 1.25' C.L. 0.0'
	131					
429.31'						Run #3 Start 11:28 Stop 11:44 M.D. Start 131.45' M.D. Stop 133.9' D.D. 2.45' Rec. 2.45' C.L. 0.0'
	132			100	1	
	133		Broken with some chert.			
426.86'			Chert, hd., gray			
	134					Run #4 Start 11:55 Stop 12:07 M.D. Start 133.9' M.D. Stop 136.1' D.D. 2.2' Rec. 2.2' C.L. 0.0'
	135		Broken Chert, hd., gray	100	1	
424.66'	136		Bottom of Rock Core			

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: BQ - Diamond	
2 LOCATION of Boring: A101-110-West-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC 150	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER: Mike Gilley		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole 452.15'	
		16 DATE HOLE: STARTED 10/5/81	COMPLETED 10/6/81
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE: 557.0' TOPlatform	
8 DEPTH DRILLED INTO ROCK: 10.00'		18 TOTAL CORE RECOVERY FOR BORING: %	
9 TOTAL DEPTH OF HOLE: 104.85'		19 Casing Record: Depth 95' Type HW	

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOVERY	BOX OR SAMPLE NO	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
	90					
	91					
	92					
	93					
	94					
462.15'			Bottom of Rock Socket			
	95		Broken			Run #1 Start 4:47 Stop 4:55 MD Start 94.85' MD Stop 99.68' DD 4.83' REC 4.83' CL 0.0
	96		Dolomite, Mod. hd. to hd., gray to gray-buff, frequent fractures and joints with some calcite healing, traces of shale, occ. vugs with calcite crystals.			
	97			100	1	
	98					
	99		Vug with calcite crystals			
457.32'						
	100		Vugs with calcite crystals			Run #2 See sheet 2

279

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 OF 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: HQ - Diamond
2 LOCATION of Boring: H101-P10-West-Rock Core	11 Boring No.
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL: Lungyear
4 HOLE NO	13 Water Depth
5 NAME OF DRILLER	14 TOTAL NUMBER CORE BOXES
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15 Depth of Bottom of Hole
7 Boring Method: Rotary	16 DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17 ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18 TOTAL CORE RECOVERY FOR BORING %
	19 Casing Record: Depth ____ Type HW

ELEVATION a	DEPTH 100	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	101		Dolomite as above.			Run #2 Start 7:05 Stop 7:30 MD Start 99.68' MD Stop 104.85' DD 5.17' REC 5.17' CL 0.0
	102			100	1	
	103					
	104					
452.15'			Broken Bottom of Rock Core			

280

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 1 OF 2 SHEETS
1 PROJECT: Norfork Lake Bridges		10 SIZE AND TYPE OF BIT: HQ - Diamond	
2 LOCATION of Boring: H101-P10-East-Rock Core		11 Boring No.	
3 Geotechnician: Robert Schmoker		12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear HC - 150	
4 HOLE NO		13 Water Depth	
5 NAME OF DRILLER: Mike Gilley		14 TOTAL NUMBER CORE BOXES	
6 DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15 Depth of Bottom of Hole 452.69'	
		16 DATE HOLE: STARTED 10/6/81	COMPLETED 10/6/81
7 Boring Method: Rotary		17 ELEVATION TOP OF HOLE 557.6' TOPlatform	
8 DEPTH DRILLED INTO ROCK: 10.06'		18 TOTAL CORE RECOVERY FOR BORING	%
9 TOTAL DEPTH OF HOLE: 104.91'		19 Casing Record: Depth 95, Type HW	

ELEVATION a	DEPTH 90	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	91					
	92					
	93					
	94					
462.75'			Bottom of Rock Socket			
	95		Dolomite, mod.hd. to hd., gray, frequenc fractures and joints with some calcite healing, occ. shaly, some druses and vugs.			Run #1 Start 12:55 Stop 1:12 MD Start 94.85' MD Stop 99.85' DD 5.0 REC 5.0 CL 0.0
	96					
	97			100	1	
	98					
	99					
457.75'	100		Druses with dolomite crystals. Vug with calcite crystals.			Run #2 See sheet 2

281

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

DRILLING LOG	Project No. DACW 03-79-C-0055	Contractor Massman Construction Company	SHEET 2 of 2 SHEETS

1 PROJECT: Norfork Lake Bridges	10 SIZE AND TYPE OF BIT: HQ - Diamond
2 LOCATION of Boring: H101-P10-East-Rock Core	11 Boring No.
3 Geotechnician	12 MANUFACTURER'S DESIGNATION OF DRILL: Longyear
4 HOLE NO.	13. Water Depth
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG FROM VERT.	15. Depth of Bottom of Hole
7 Boring Method: Rotary	16. DATE HOLE: STARTED / COMPLETED
8 DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9 TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19 Casing Record: Depth _____ Type HW

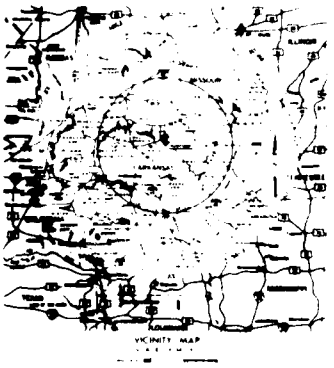
ELEVATION a	DEPTH 100	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			Vug with calcite crystals.			Run #2 Start 1:22 Stop 1:38 MD Start 99.85 MD Stop 104.91 DD 5.06' REC 5.06' CL 0.0
			Vugs with calcite crystals.			
			Dolomite as above.			
	101					
	102			100	1	
	103					
	104					
452.69'			Bottom of Rock Core			

282

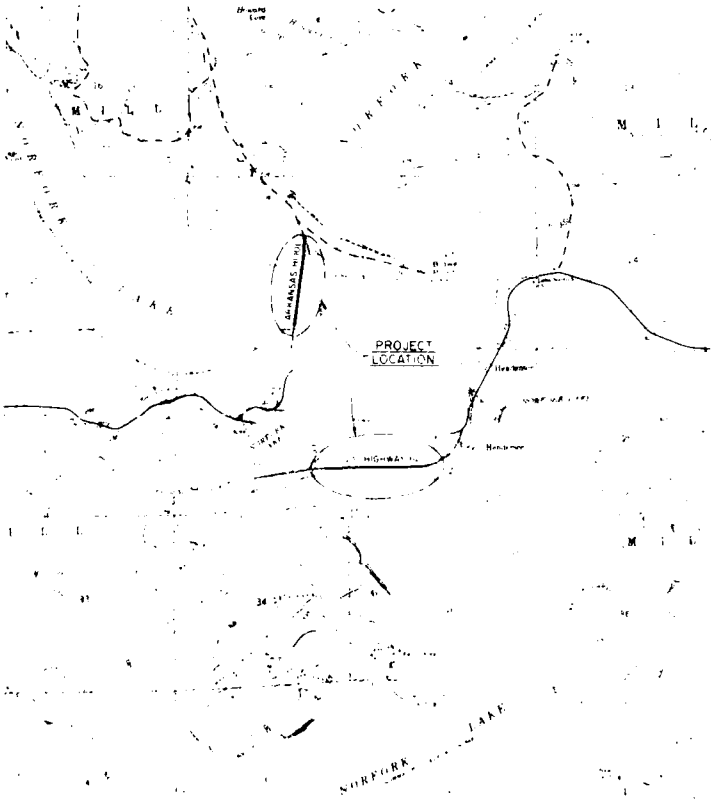
ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO

APPENDIX D

PLATES



VICINITY MAP



NORFORK LAKE SITE PLAN

0 2000 4000 6000
SCALE IN FEET

INDEX TO DRAWINGS

FILE NO. 9687 DRAWING NO.	SHEET NO.	TITLE
		GENERAL
134/3020		PROJECT LOCATION, INDEX TO DRAW
134/3021	1	ORGANIZATION CHART, TY INS
134/2707	2	GEN PLAN & ELEVATION - HWY
134/2708	3	EMBANKMENT DETAILS - HWY
134/2727	4	GEN PLAN & ELEVATION - HWY
134/2728	5	EMBANKMENT DETAILS - HWY
		ROCK SOCKET INSPECTION - HWY 62
134/3022	6	PIER 2 NORTH SOCKET
134/3023	7	PIER 2 SOUTH SOCKET
134/3024	8	PIER 3 NORTH SOCKET
134/3025	9	PIER 3 SOUTH SOCKET
134/3026	10	PIER 4 NORTH SOCKET
134/3027	11	PIER 4 SOUTH SOCKET
134/3028	12	PIER 5 NORTH SOCKET
134/3029	13	PIER 5 SOUTH SOCKET
134/3030	14	PIER 6 NORTH SOCKET
134/3031	15	PIER 6 SOUTH SOCKET
134/3032	16	PIER 7 NORTH SOCKET
134/3033	17	PIER 7 SOUTH SOCKET
134/3034	18	PIER 8 NORTH SOCKET
134/3035	19	PIER 8 SOUTH SOCKET
134/3036	20	PIER 9 NORTH SOCKET
134/3037	21	PIER 9 SOUTH SOCKET
134/3038	22	PIER 10 NORTH SOCKET
134/3039	23	PIER 10 SOUTH SOCKET
134/3040	24	PIER 11 NORTH SOCKET
134/3041	25	PIER 11 SOUTH SOCKET
134/3042	26	PIER 12 NORTH SOCKET
134/3043	27	PIER 12 SOUTH SOCKET
134/3044	28	PIER 13 NORTH SOCKET
134/3045	29	PIER 13 SOUTH SOCKET
		ROCK SOCKET INSPECTION - HWY 101 E
134/3046	30	PIER 1 WEST SOCKET
134/3047	31	PIER 1 EAST SOCKET (CONT.
134/3048	32	PIER 2 EAST SOCKET
134/3049	33	PIER 2 EAST SOCKET
134/3050	34	PIER 2 WEST SOCKET
134/3051	35	PIER 3 WEST SOCKET
134/3052	36	PIER 3 EAST SOCKET
134/3053	37	PIER 4 WEST SOCKET
134/3054	38	PIER 4 EAST SOCKET
134/3055	39	PIER 5 WEST SOCKET (CONT.
134/3056	40	PIER 5 WEST SOCKET
134/3057	41	PIER 5 EAST SOCKET (CON
134/3058	42	PIER 5 EAST SOCKET
134/3059	43	PIER 6 EAST SOCKET
134/3060	44	PIER 6 WEST SOCKET
134/3061	45	PIER 7 WEST SOCKET
134/3062	46	PIER 7 EAST SOCKET
134/3063	47	PIER 7 EAST SOCKET
134/3064	48	PIER 8 WEST SOCKET
134/3065	49	PIER 8 EAST SOCKET
134/3066	50	PIER 9 WEST SOCKET
134/3067	51	PIER 9 EAST SOCKET
134/3068	52	PIER 10 WEST SOCKET

WORK SAFELY

UE ENGINEERING WILL INCREASE YOUR PROFIT

INDEX TO DRAWINGS

FILE NO 9687

DRAWING NO	SHEET NO	TITLE
		GENERAL
134/3021	1	PROJECT LOCATION, INDEX TO DRAWINGS
134/3022	2	ORGANIZATION CHART, T.V. INSPECTION SYSTEM
134/3023	3	GEN PLAN & ELEVATION - HWY 62 BRIDGE
134/3024	4	EMBANKMENT DETAILS - HWY 62 BRIDGE
134/3025	5	GEN PLAN & ELEVATION - HWY 101 BRIDGE
134/3026	6	EMBANKMENT DETAILS - HWY 101 BRIDGE
		ROCK SOCKET INSPECTION - HWY 62 BRIDGE
134/3027	7	PIER 2 NORTH SOCKET
134/3028	8	PIER 2 SOUTH SOCKET
134/3029	9	PIER 3 NORTH SOCKET
134/3030	10	PIER 3 SOUTH SOCKET
134/3031	11	PIER 4 NORTH SOCKET
134/3032	12	PIER 4 SOUTH SOCKET
134/3033	13	PIER 5 NORTH SOCKET
134/3034	14	PIER 5 SOUTH SOCKET
134/3035	15	PIER 6 NORTH SOCKET
134/3036	16	PIER 6 SOUTH SOCKET
134/3037	17	PIER 7 NORTH SOCKET
134/3038	18	PIER 7 SOUTH SOCKET
134/3039	19	PIER 8 NORTH SOCKET
134/3040	20	PIER 8 SOUTH SOCKET
134/3041	21	PIER 9 NORTH SOCKET
134/3042	22	PIER 9 SOUTH SOCKET
134/3043	23	PIER 10 NORTH SOCKET
134/3044	24	PIER 10 SOUTH SOCKET
134/3045	25	PIER 11 SOUTH SOCKET
		ROCK SOCKET INSPECTION - HWY 101 BRIDGE
134/3046	26	PIER 1 WEST SOCKET
134/3047	27	PIER 1 EAST SOCKET (CONT)
134/3048	28	PIER 2 EAST SOCKET
134/3049	29	PIER 2 EAST SOCKET
134/3050	30	PIER 2 WEST SOCKET
134/3051	31	PIER 3 WEST SOCKET
134/3052	32	PIER 3 EAST SOCKET
134/3053	33	PIER 4 WEST SOCKET
134/3054	34	PIER 4 EAST SOCKET
134/3055	35	PIER 5 WEST SOCKET (CONT)
134/3056	36	PIER 5 WEST SOCKET
134/3057	37	PIER 5 EAST SOCKET (CONT)
134/3058	38	PIER 5 EAST SOCKET
134/3059	39	PIER 6 EAST SOCKET
134/3060	40	PIER 6 WEST SOCKET
134/3061	41	PIER 7 WEST SOCKET
134/3062	42	PIER 7 EAST SOCKET
134/3063	43	PIER 8 WEST SOCKET
134/3064	44	PIER 8 EAST SOCKET
134/3065	45	PIER 9 WEST SOCKET
134/3066	46	PIER 9 EAST SOCKET
134/3067	47	PIER 10 WEST SOCKET

NORFOLK BRIDGES PROJECT

ORGANIZATION CHART

QUALITY CONTROL

MASSMAN CONSTRUCTION CO
M.J. MASSMAN

D. McDOUGAL
PROJECT MANAGER

M. SCHNEIDELEIN
QC MANAGER

JON BOVREAU
FIELD ENGINEER

HAR INSP. SERVICE
SHOP WELD INSP.

JAMES CONEWAY
ENGR./INSP.

VOST & CONANT
SUPERSTRUCTURE

ROBERT SCHNOKER
GEOTECHNICIAN

DON JONES
LAB TECHNICIAN

QUALITY ASSURANCE

CORPS OF ENGINEERS
DARDANELLE RESIDENT OFFICE
R.M. HARBARGER, RES. ENGINEER

J. HOOVER
PROJECT ENGR.

T. SPENCER
ENGR.-CONTRACT SUPPORT BRANCH

H.E. RHODES
CONST. INSP.

R. CRUTCHFIELD
GEOLOGIST

L. PITCHFORD
ENGINEER

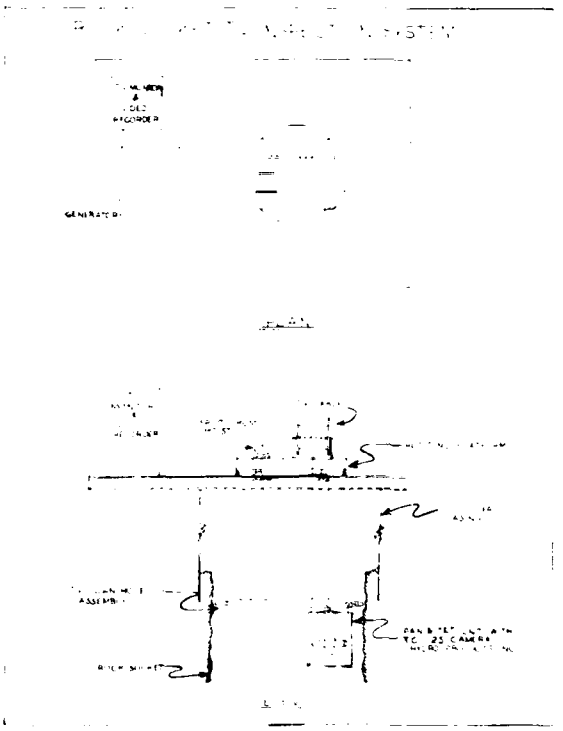
OFFICE ENGR.

GEORGE LEM
CONST. INSP.

SURVEY

JOHN WEBSLER
CONST. INSP.

LABORATORY

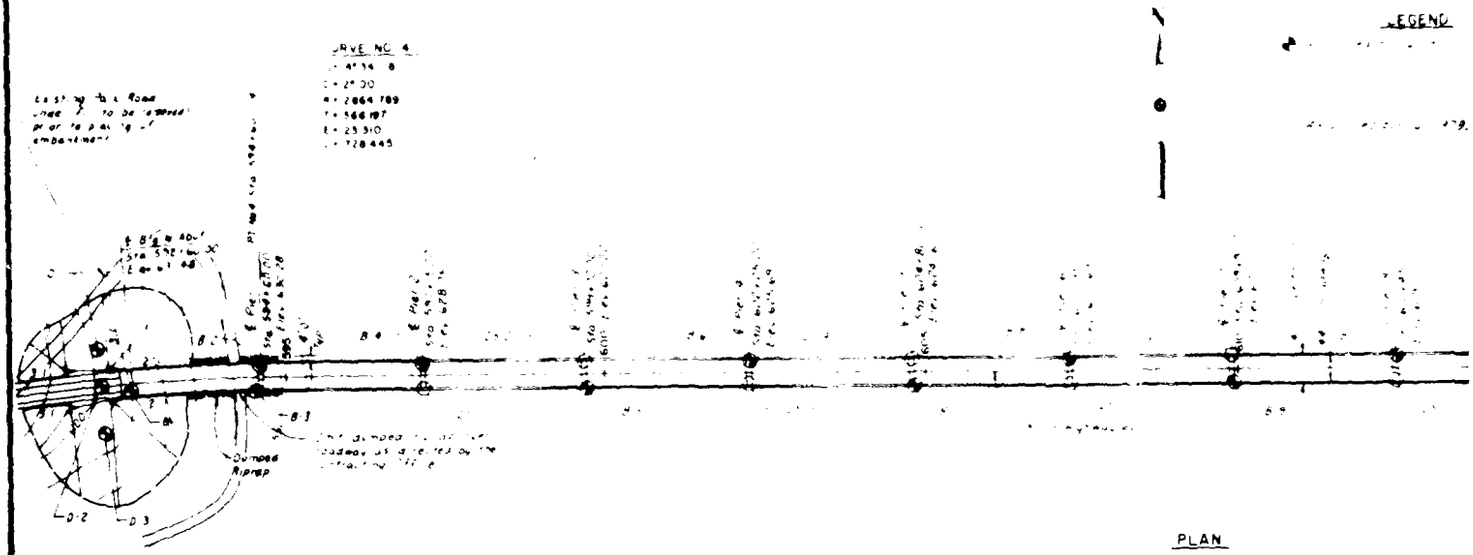


REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

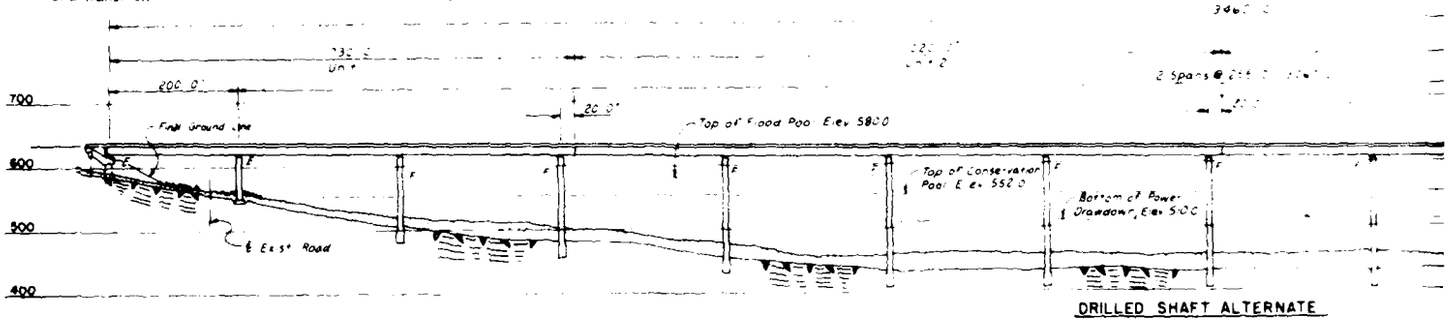
DESIGNED BY: RC	WHITE RIVER AND TRIBUTARIES — NORTH FORK RIVER, ARKANSAS
DRAWN BY: RC	NORFOLK LAKE HIGHWAY BRIDGES
CHECKED BY: CD	BAXTER COUNTY, ARKANSAS
SUBMITTED BY:	US HIGHWAY 62 & ARKANSAS HWY 101
ENGINEER	LOCATION MAP AND INDEX TO DRAWINGS
	APRIL 19[illegible]
	INV. SERIAL NO.
	DRAWING NUMBER: 9687-134/3020
	SHEET 1 OF 48

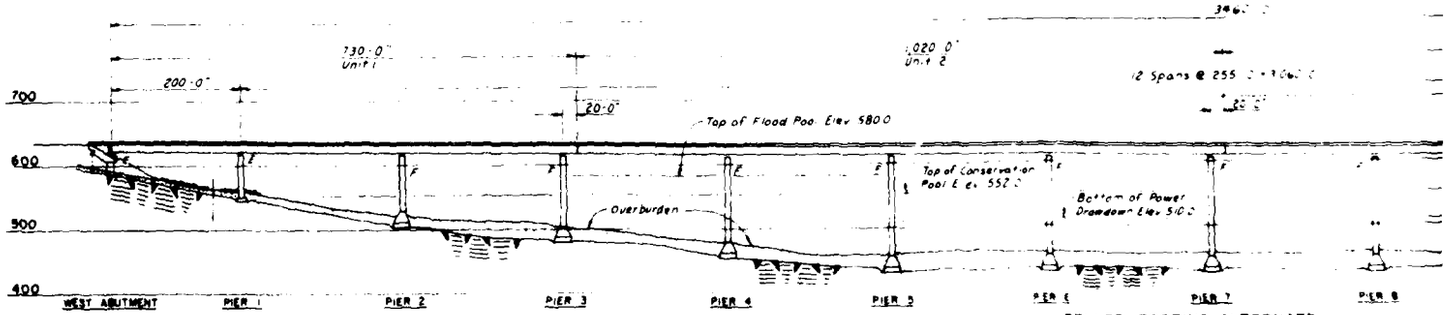
CORPS OF ENGINEERS



PLAN



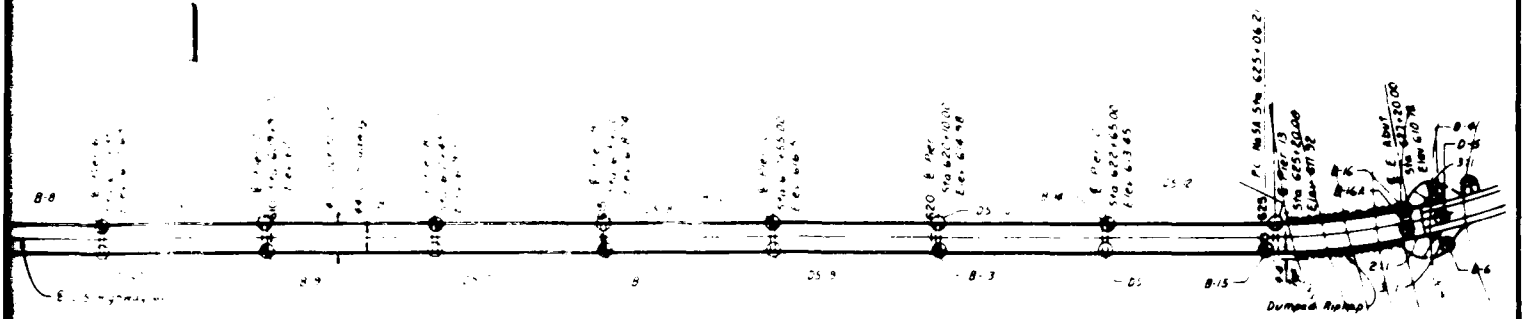




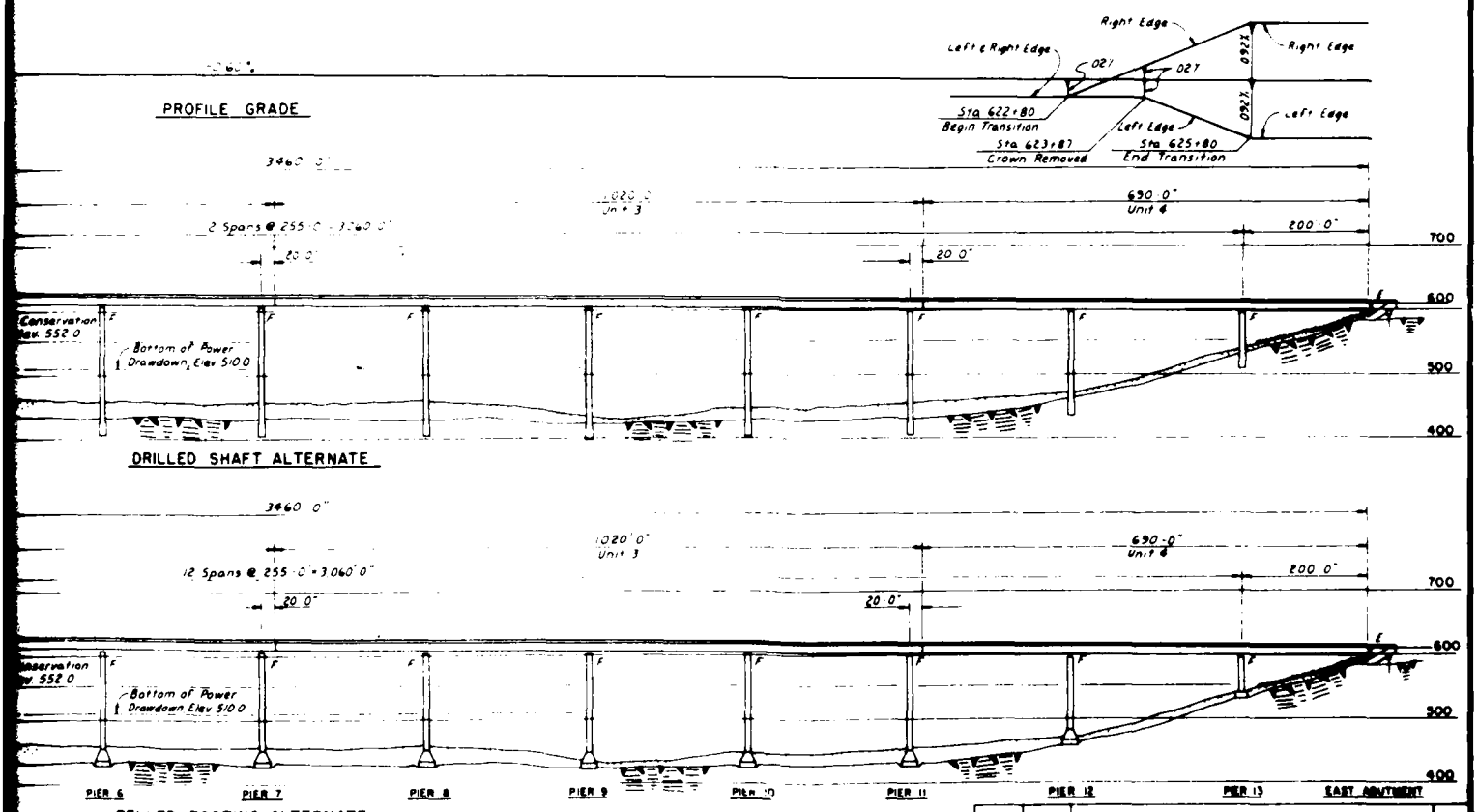
Notes

LEGEND

CURVE NO 5A
Δ = 58° 3' 31"
D = 5° 00
R = 1145 916
T = 642 077
E = 67 624
L = 1170 506'



PLAN



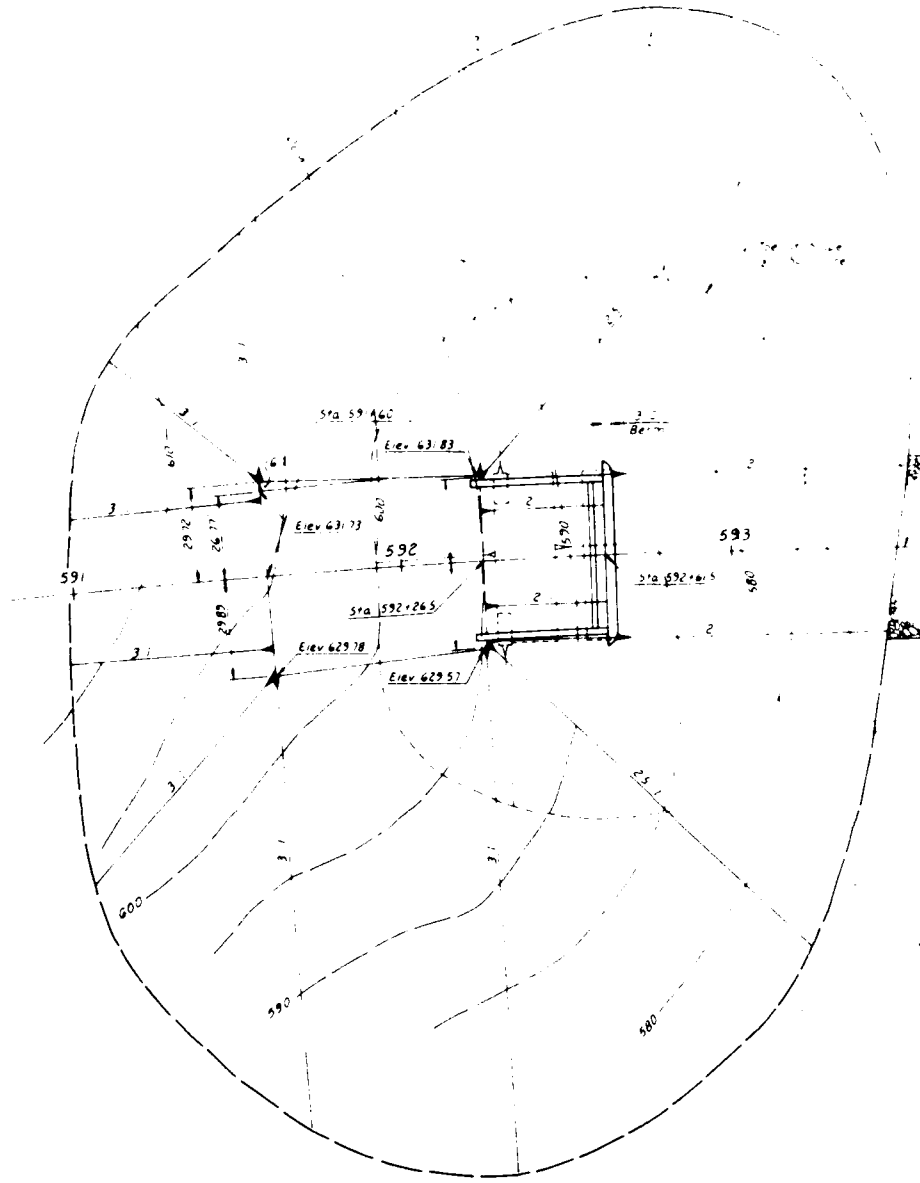
DRILLED SHAFT ALTERNATE

BELLED FOOTING ALTERNATE

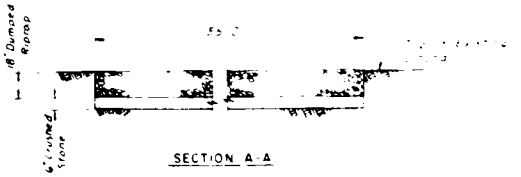
100 0 100
SCALE IN FEET

Notes
For embankment and riprap details see Sheet 8
For limits of Contractors Work Areas see Sheet 2
Boring logs and laboratory and field test data from subsurface explorations are included with the Contract Specifications
Dumped riprap shall be provided at ends of bridge as shown Riprap shall be placed from abutment to Elevation 550 contour line

HNTB
U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK, ARKANSAS
NORFORK LAKE HIGHWAY BRIDGES
BAXTER COUNTY, ARKANSAS
SUBSTRUCTURE
U.S. HIGHWAY 62
GENERAL PLAN AND ELEVATION
FEBRUARY 1979
9435-134/2707
2 of 32

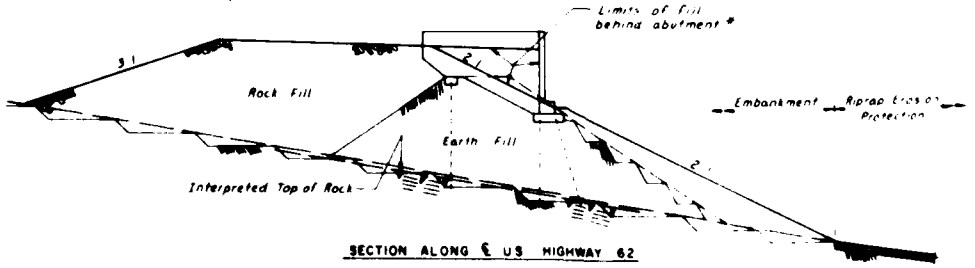


PLAN



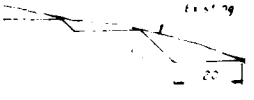
SECTION A-A

*Note
Fill behind abutments shall be placed after abutments are completed. Fill material may be either earth or rock or both except material adjacent to wall must be non-shrinking. Backfill as shown on abutment drawings. The cost of furnishing and placing fill behind abutments shall be considered incidental to and included with the price bid for the Unclassified Excavation Abutments.

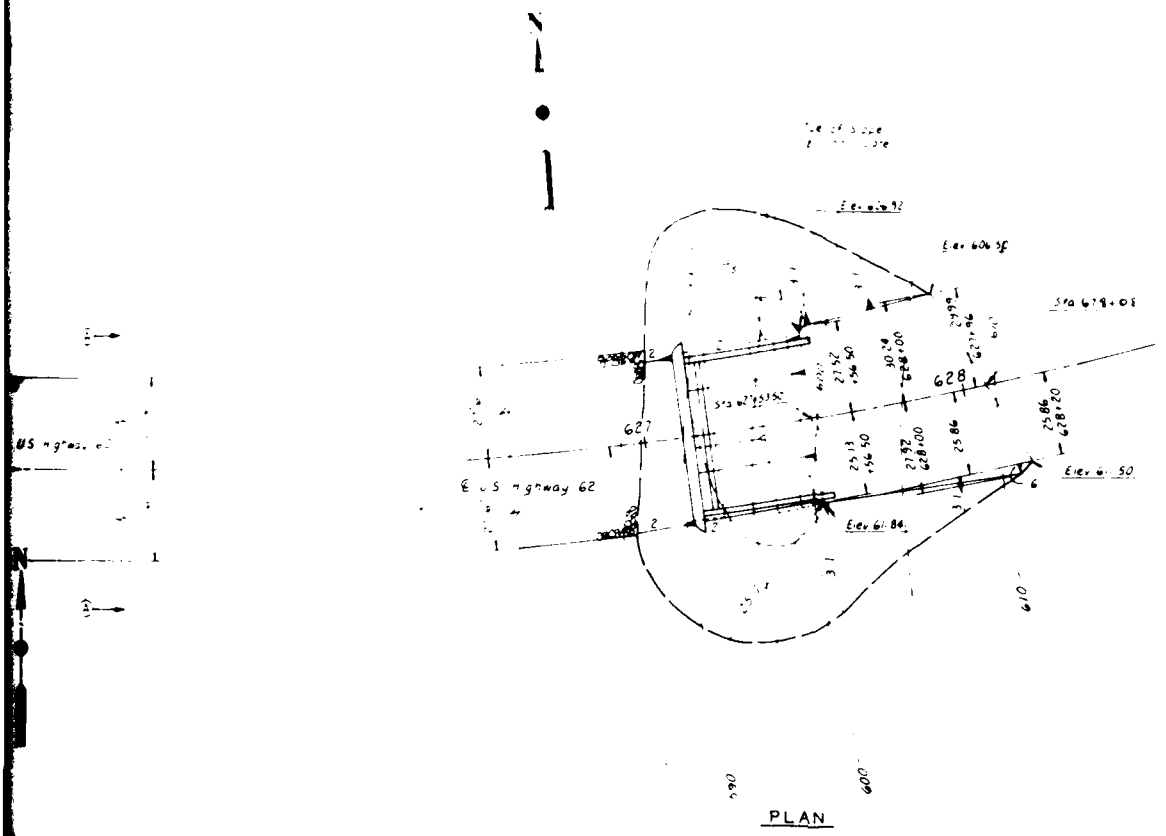


SECTION ALONG ℄ US HIGHWAY 62

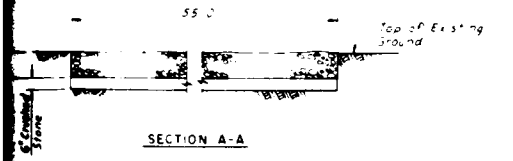
WEST APPROACH EMBANKMENT



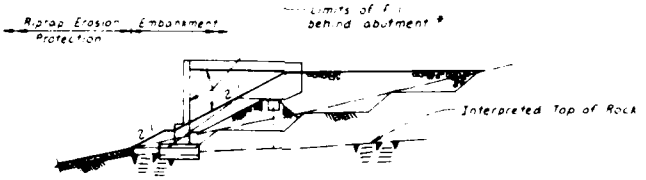
TYPICAL BENCHING NATURAL GR



PLAN



SECTION A-A

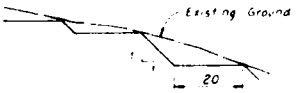


SECTION ALONG ℄ U.S. HIGHWAY 62

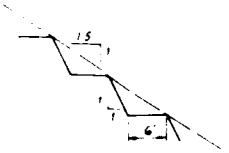
EAST APPROACH EMBANKMENT



...utments shall be placed after abutments are ...aterial may be either earth or rock or both ...djacent to walls must be Noncohesive Backfill ...ment drawings. The cost of furnishing and placing ...nts shall be considered incidental to and included ... for Unclassified Excavation Abutments



TYPICAL BENCHING NATURAL GROUND



TYPICAL KEYING SOIL CORE

HNTB

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK, ARKANSAS

WHITE RIVER AND TRIBUTARIES NORTH FORK RIVER, ARKANSAS

GDJ/JFP
RLB
HWL

NORFORK LAKE HIGHWAY BRIDGES
BAXTER COUNTY, ARKANSAS

SUBSTRUCTURE
U.S. HIGHWAY 62
EMBANKMENT DETAILS

FEBRUARY 1978

8435-134/2708

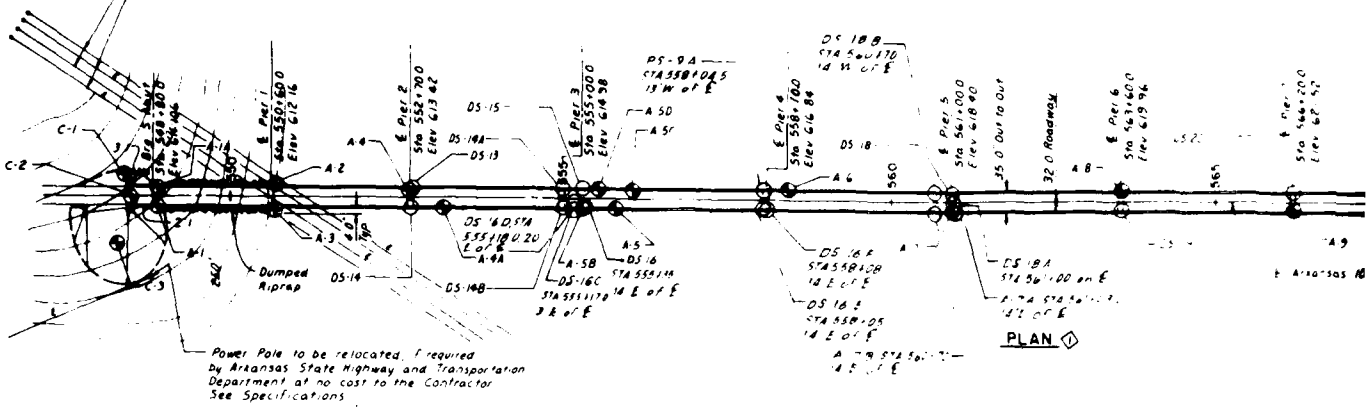
3 of 52

LEGEND

As Drilled Boring (1977)

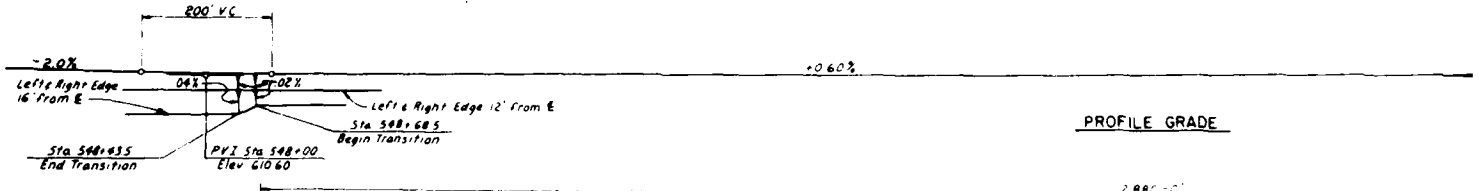
As Drilled Boring (1979)

3 phase 72 KV Power Distribution Lines cross ℄ Bridge at Sta 550+60± Elev 681.1 @ 84°F These lines are scheduled to be removed but a definite time has not been established See Contract Specifications

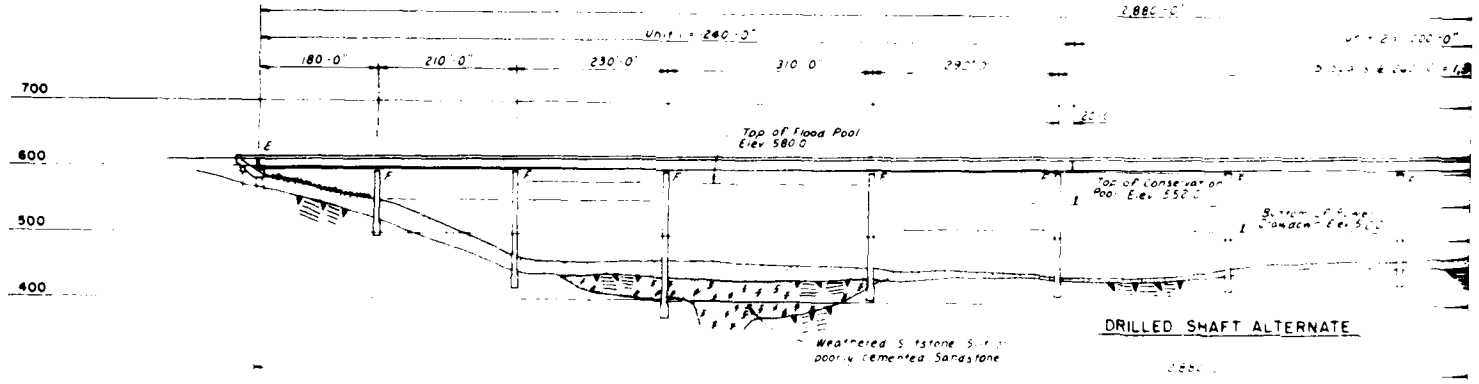


Power Pole to be relocated, if required by Arkansas State Highway and Transportation Department at no cost to the Contractor See Specifications

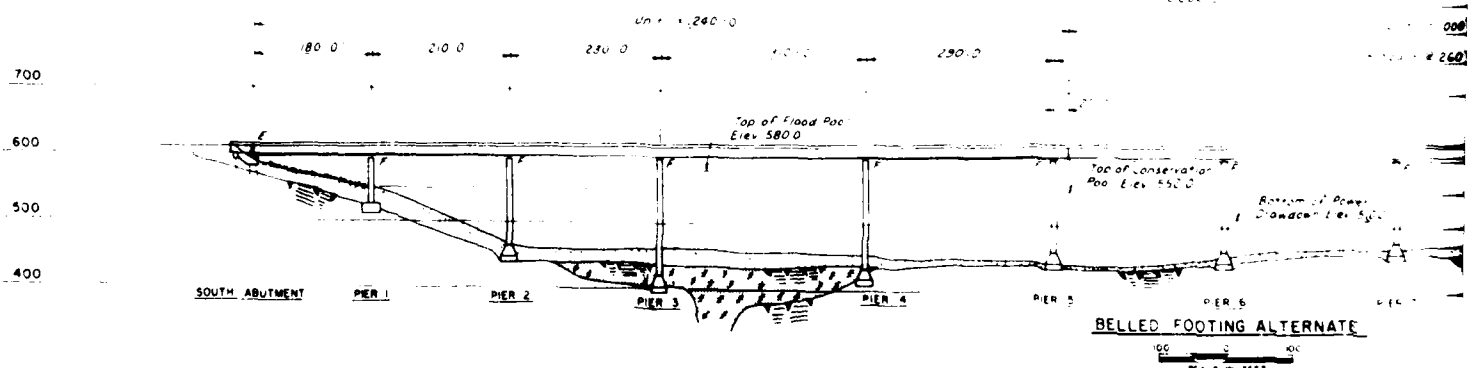
PLAN ①



PROFILE GRADE

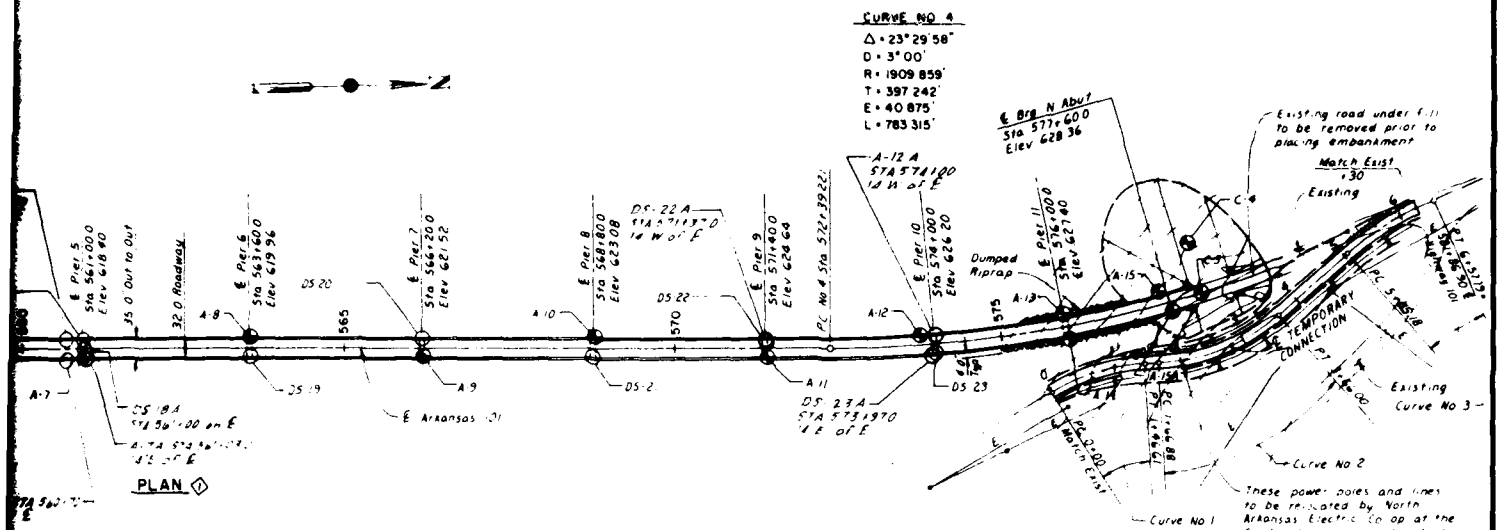


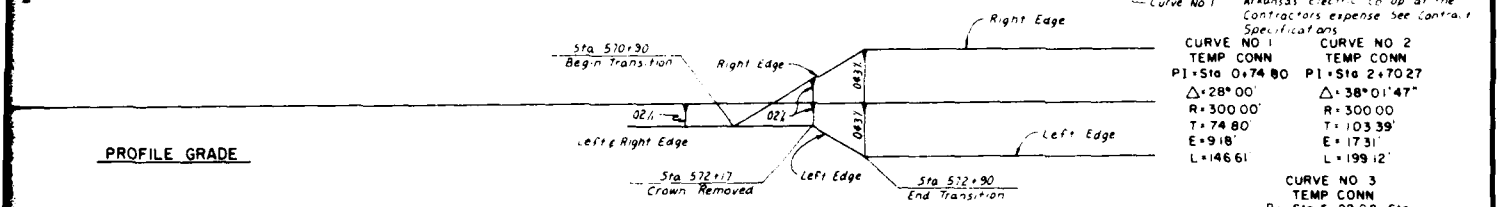
DRILLED SHAFT ALTERNATE



BELLED FOOTING ALTERNATE

SCALE IN FEET

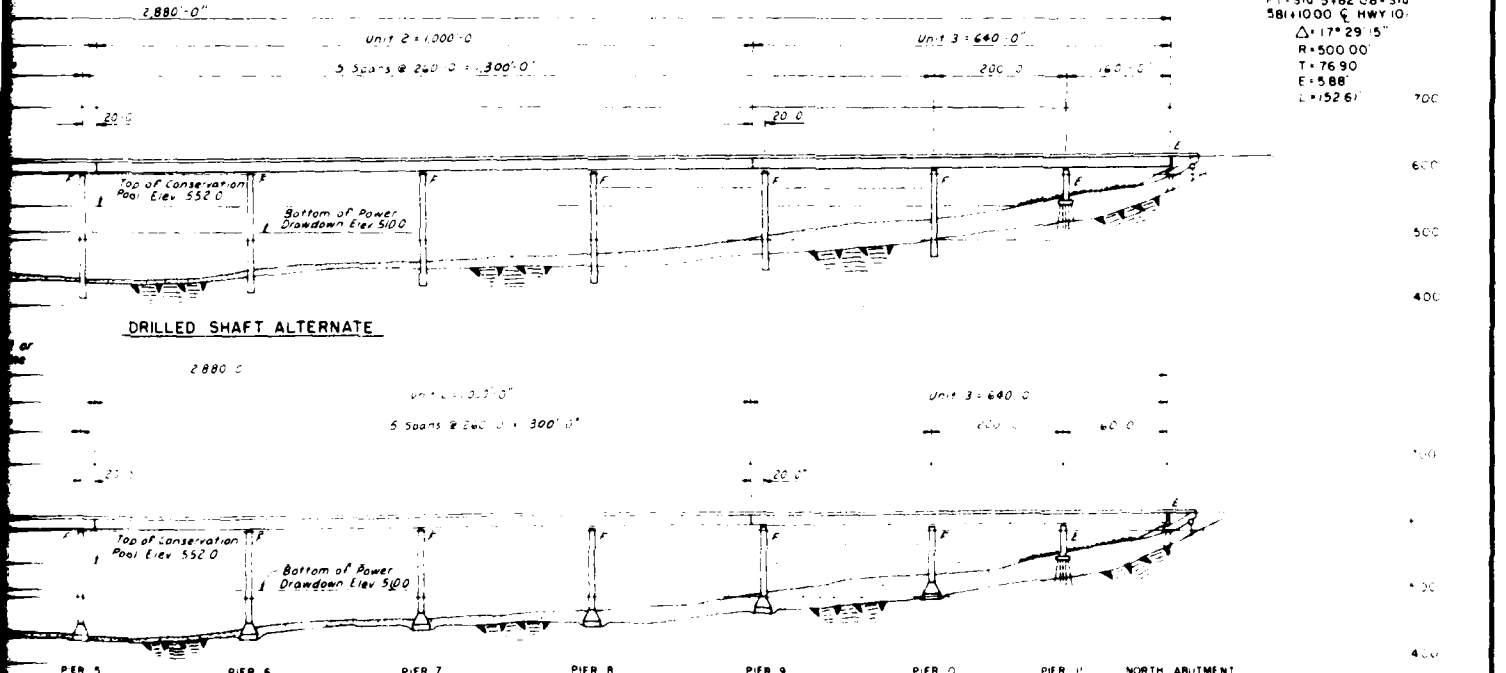




CURVE NO 1
TEMP CONN
PI = Sta 0+74.80
Δ = 28°00'
R = 300.00'
T = 74.80'
E = 9.18'
L = 146.61'

CURVE NO 2
TEMP CONN
PI = Sta 2+70.27
Δ = 38°01'47"
R = 300.00'
T = 103.39'
E = 17.31'
L = 199.12'

CURVE NO 3
TEMP CONN
PI = Sta 5+82.08 = Sta 581+10.00 ℄ HWY 101
Δ = 17°29'15"
R = 500.00'
T = 76.90'
E = 5.88'
L = 152.61'

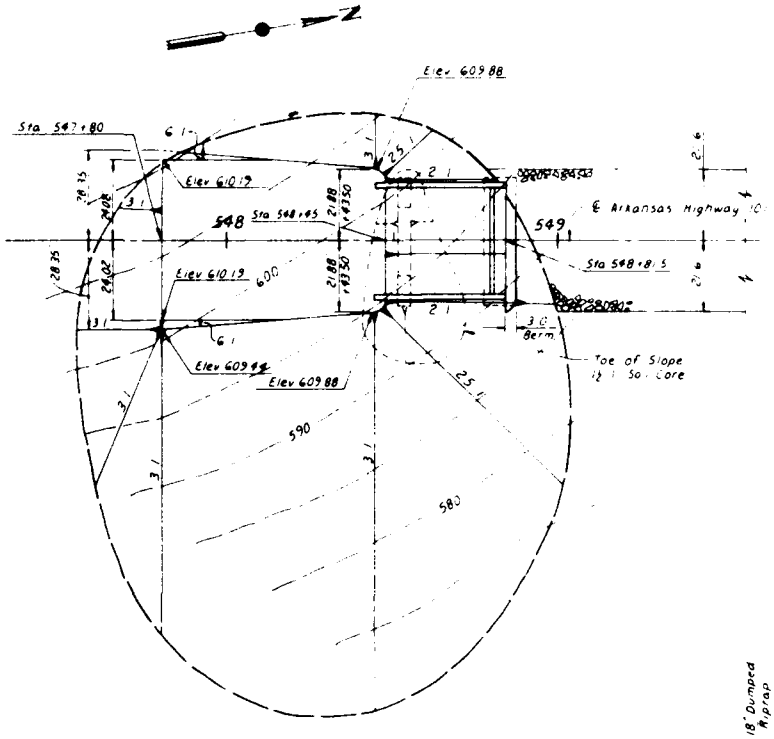


Notes

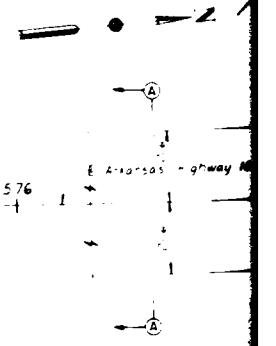
For stats & of temporary connection see Sheet 3
For embankment and typical details see Sheet 28
For limits of contractors Work Areas see Sheet 2
For boring logs and laboratory and field test data
From subsurface explorations are included with the
Geological Exploration
Expansion joints shall be provided at ends of bridge
Asphalt wearing surface shall be placed from abutment to Elevation
[illegible]

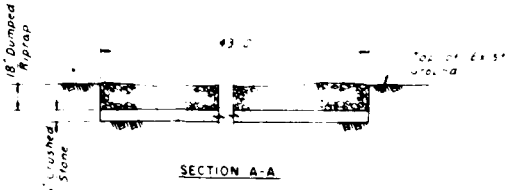
HNTB
U S ARMY ENGINEER DISTRICT
LITTLE ROCK ARKANSAS
WHITE RIVER AND TRIBUTARIES NORTH FORK RIVER ARKANSAS
NORFORK LAKE HIGHWAY BRIDGES
BAXTER COUNTY ARKANSAS
SUBSTRUCTURE
ARKANSAS HIGHWAY 101
GENERAL PLAN AND ELEVATION
FEBRUARY 1970
8435-134/2727
4 52

INCL 1
AMEND NO 0003

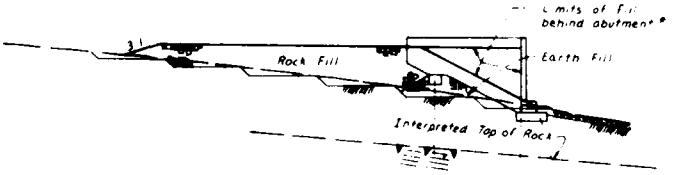


PLAN





SECTION A-A



SECTION ALONG ℄ ARKANSAS HIGHWAY 101

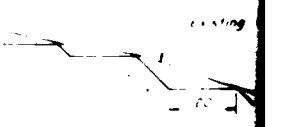
*Note
Fill behind abutments shall be placed after abutments are completed. Fill material may be either earth or rock or both except material adjacent to wall is must be Noncohesive Backfill as shown on abutment drawings. The cost of furnishing and placing fill behind abutments shall be considered incidental to and included with the price bid for Unclassified Excavation Abutments.

SOUTH APPROACH EMBANKMENT

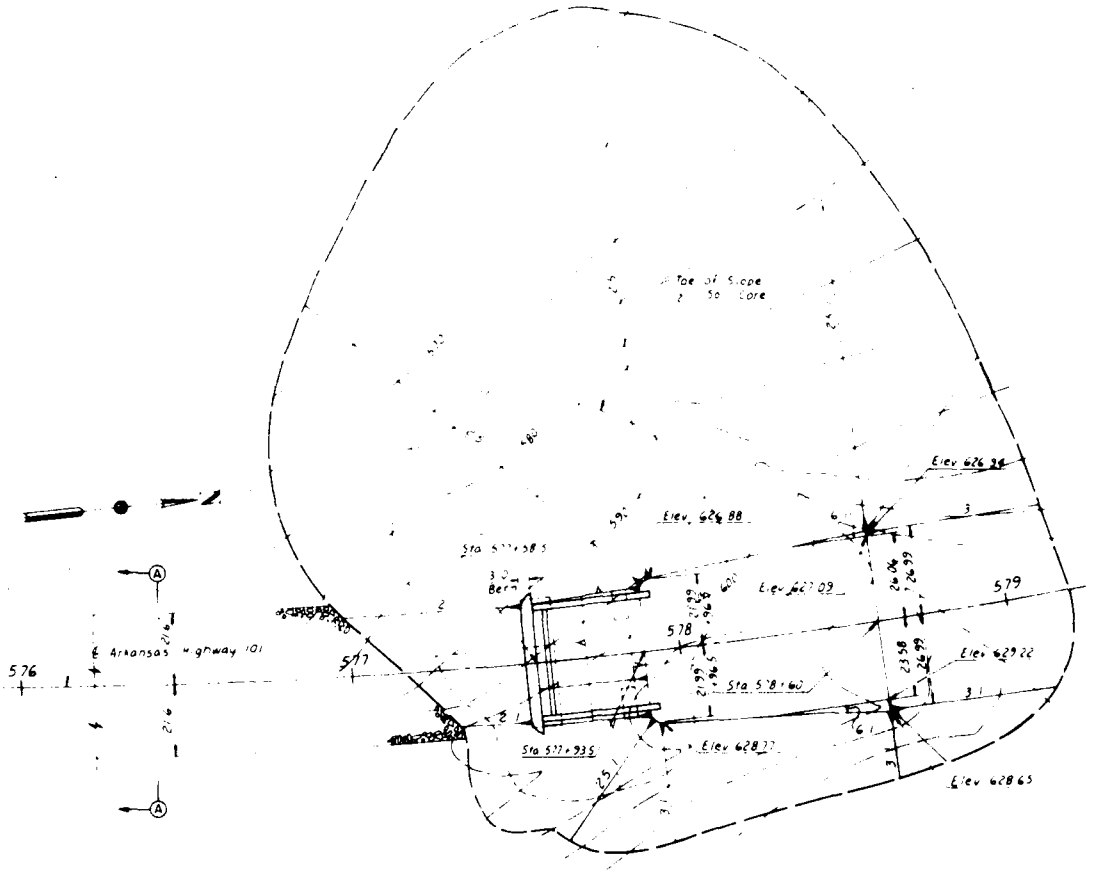




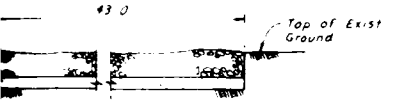
TYPICAL KEYING SOIL CORE



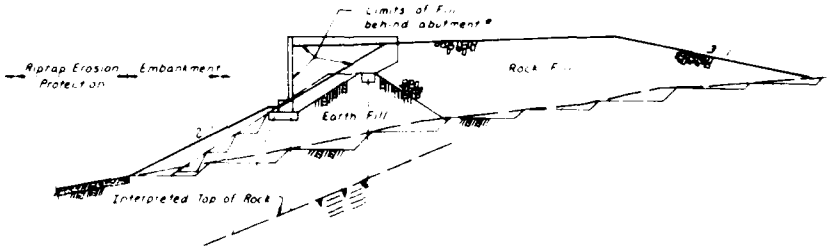
TYPICAL BENCHING NATURAL GR



PLAN



SECTION A-A

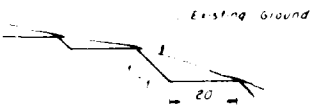


SECTION ALONG ℄ ARKANSAS HIGHWAY 101

NORTH APPROACH EMBANKMENT

SCALE IN FEET

Fill behind abutments shall be placed after abutments completed. Fill material may be either earth or rock or except material adjacent to walls must be Noncohesive Fill as shown on abutment drawings. The cost of furnishing and placing Fill behind abutments shall be considered incidental to and included with the price for Unclassified Excavation - Abutments



TYPICAL BENCHING NATURAL GROUND

CORE

HNTB

U.S. ARMY ENGINEER DISTRICT
LITTLE ROCK ARKANSAS

WHITE RIVER AND TRIBUTARIES — NORTH FORK RIVER ARKANSAS

GDJ/JVP
RLB
HWL

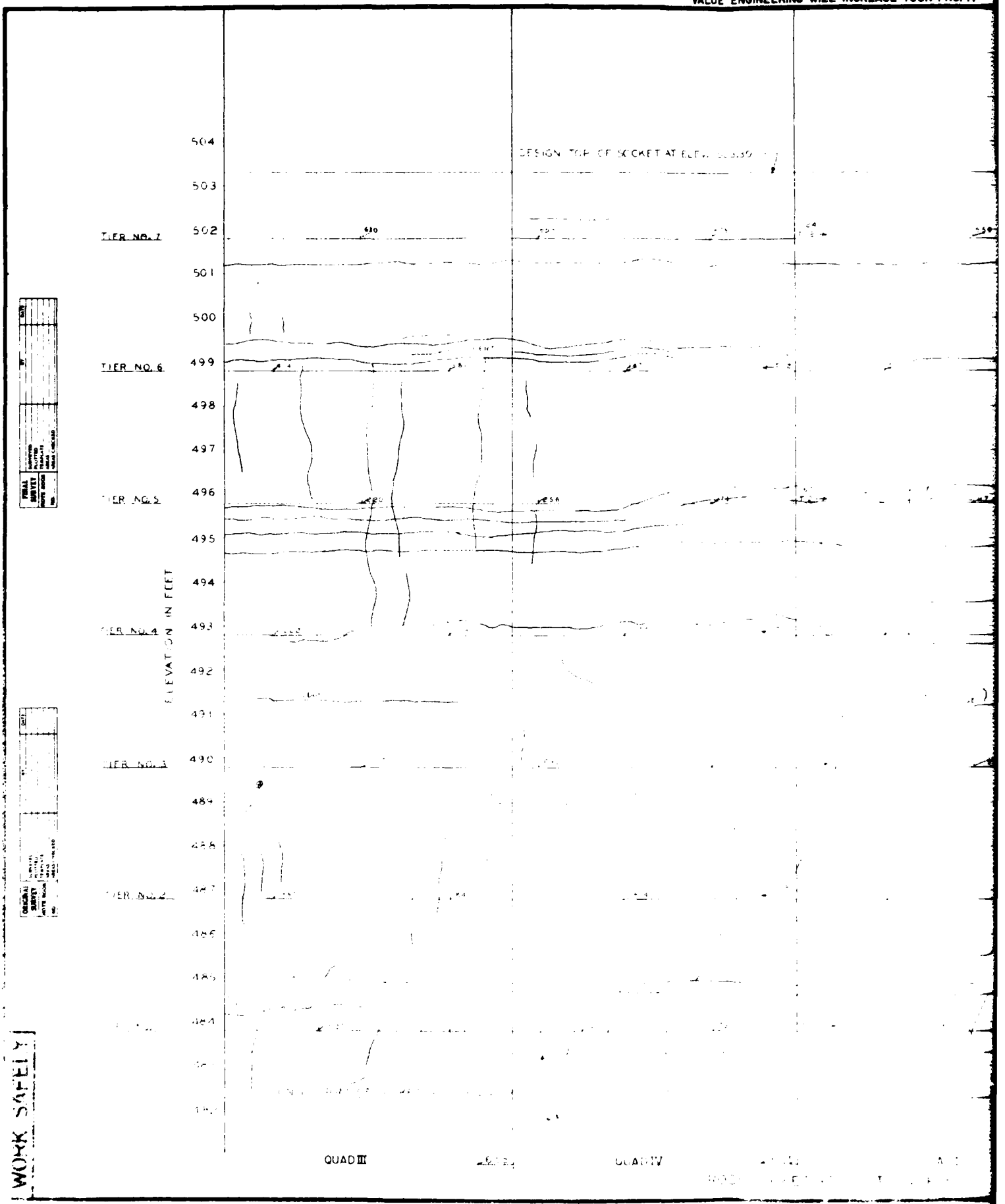
NORFORK LAKE HIGHWAY BRIDGES
BAXTER COUNTY ARKANSAS
SUBSTRUCTURE
ARKANSAS HIGHWAY 101
EMBANKMENT DETAILS

FEBRUARY 1970

-5 -52

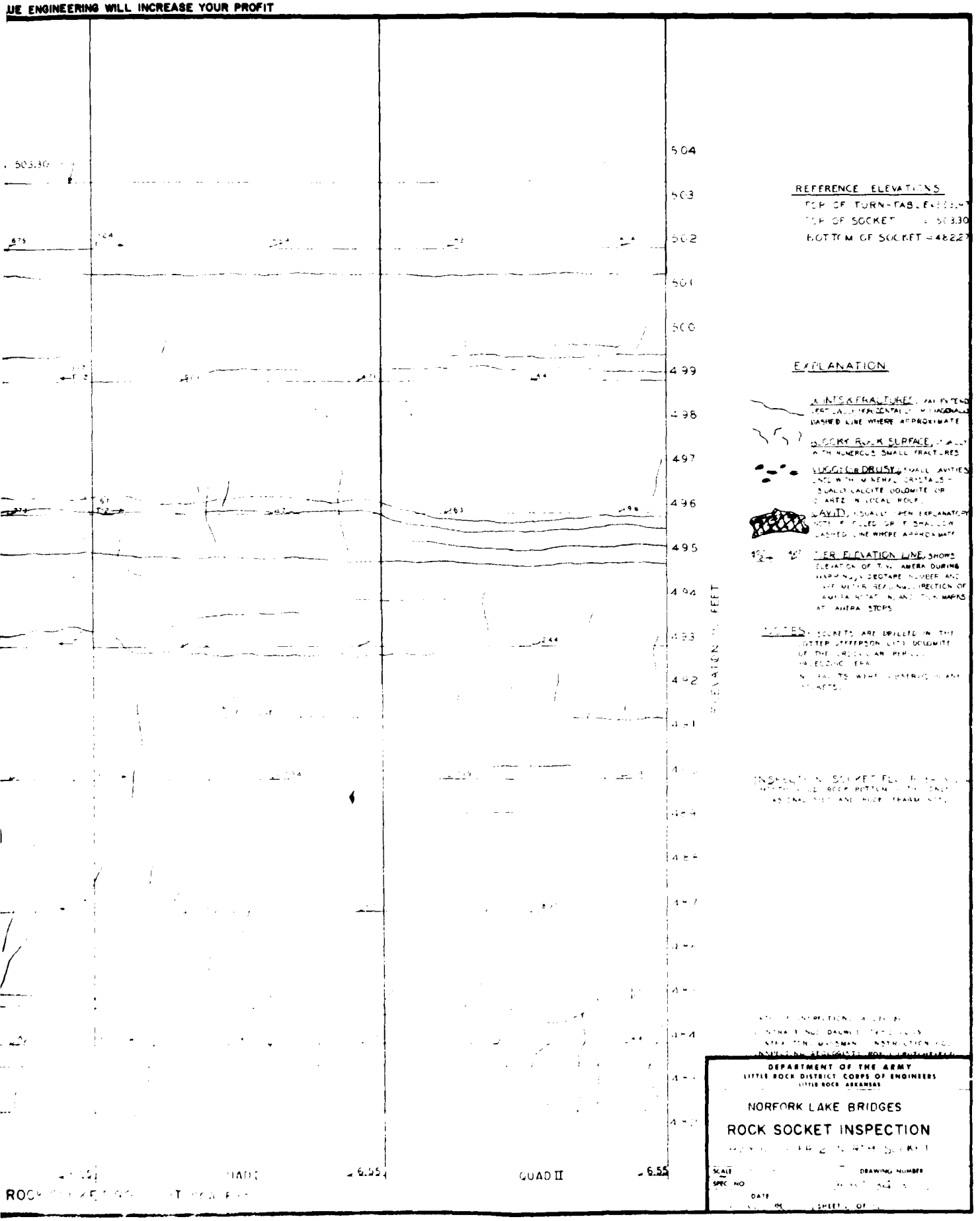
9435-134/2728

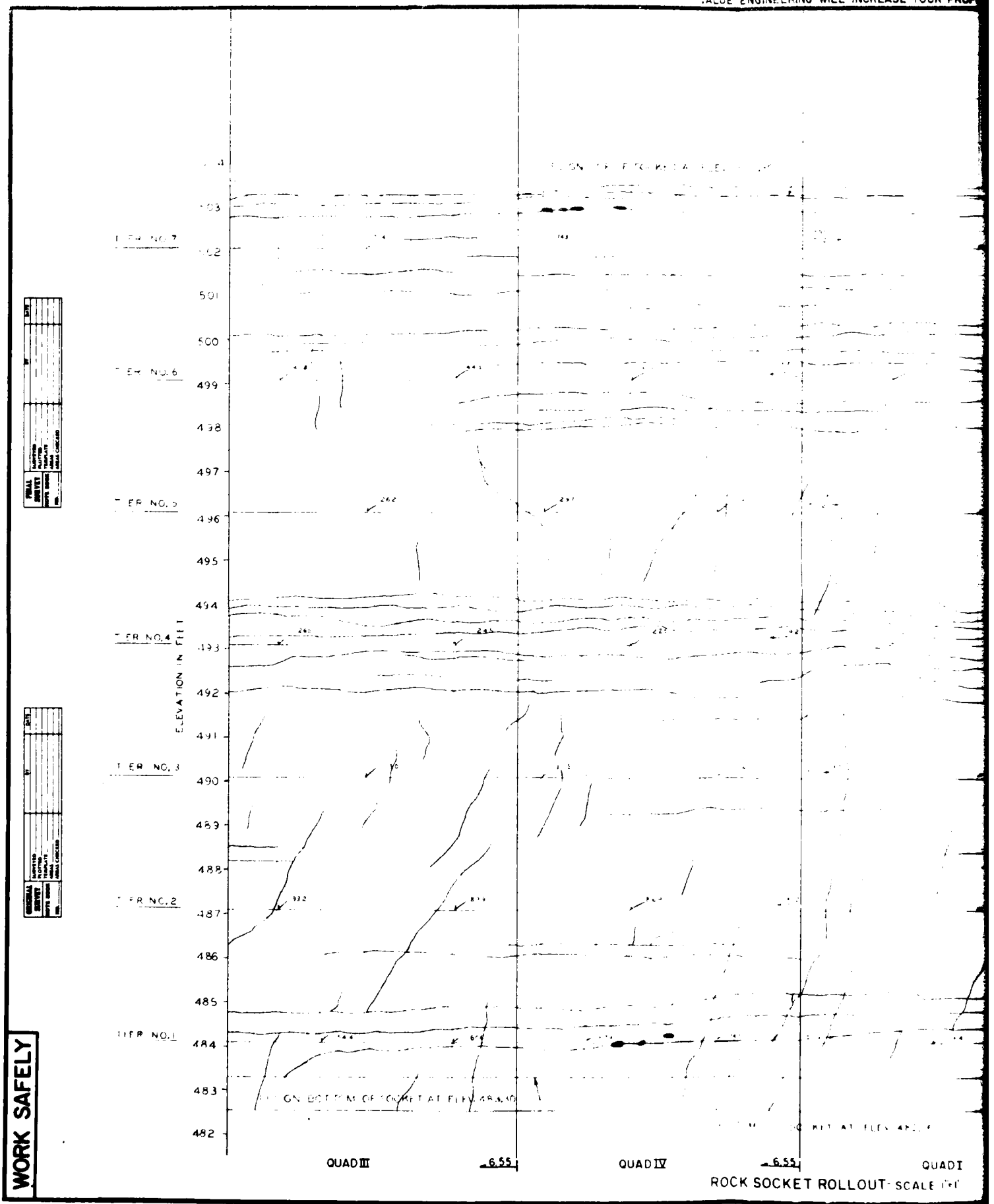
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



WORK SAFELY

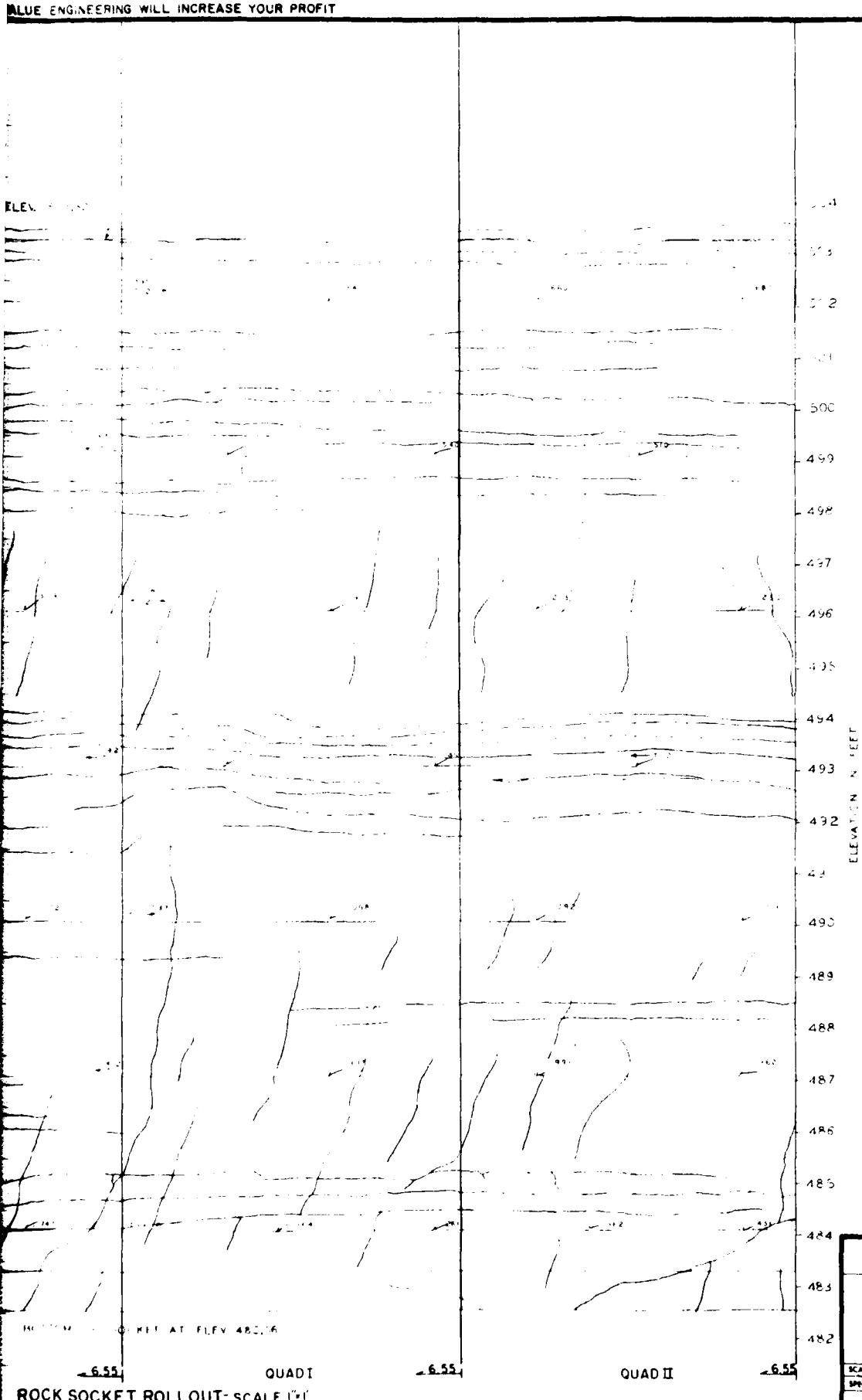
UE ENGINEERING WILL INCREASE YOUR PROFIT




TIER NO.7
TIER NO.6
TIER NO.5
TIER NO.4
TIER NO.3
TIER NO.2
TIER NO.1
ELEVATION IN FEET
503
502
501
500
499
498
497
496
495
494
493
492
491
490
489
488
487
486
485
484
483
482
QUAD III
-6.55
QUAD IV
-6.55
QUAD I
ROCK SOCKET ROLLOUT- SCALE 1"=

WORK SAFELY

ALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

DIFFERENCE IN ELEVATION

INSPECTION OF SOCKET FLOOR SHOWED

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

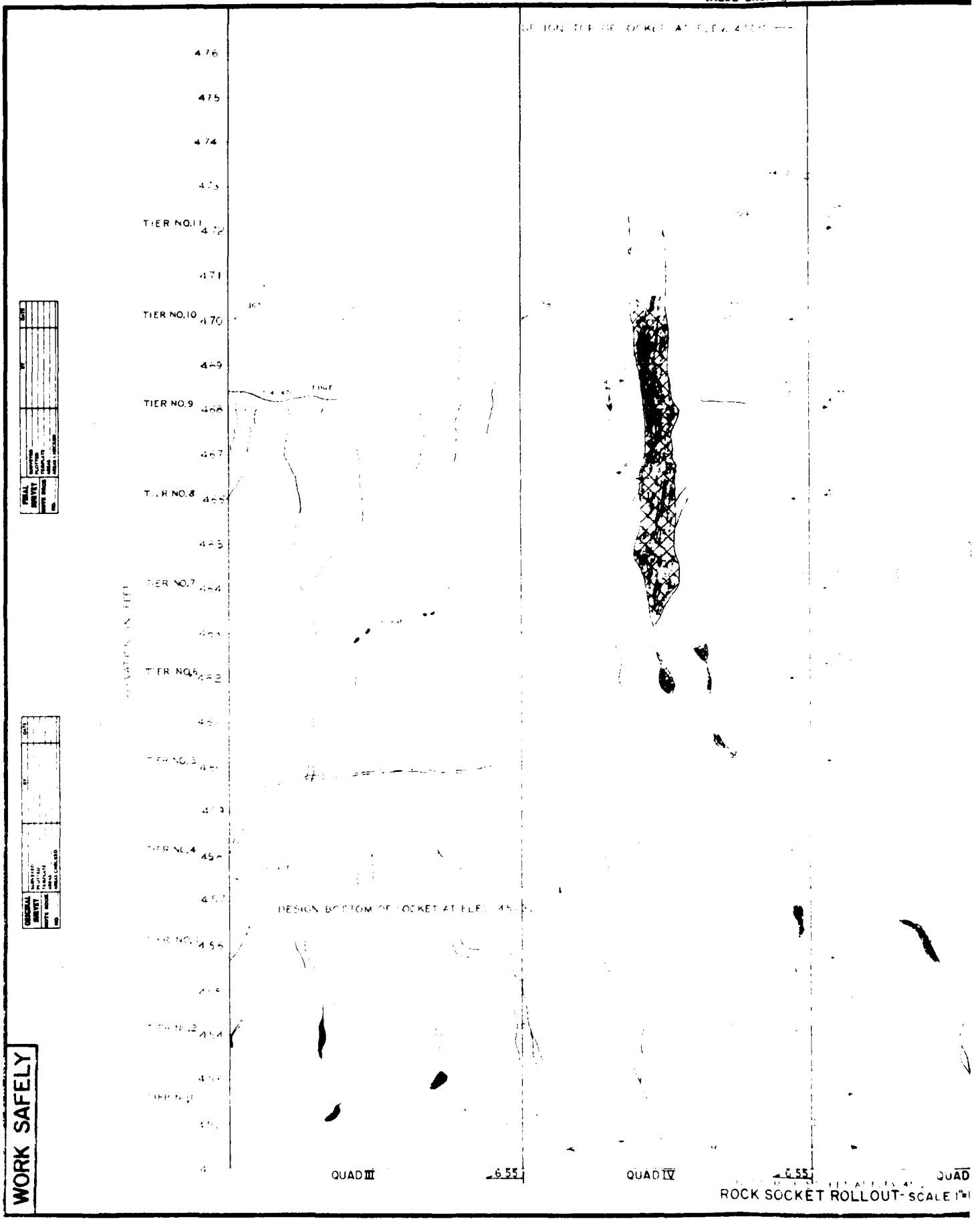
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62 PIER 2 SOUTH SOCKET

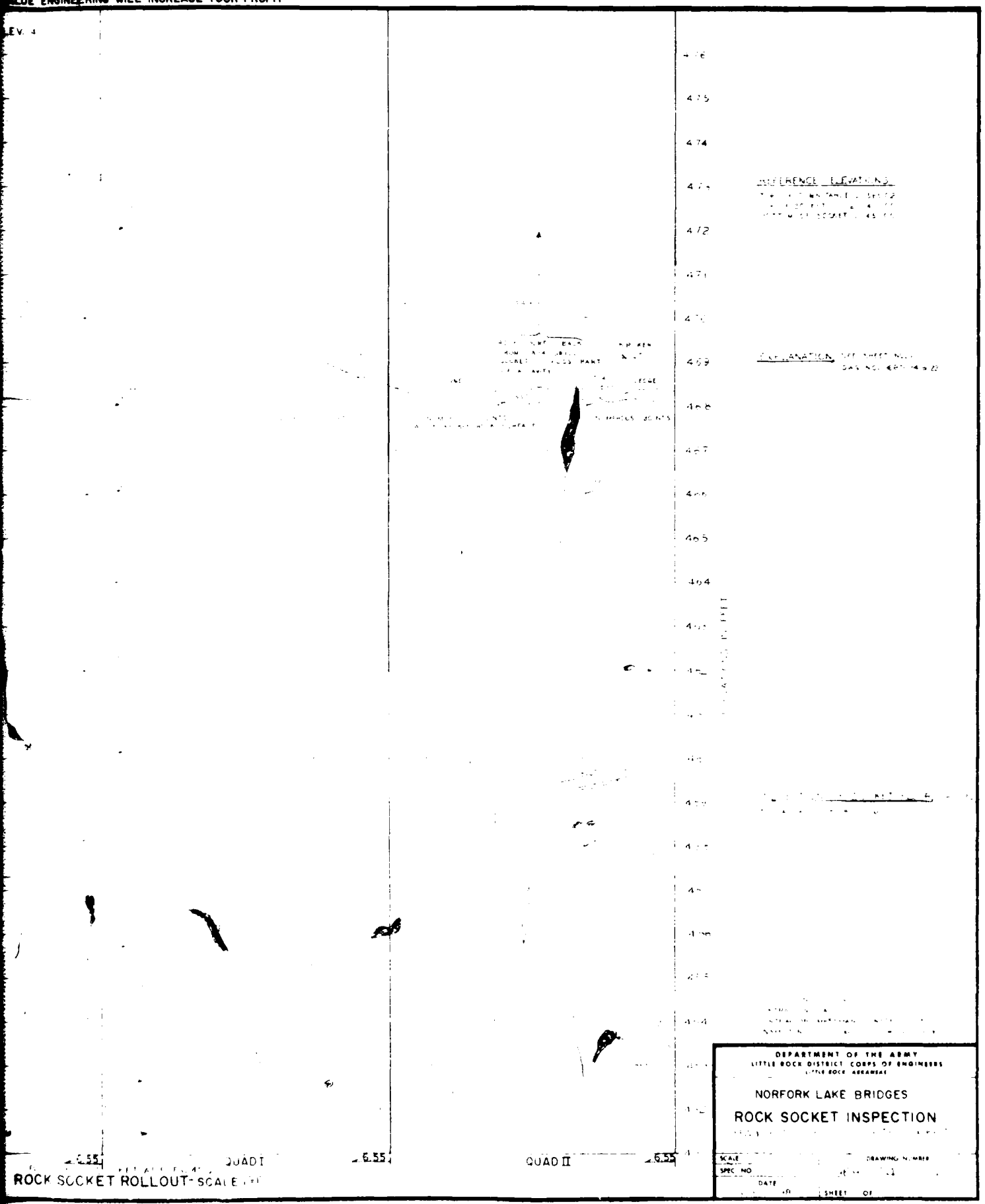
SCALE	DRAWING NUMBER
SPEC NO	
DATE	SHEET OF

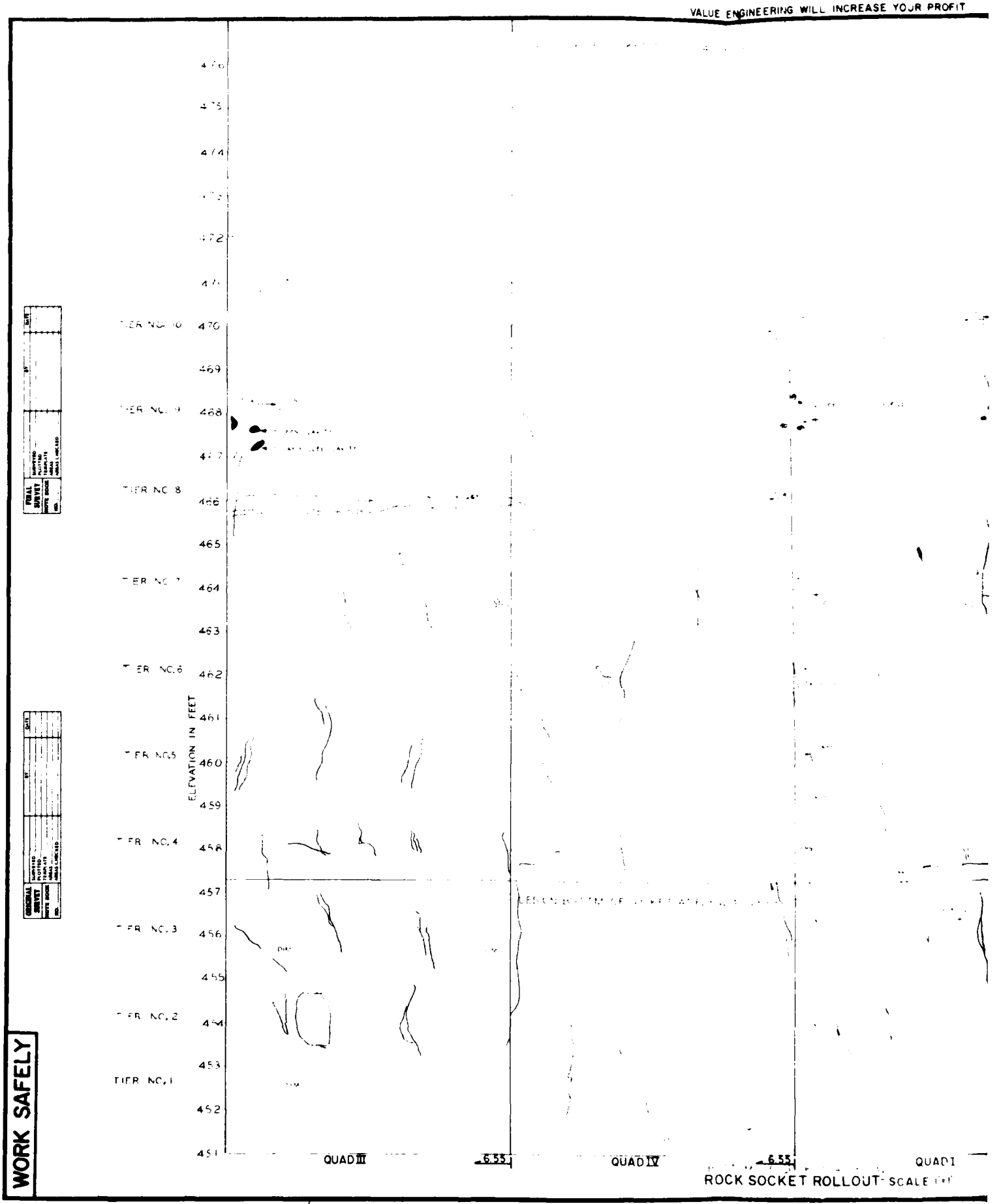
VALUE ENGINEERING WILL INCREASE YOUR PR



WORK SAFELY

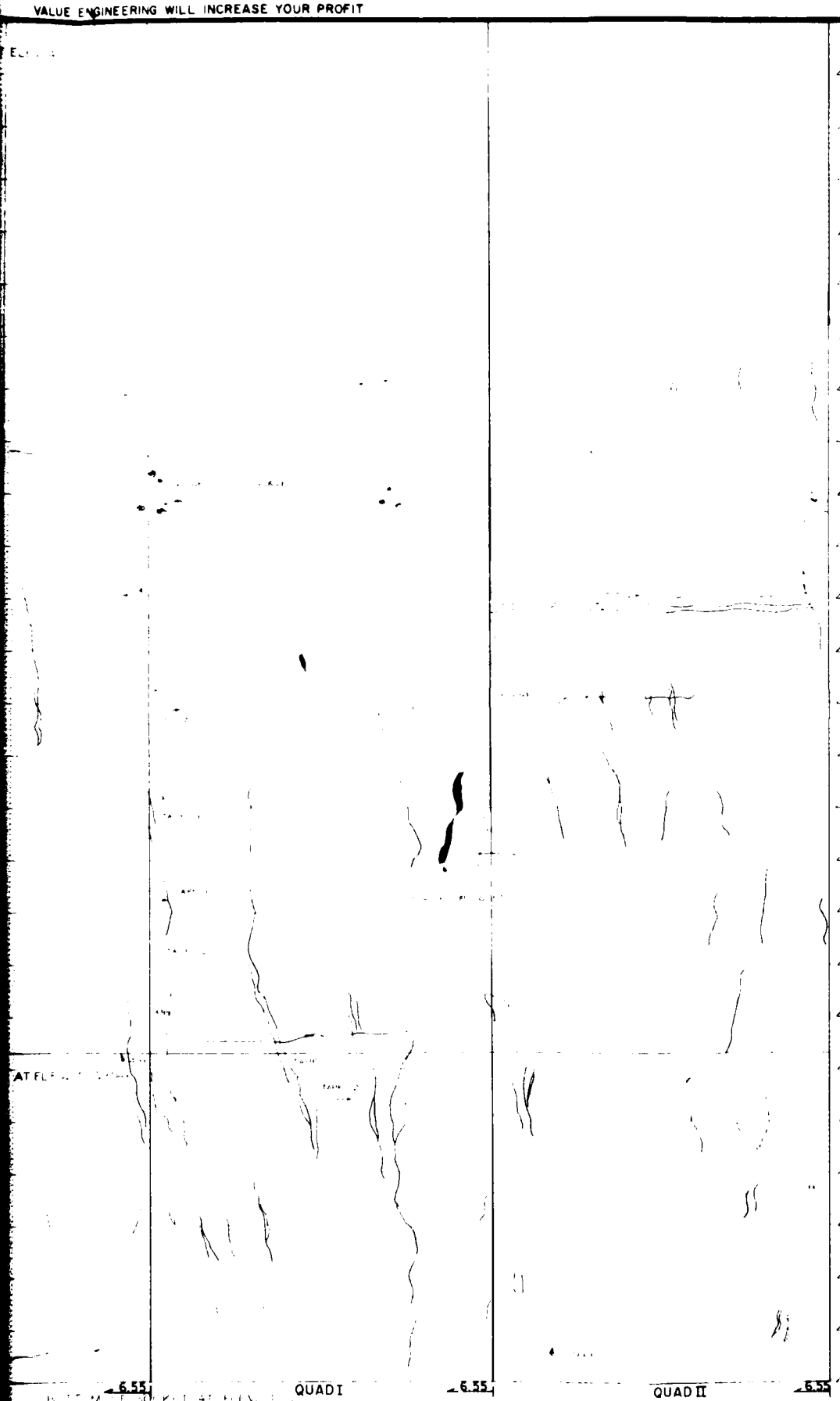
ALUE ENGINEERING WILL INCREASE YOUR PROFIT




TIER NO. 10
TIER NO. 9
TIER NO. 8
TIER NO. 7
TIER NO. 6
TIER NO. 5
TIER NO. 4
TIER NO. 3
TIER NO. 2
TIER NO. 1
ELEVATION IN FEET
470
469
468
466
465
464
463
462
461
460
459
458
457
456
455
454
453
452
451
QUAD III
6.55
QUAD IV
6.55
QUAD I
ROCK SOCKET ROLLOUT

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXPLANATION

INSPECTION OF SOCKET FLOOR, SHOWING A SUITABLE ROCK BOTTOM

DATE OF INSPECTION
CONTRACT NO.
CONTRACTOR: MASSMAN CONSTRUCTION CO
INSPECTING GEOLOGIST: JOHNES BROWN

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

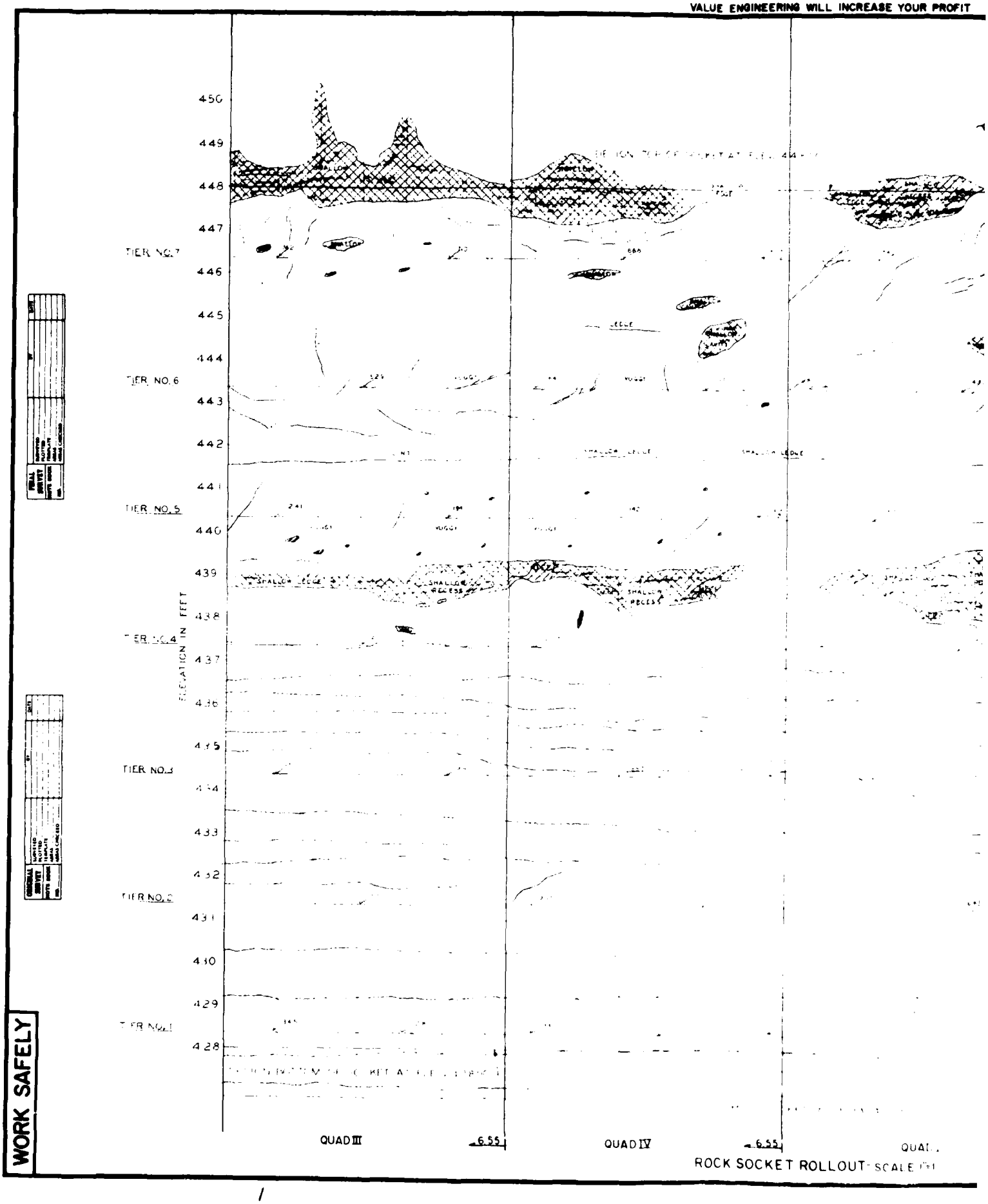
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62 - EAST PIER - SOUTH SOCKET

SCALE 1" = 1'
SPEC NO
DATE APR 1984
DRAWING NUMBER 39887 134/3025
SHEET 2 OF 2

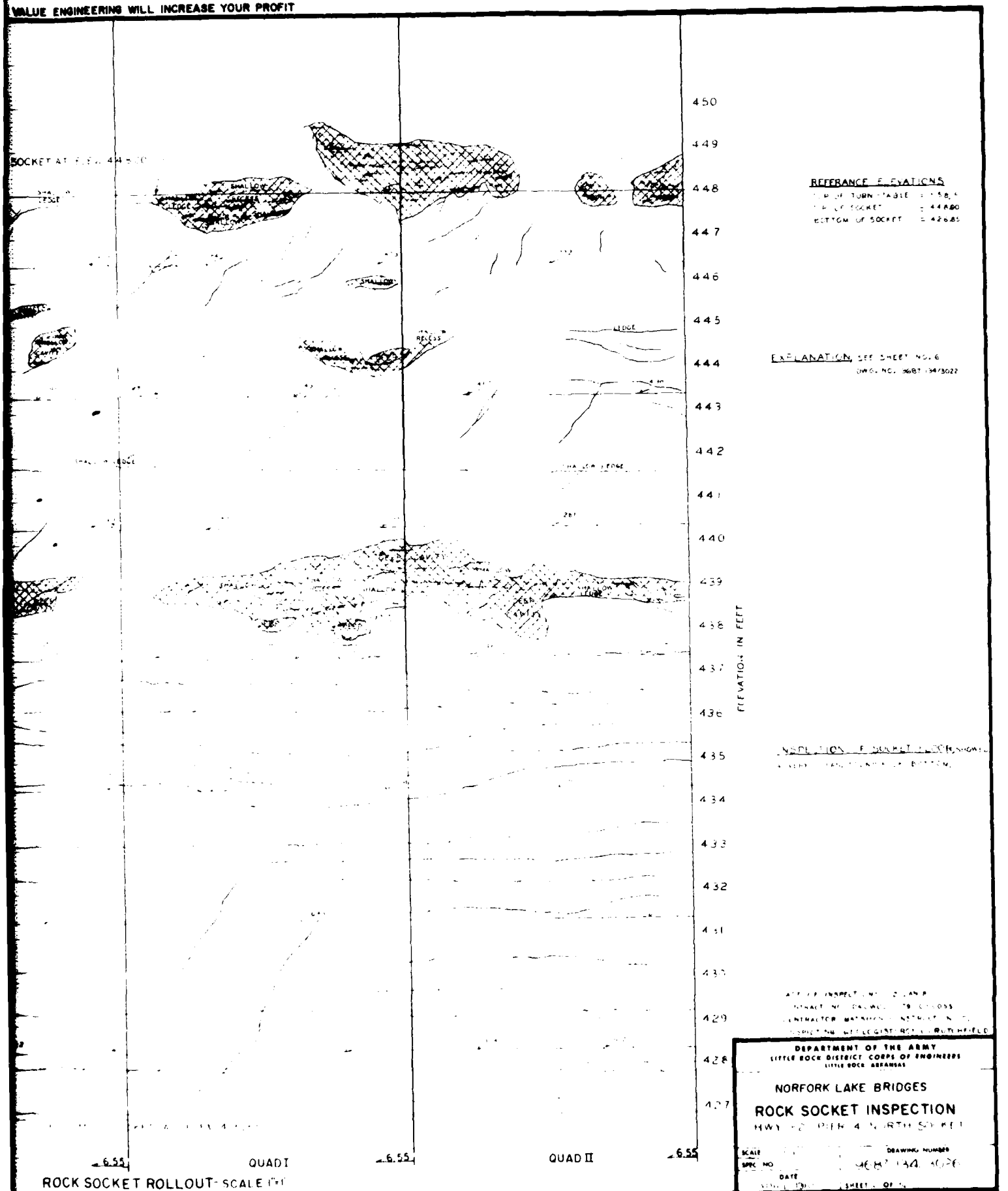
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERANCE ELEVATIONS

TOP OF TURN TABLE = 458.5
TOP OF SOCKET = 448.80
BOTTOM OF SOCKET = 426.85

EXPLANATION, SEE SHEET NO. 6
DWG. NO. 3687-134/3022

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

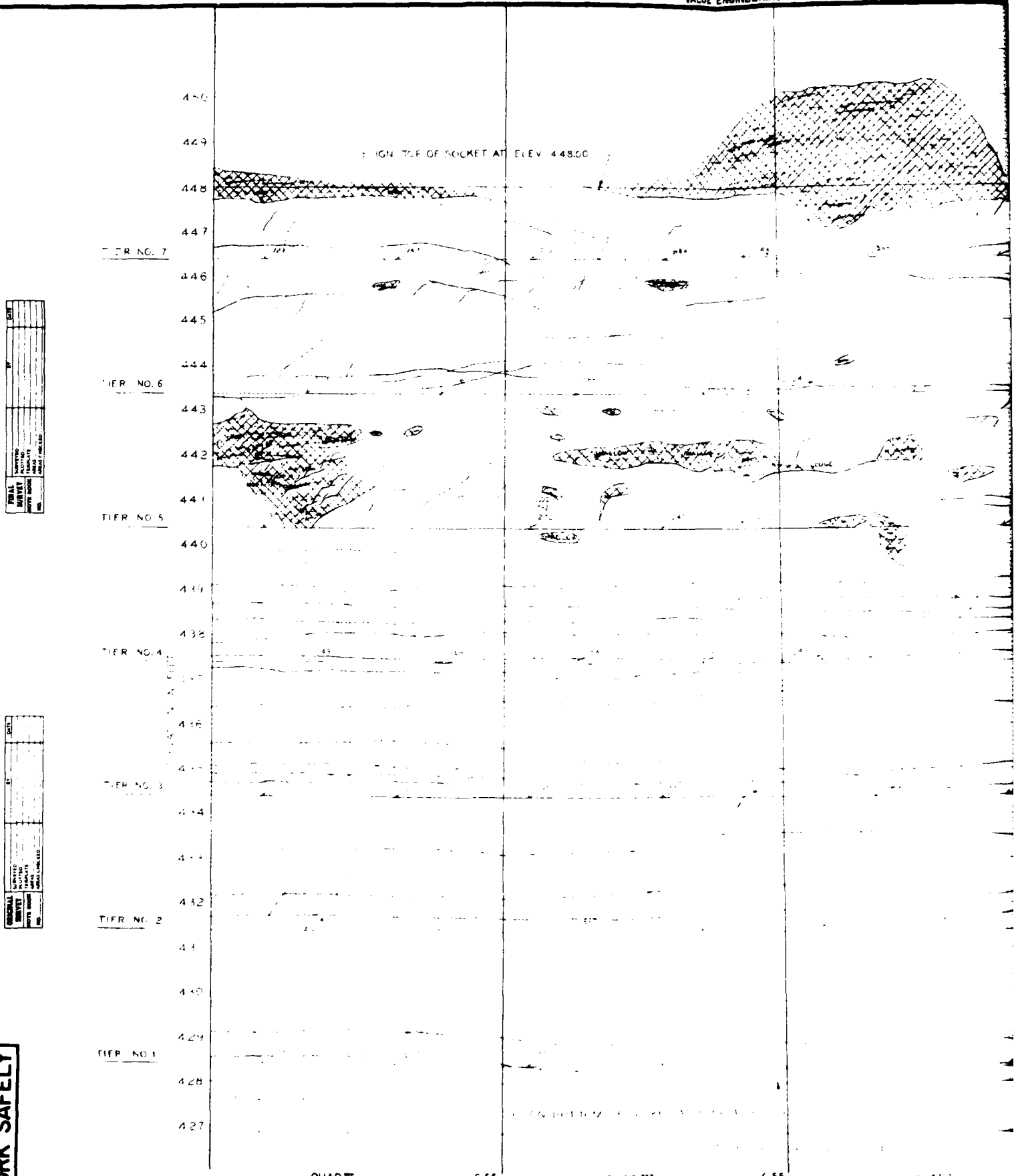
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62 PIER 4 NORTH SOCKET

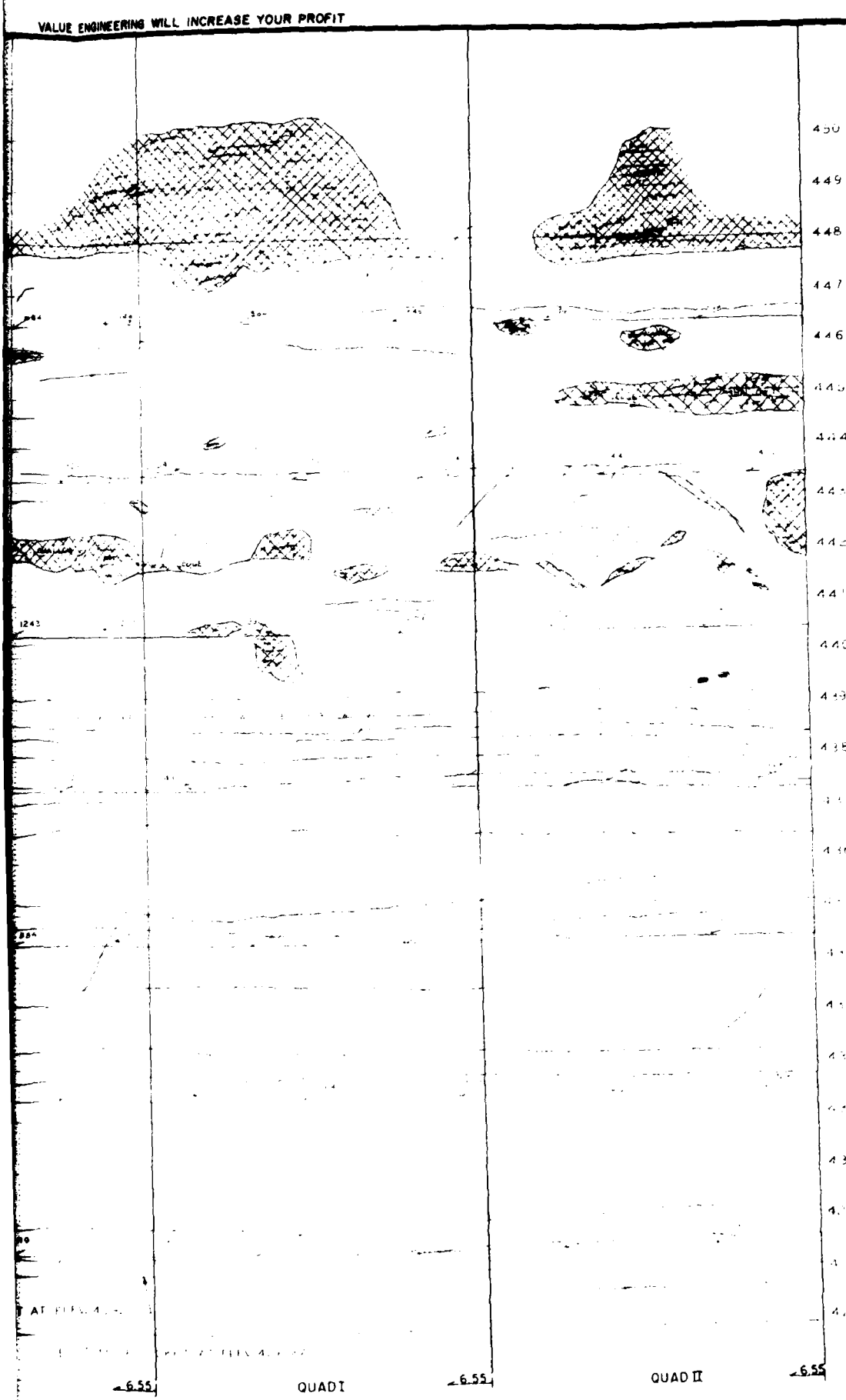
SCALE
DRAWING NUMBER
SPEC. NO
DATE
SHEET OF

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE = 448.0 FT

TOP OF SOCKET = 448.0

BOTTOM OF SOCKET = 426.5 FT

EXPLANATION OF SHEET NO. 1

DATA FROM BORING NO. 1

NOTES:

1. ALL ELEVATIONS REFER TO MEAN SEA LEVEL DATUM.
2. SEE SHEET NO. 2 FOR BORING LOCATIONS.
3. SEE SHEET NO. 3 FOR SOIL AND ROCK DESCRIPTIONS.

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE: AS SHOWN

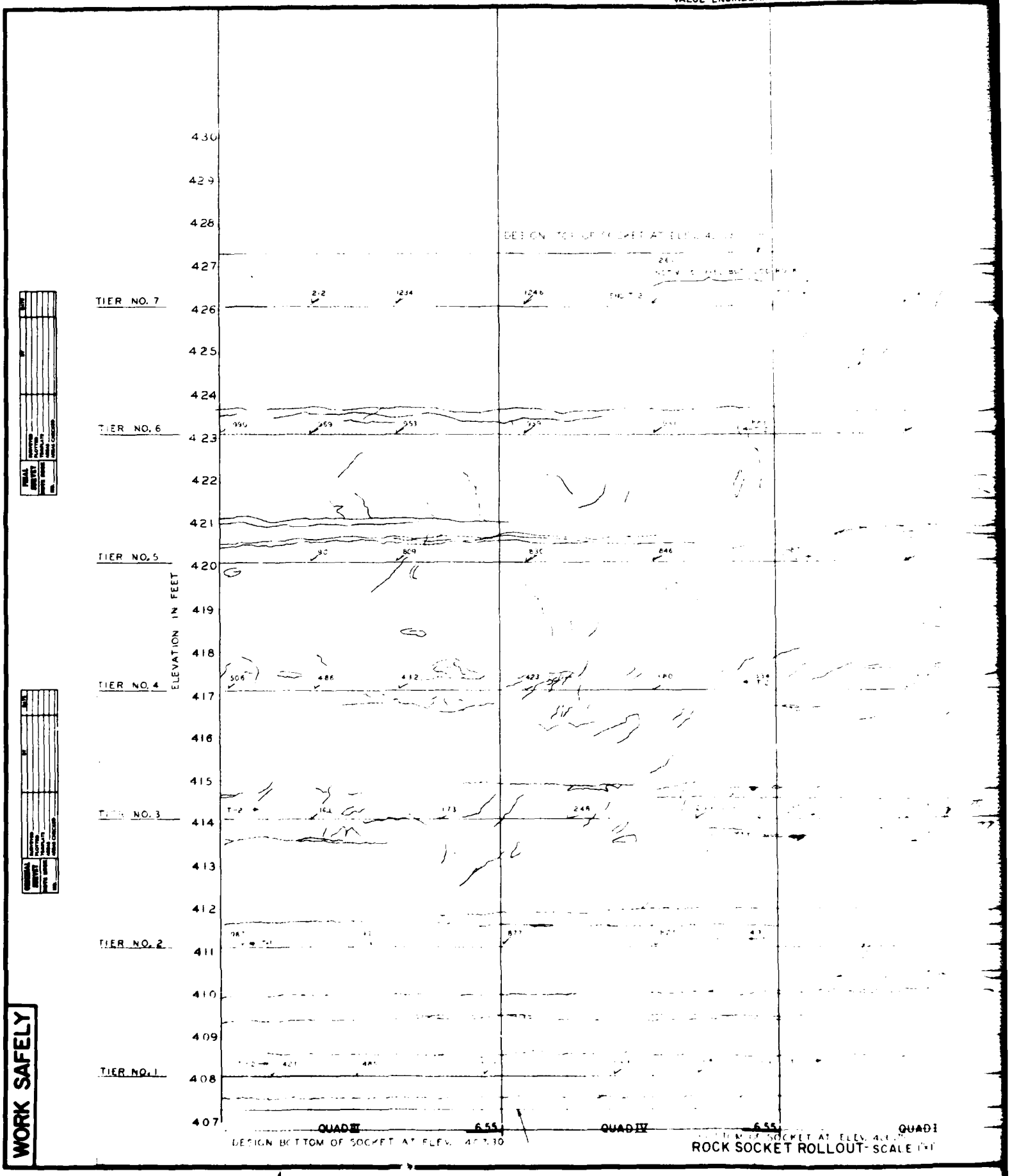
SPEC. NO.

DATE

DRAWING NUMBER

SHEET 1 OF 3

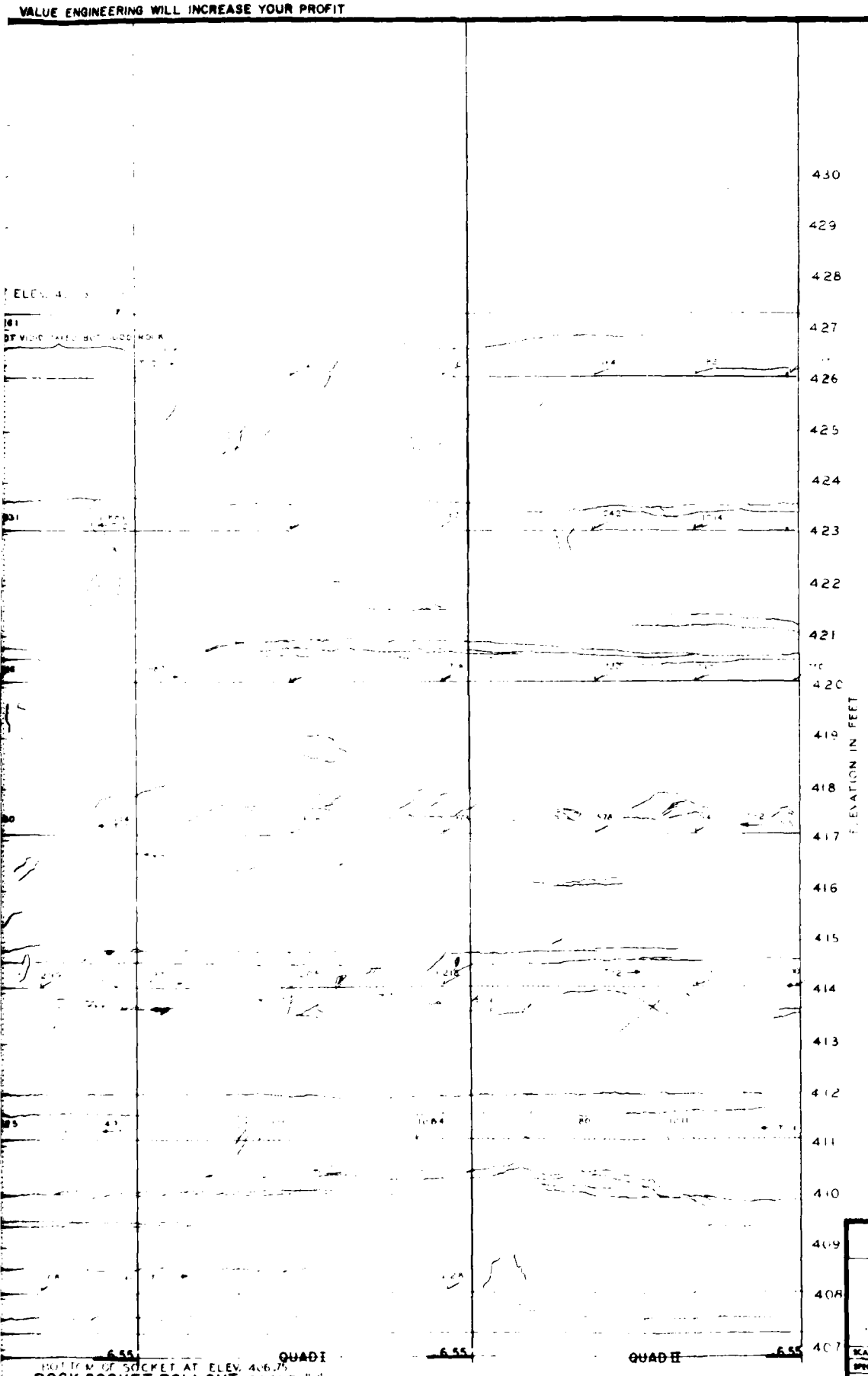
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURN TABLE 432.58

TOP OF SOCKET 421.35

BOTTOM OF SOCKET 416.75

EXPLANATION, SEE SHEET NO. 1

DWG NO. 96B7-134/3022

INSPECTION OF SOCKET FLOOR SHOWED A [illegible] WITH OCCASIONAL ROCK FRAGMENTS

DATE OF INSPECTION: 21 AUG 80

CONTRACT NO. DACW03-[illegible]

CONTRACTOR: MASSMAN CONSTRUCTION CO

INSPECTING GEOLOGISTS: BROWN & CRUTCHFIELD

BOTTOM OF SOCKET AT ELEV. 416.75

ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62 PIER 5 NORTH SOCKET

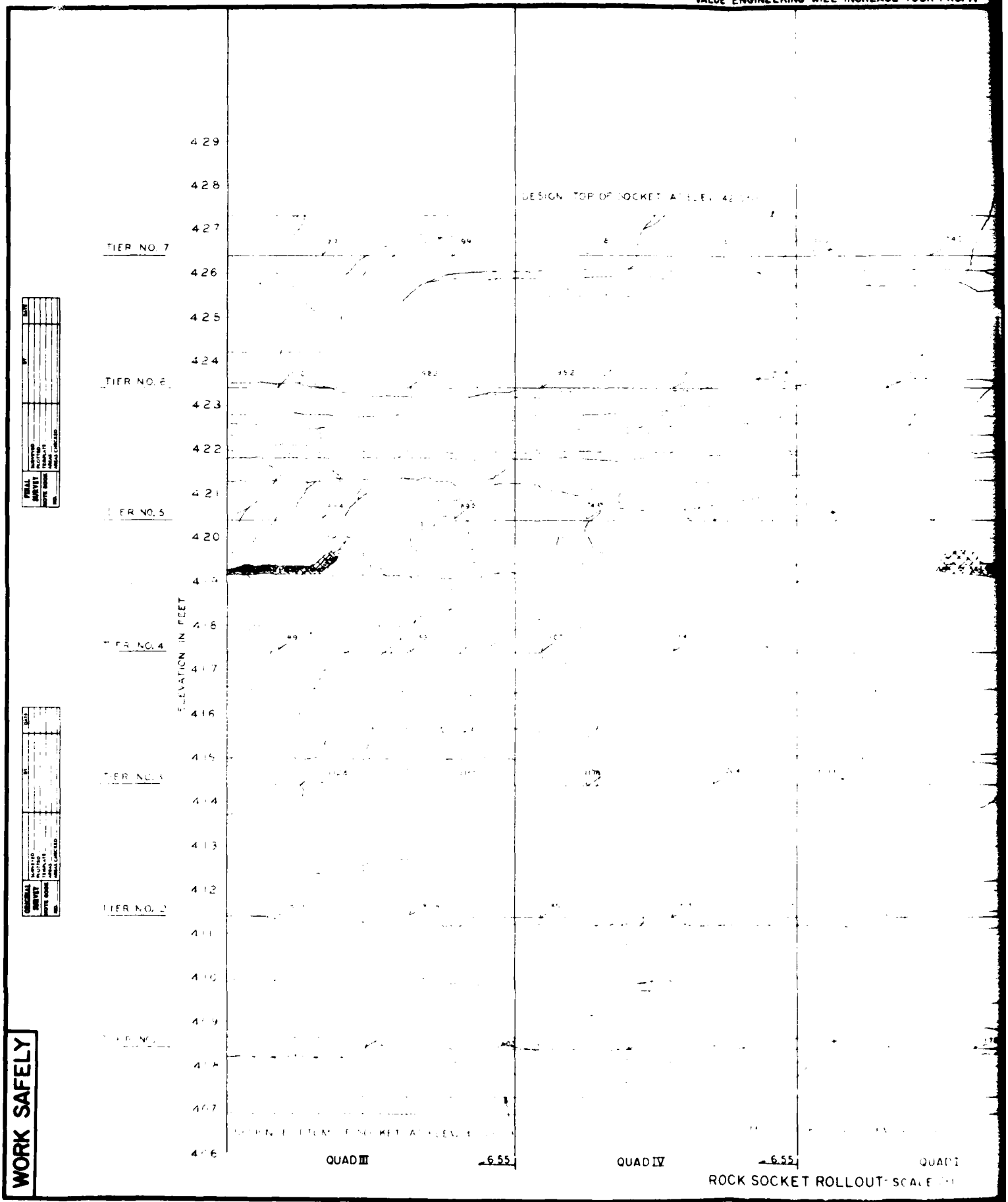
SCALE 1"=1'

SPEC NO

DRAWING NUMBER 96B7-134/3028

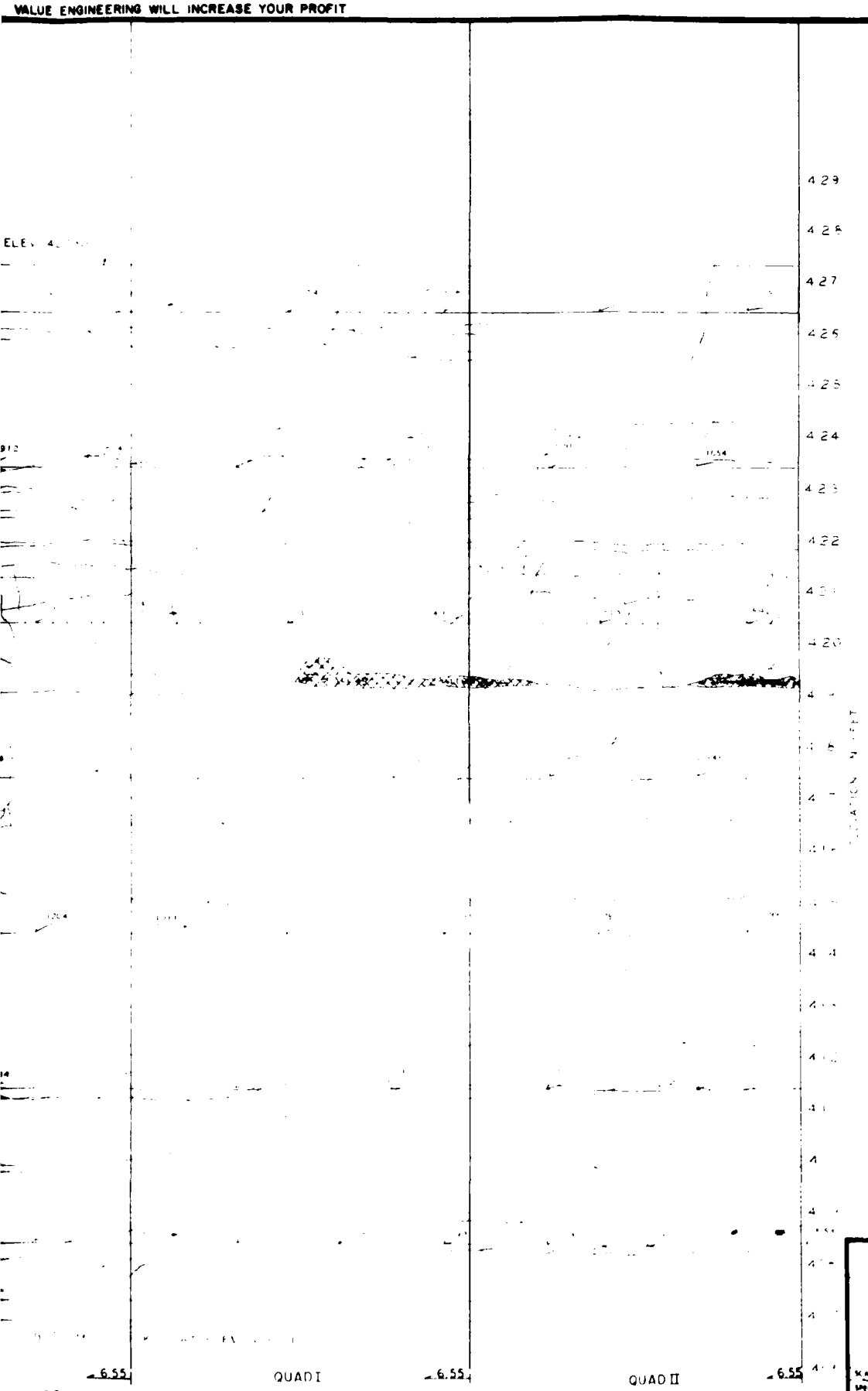
DATE APRIL 1980

SHEET 2 OF 12



ROCK SOCKET ROLLOUT- SCALE

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN TABLE = 427.4

TOP OF SOCKET = 427.10

BOTTOM OF SOCKET = 406.9

EXPLANATION SEE SHEET NO. 1

ENG. NO. 1887-34-9022

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

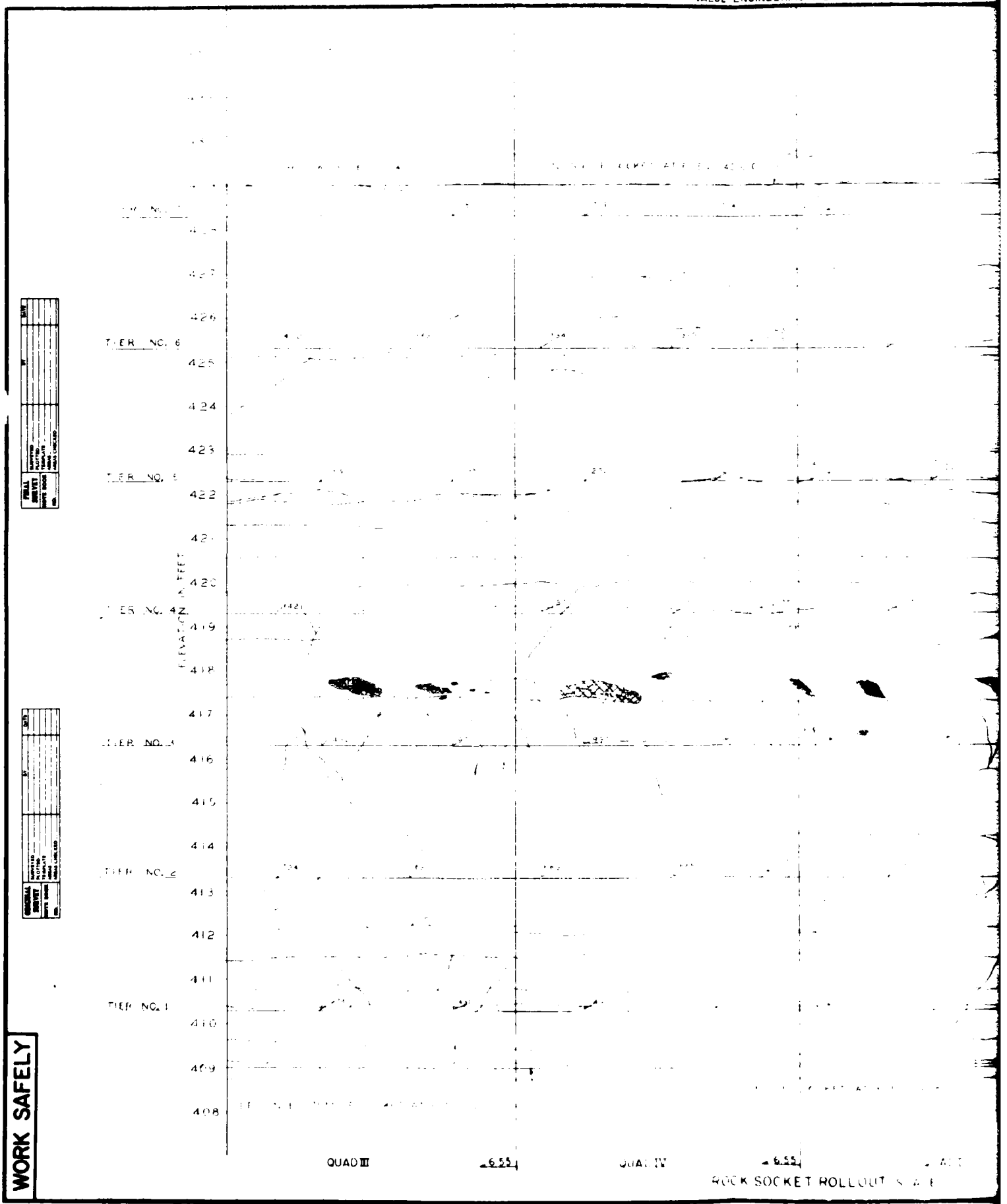
SCALE

DRAWING NUMBER

SPEC NO

DATE

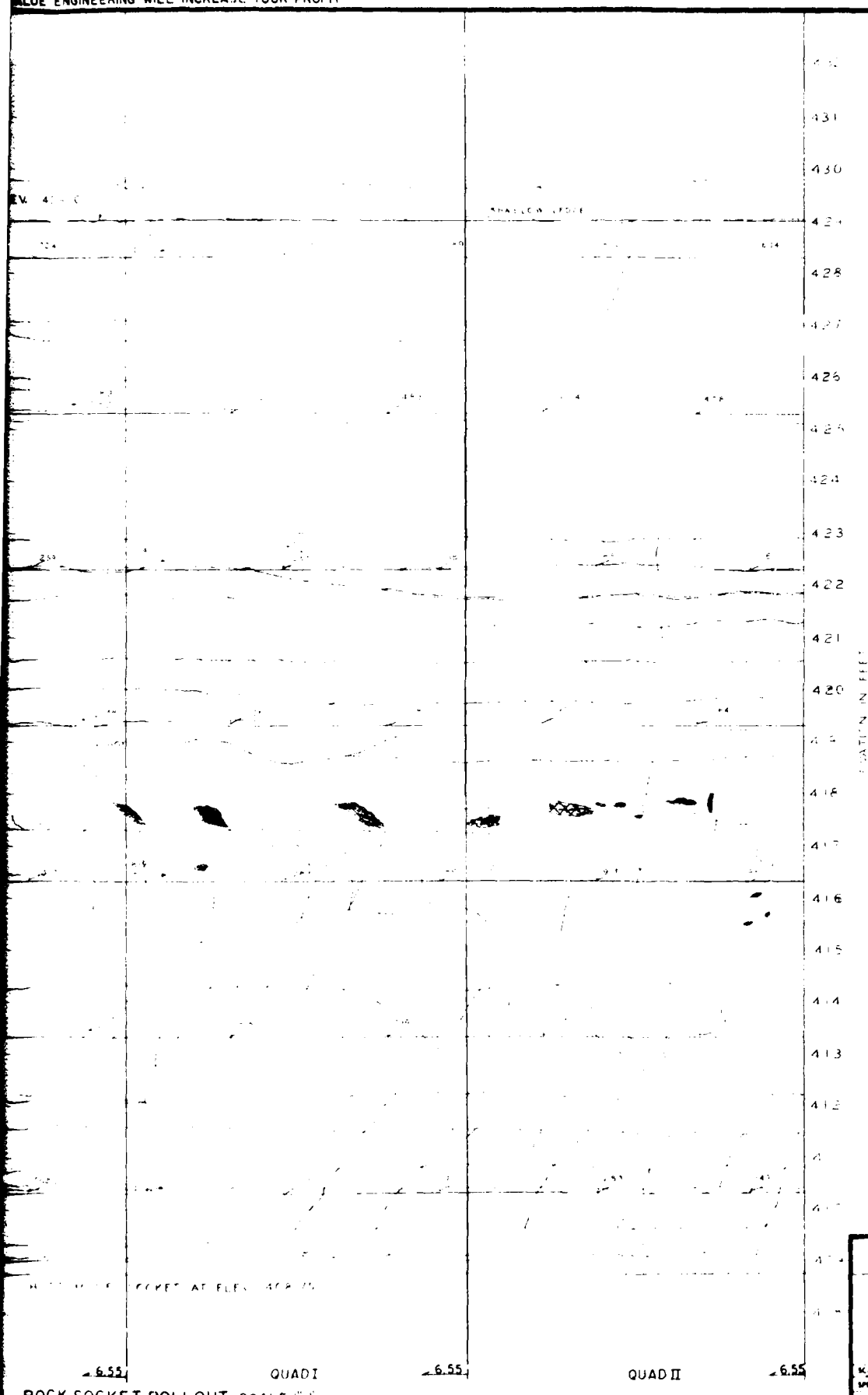
SHEET OF



ROCK SOCKET ROLLOUT

WORK SAFELY

ALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXPLANATION SEE SHEET NO. 4

INSPECTION OF SOCKET [illegible] WED
A GOOD SOUND ROCK BOTTOM WITH
OCCASIONAL [illegible] SAND AND ROCK FRAGMENTS
AT [illegible] THE BASE OF THE SOCKET WALLS.

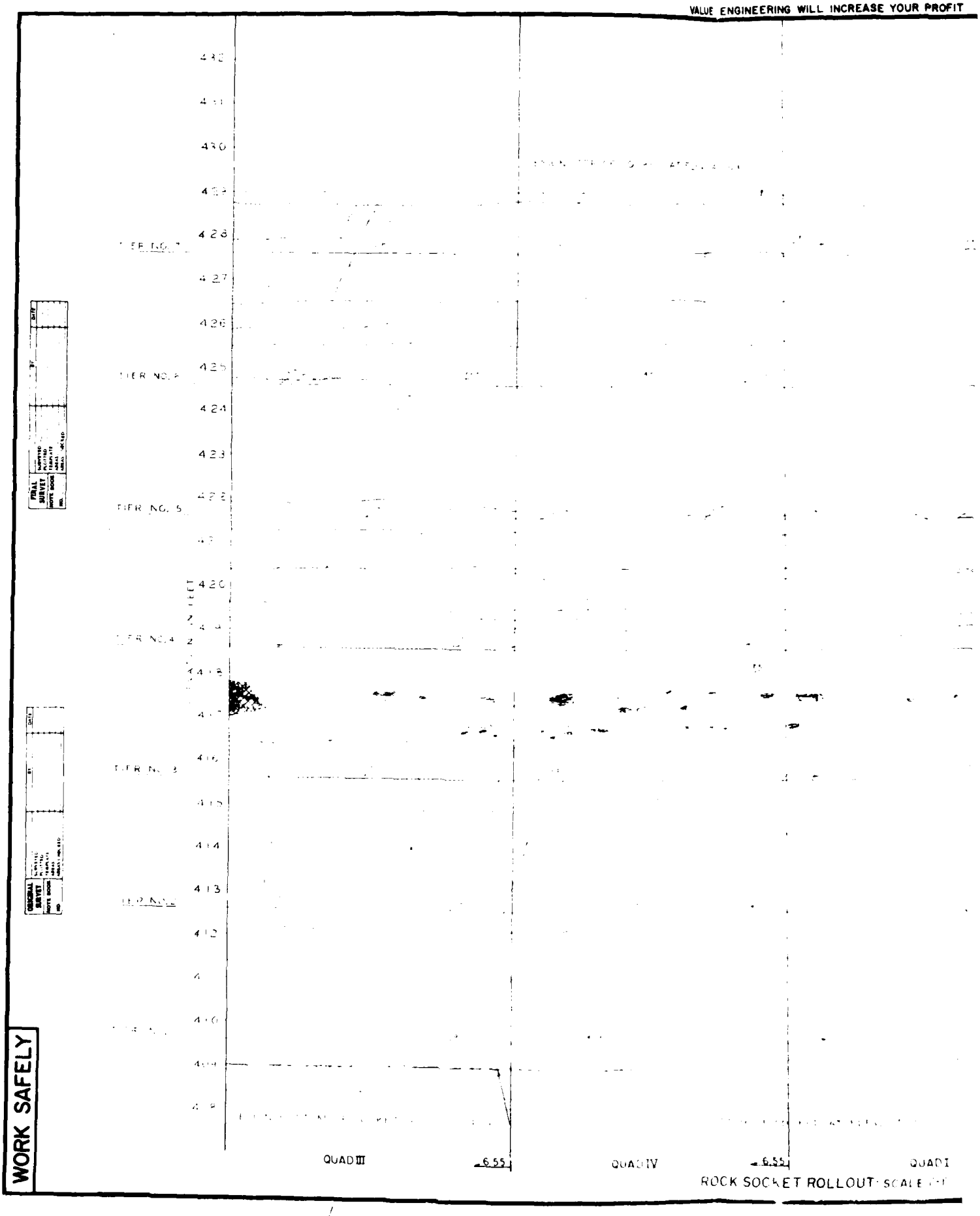
DATE OF INSPECTION [illegible]
CONTRACT NO. DA-03-[illegible]
CONTRACTOR: WARSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. NELSON, E.I.T.

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

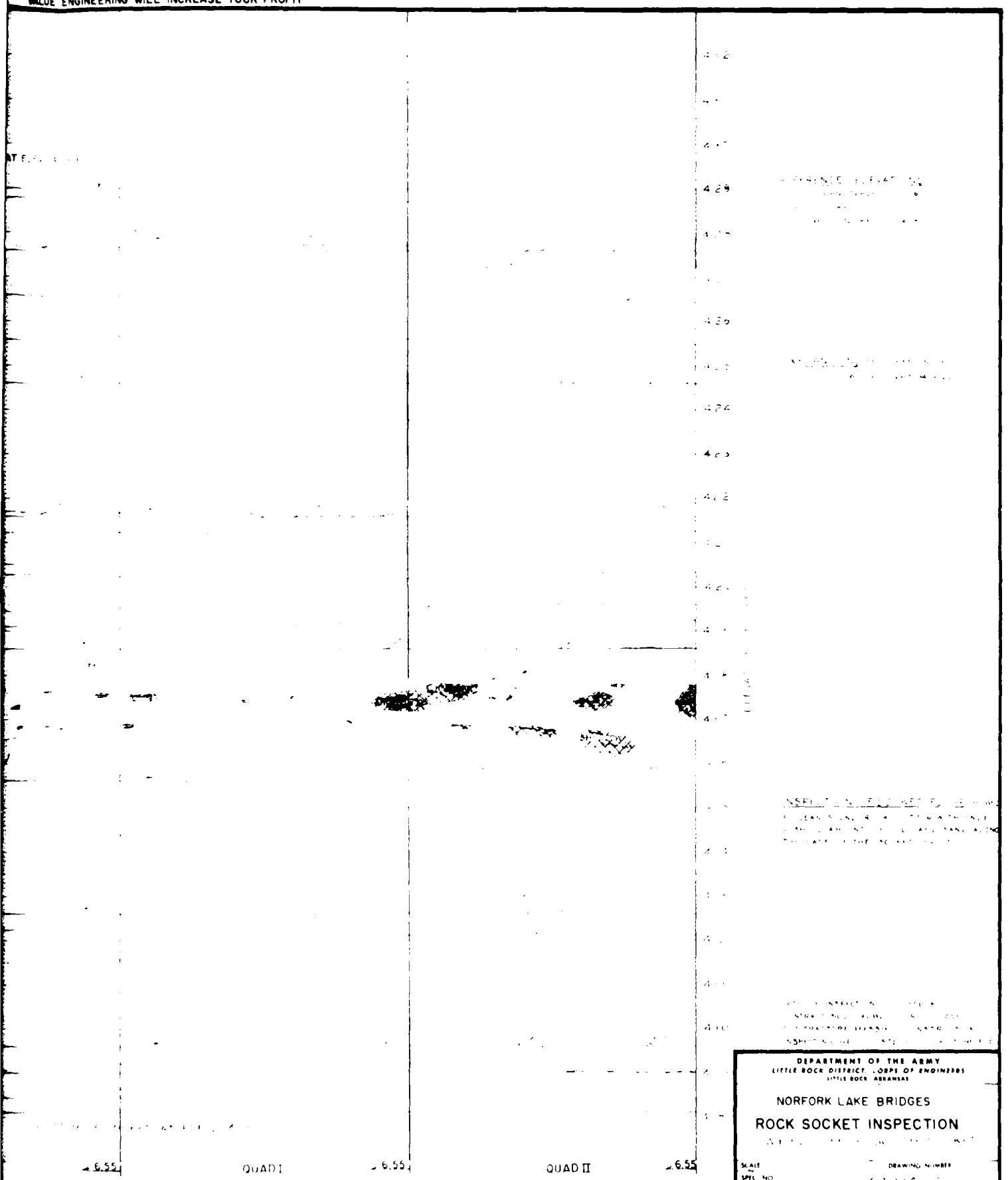
SCALE
SPEC. NO.
DATE
DRAWING NUMBER
[illegible] 1343-D-30
SHEET 4 OF [illegible]



ROCK SOCKET ROLLOUT SCALE

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



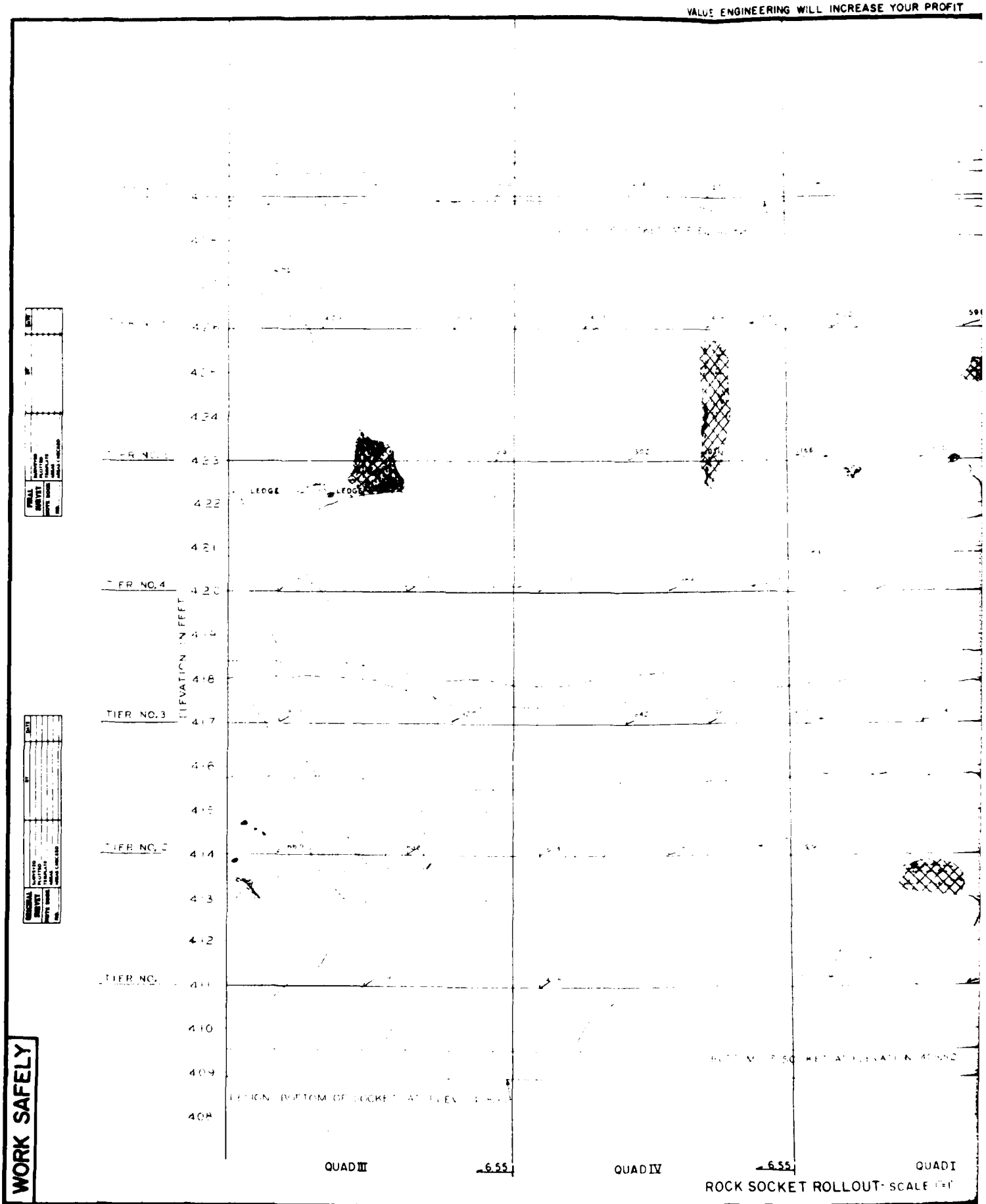
ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

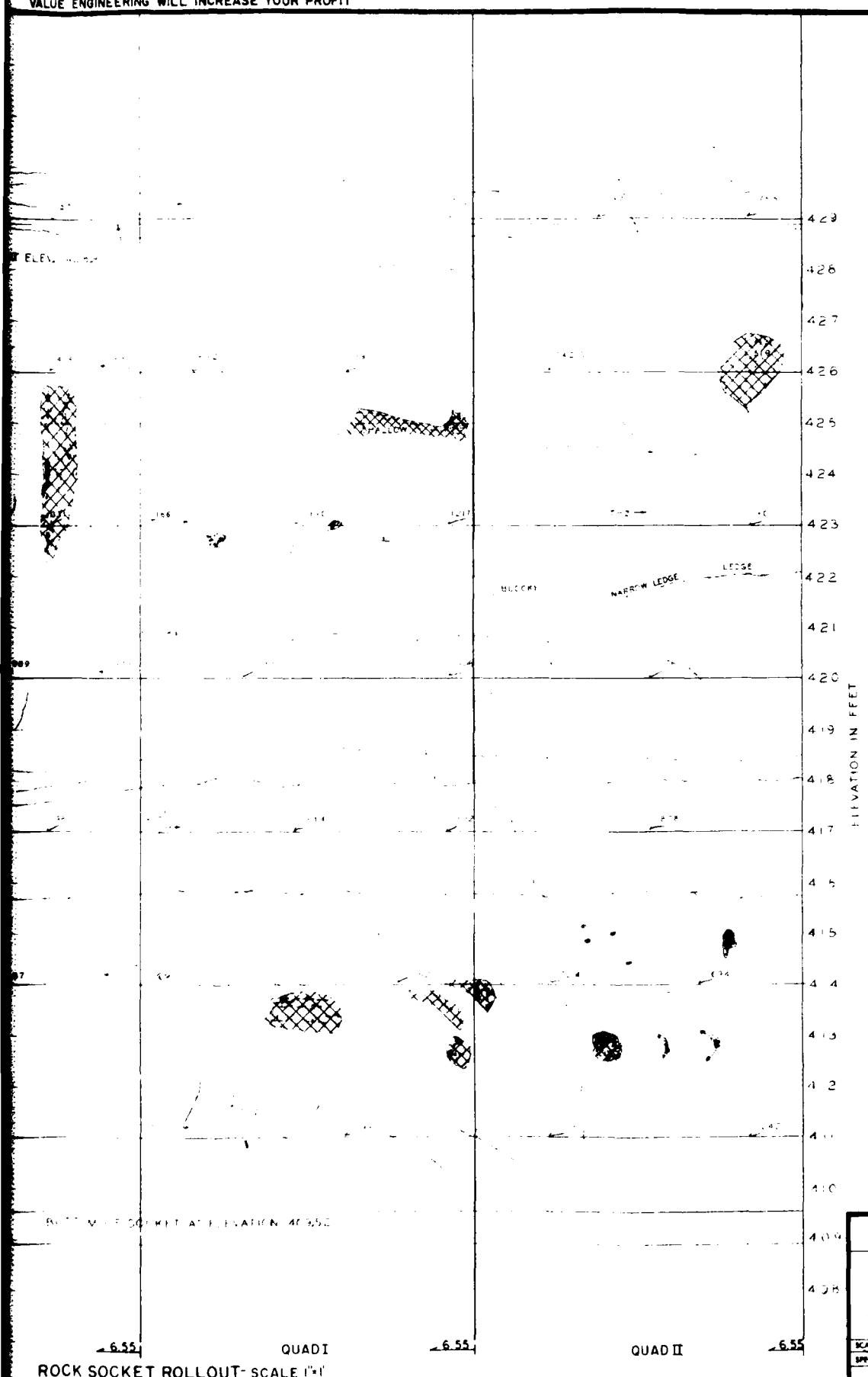
SCALE
SPEC. NO
DATE
DRAWING NUMBER
SHEET OF



ROCK SOCKET ROLLOUT- SCALE

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURNTABLE
TOP OF SOCKET
BOTTOM OF SOCKET

EXPLANATION, SEE SHEET NO. 6
W.O. NO. SHEET 34 3022

INSPECTION OF SOCKET FOR

DATE OF INSPECTION
CONTRACT NO.
CONTRACTOR MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST/ENGINEER

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

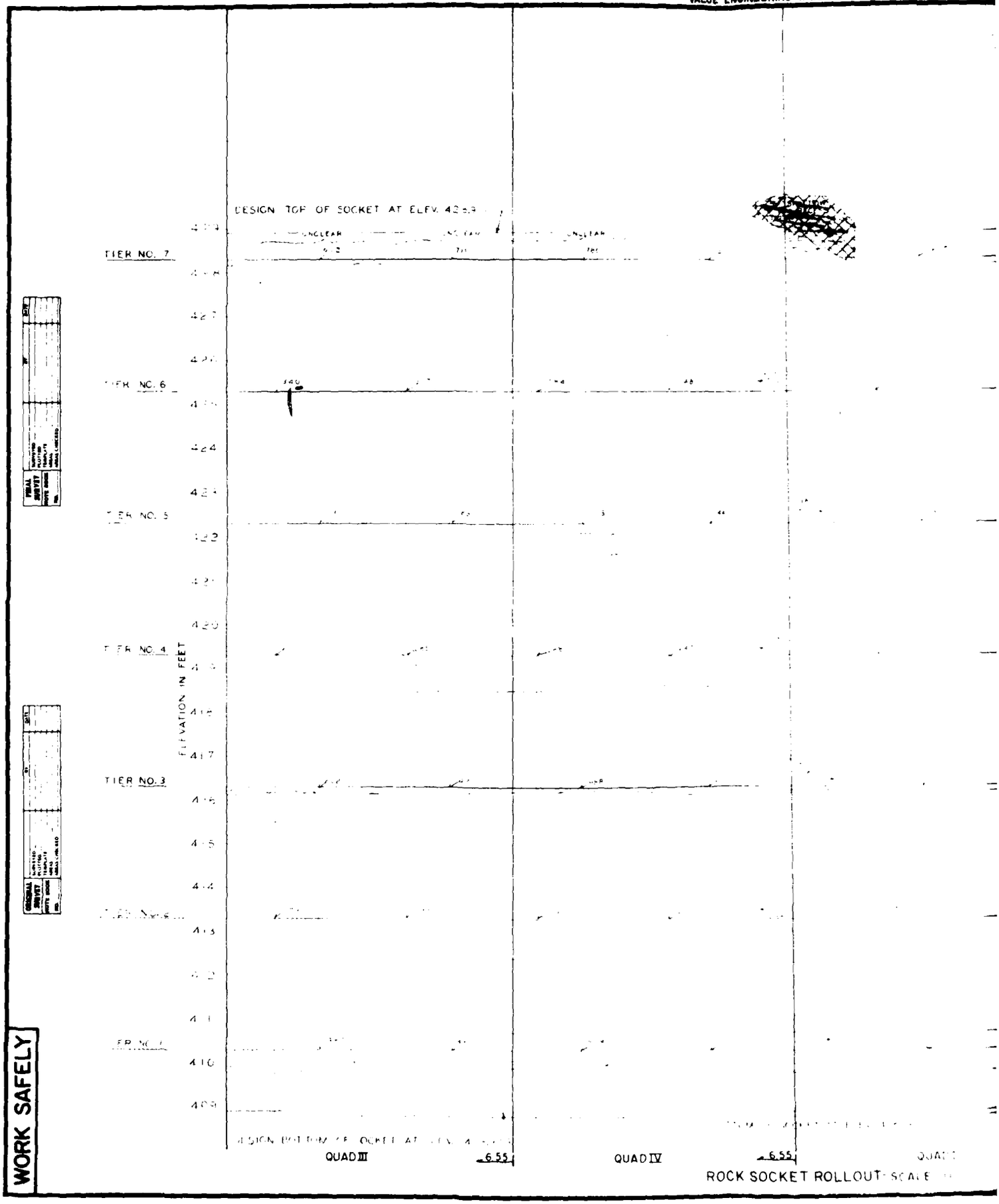
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

PIER 2 PIER 3 NORTH SOCKET

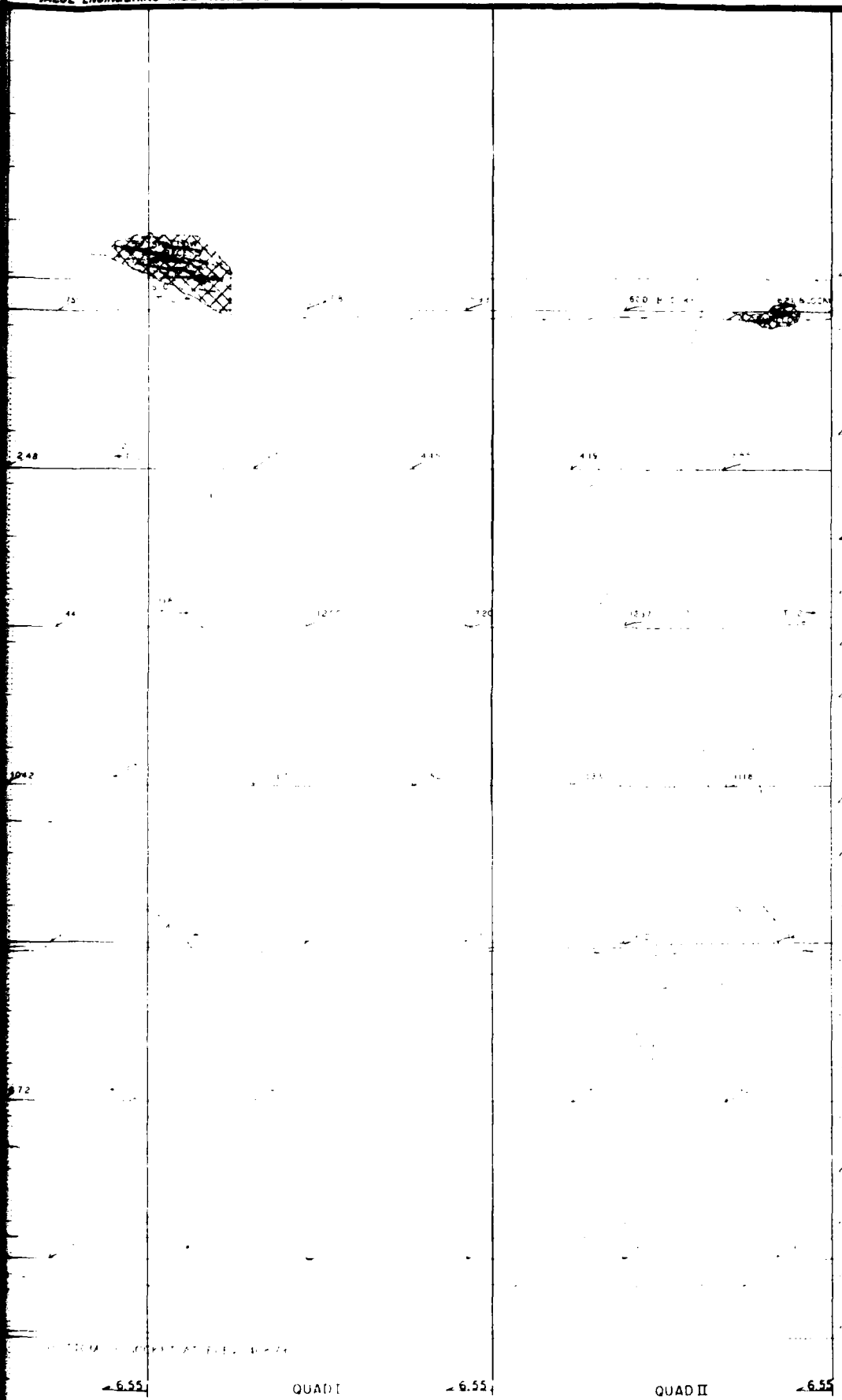
SCALE	DRAWING NUMBER
SPEC NO.	9687-134/3032
DATE APRIL 1981	SHEET 16 OF

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE (1"=

REFERENCE ELEVATIONS

TOP OF TURF TABLE = 435.04
TOP OF SOCKET = 428.41
BOTTOM OF SOCKET = 408.79

EXPLANATION SEE SHEET NO.
DWG. NO. 96/34/3022

INSPECTION OF SOCKET FOR SHOWING
THE SOUND ROCK BOTTOM IN THE
AND NOTED FILL, SAND, AND ROCK

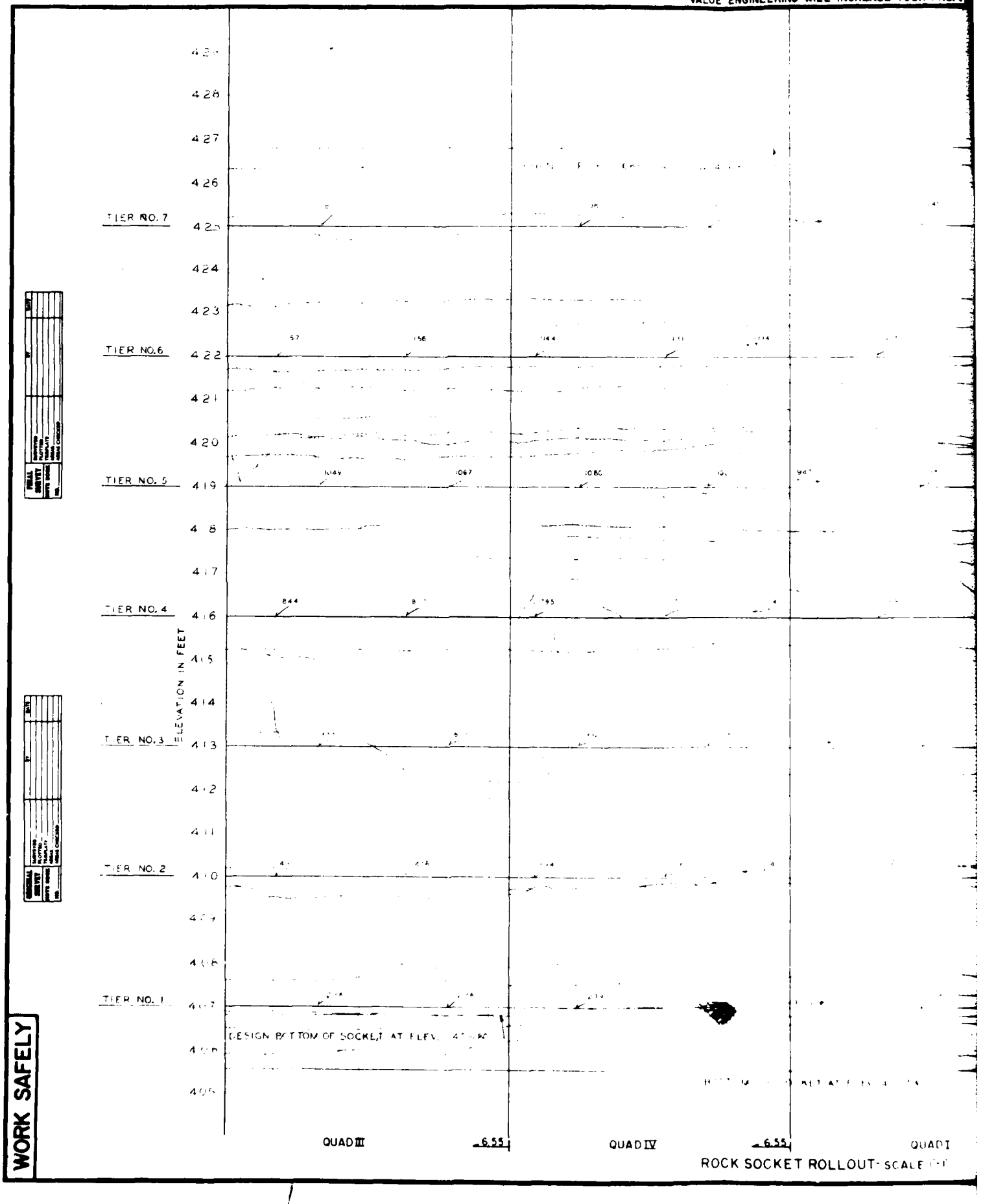
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE
SPEC. NO.
DRAWING NUMBER
96/34/3033
DATE
SHEET 7 OF

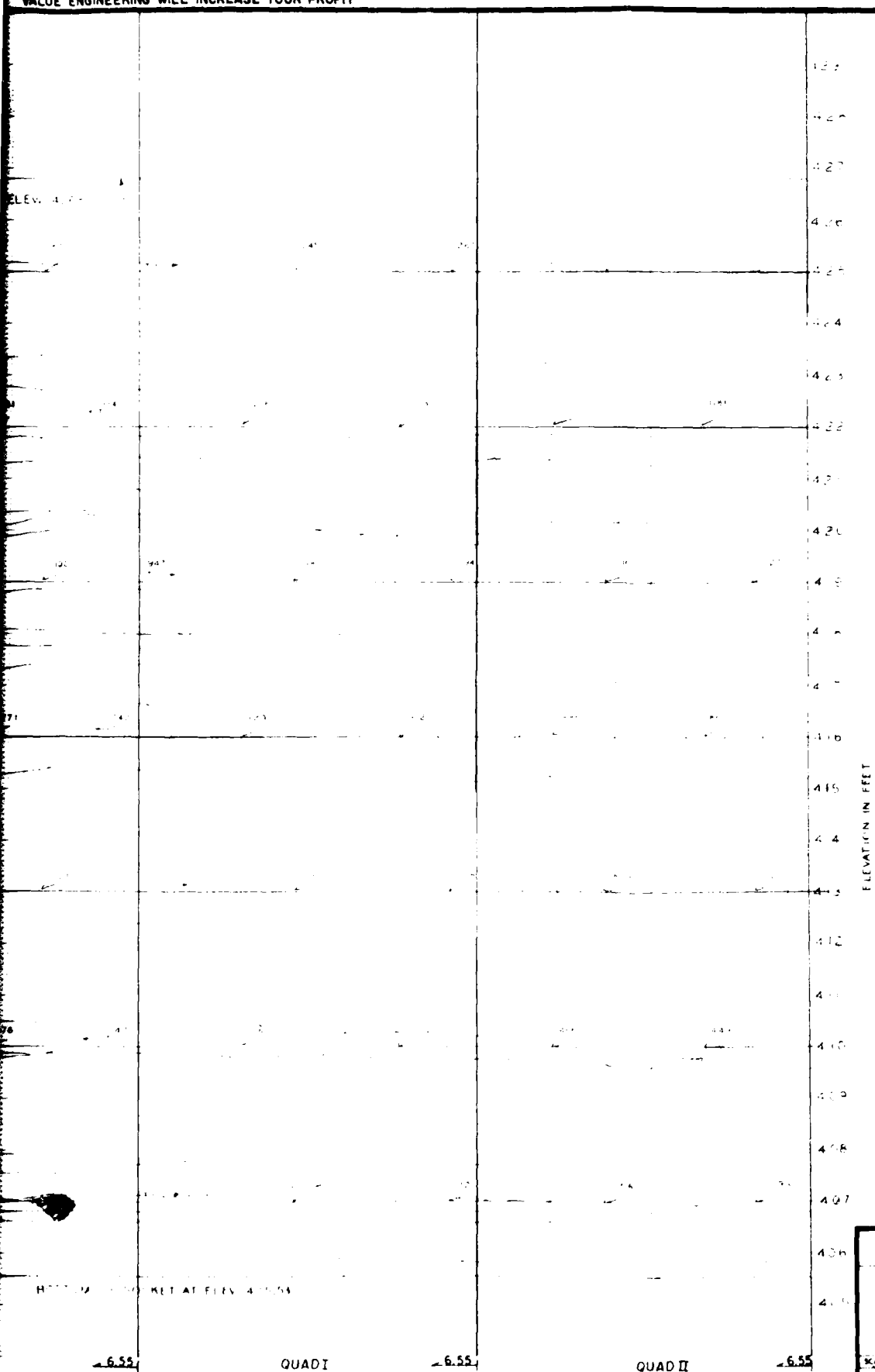
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXCAVATION TYPE SHEET NO. 1

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE

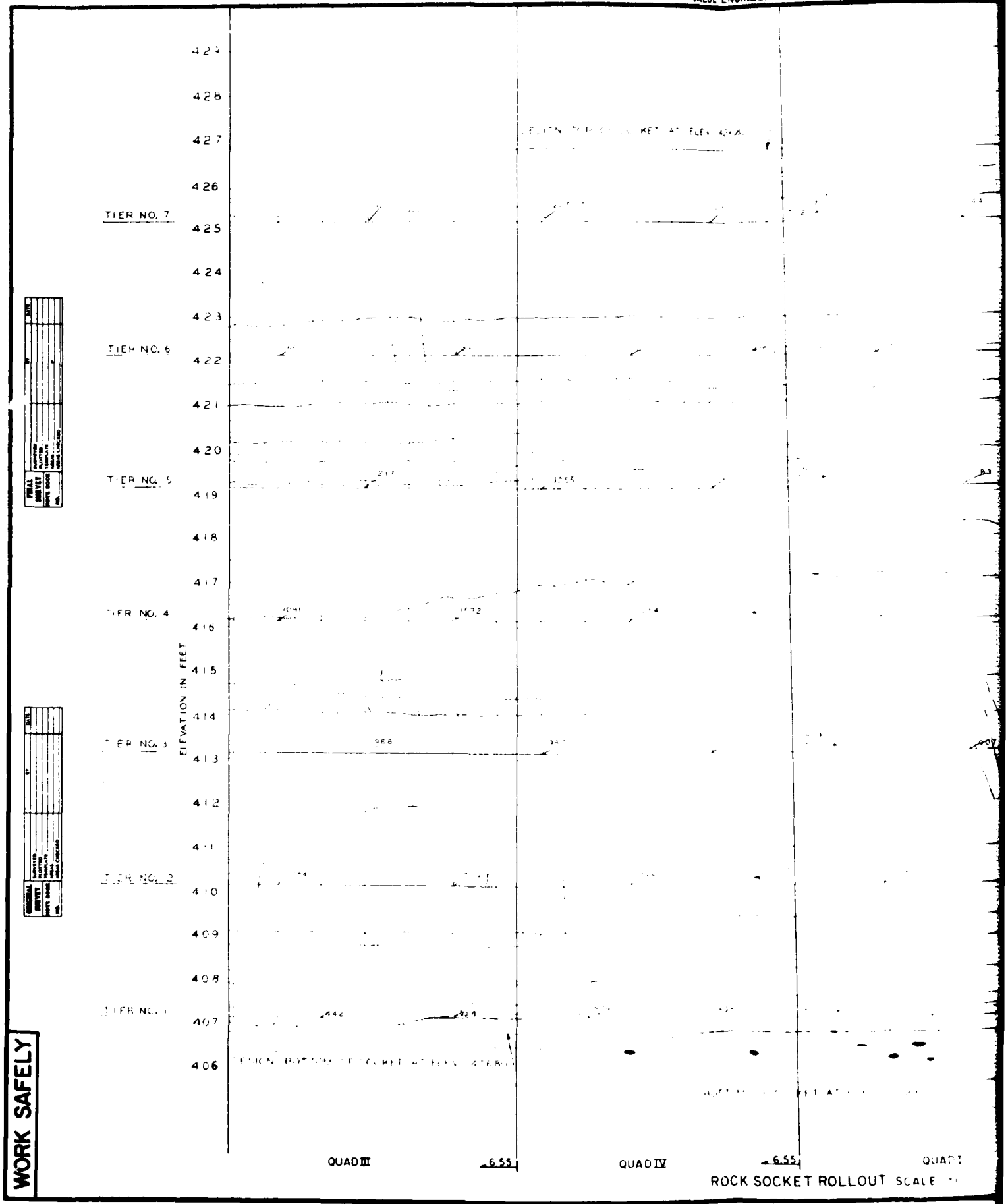
SPEC NO.

DRAWING NUMBER
96857 1344/3034

DATE

SHEET OF

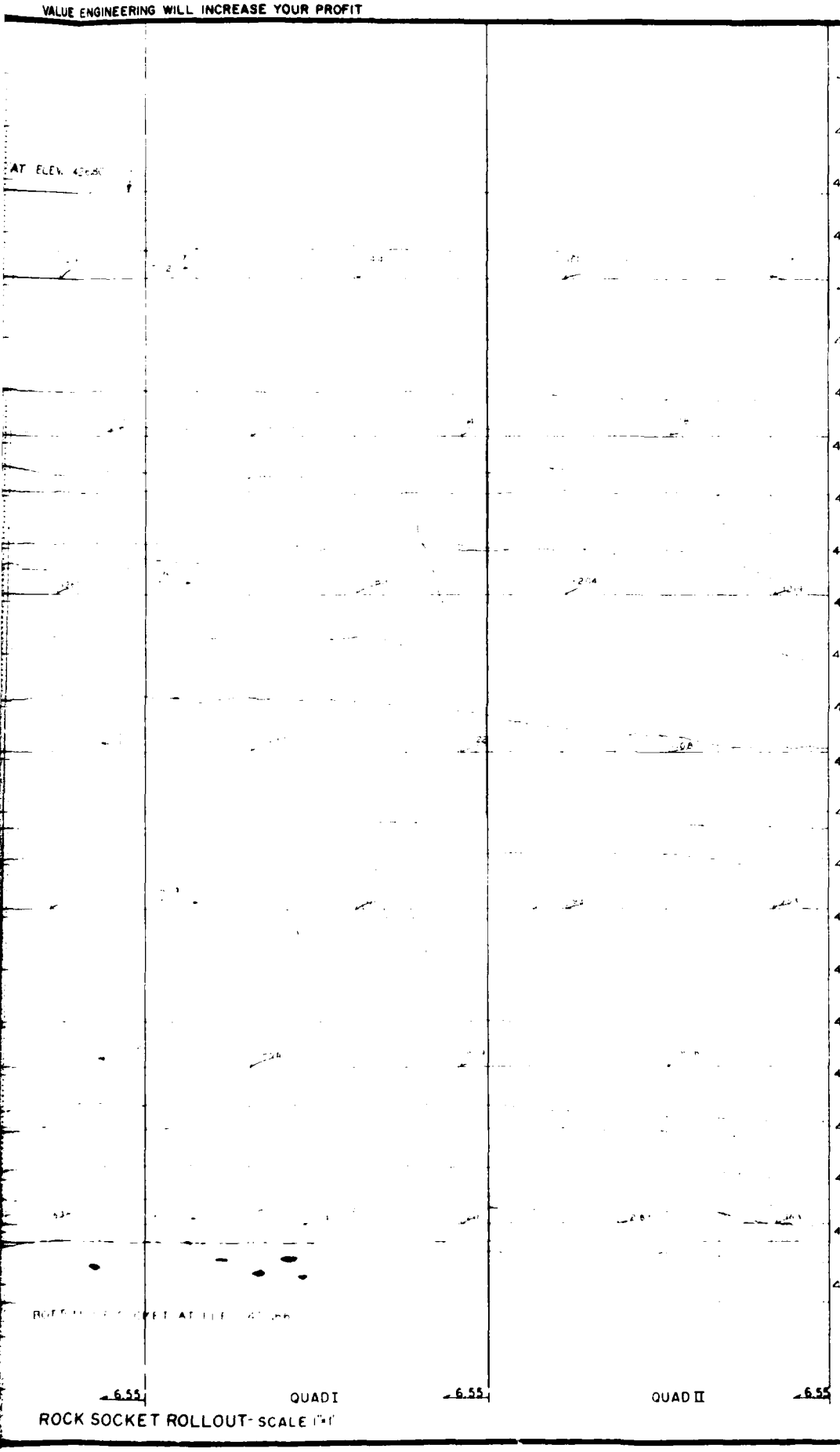
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT SCALE

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURN TABLE = 426.36

TOP OF SOCKET = 426.80

BOTTOM OF SOCKET = 405.66

EXPLANATION SEE SHEET NO. 1

DWG NO. 6B7-134/3022

INSPECTION OF SOCKET FLOORS WERE

A CLEAN SOUND ROCK BOTTOM WITH

OCCASIONAL VUGS

DATE OF INSPECTION 26 MAR 8

CONTRACTOR JACKSON CONSTRUCTION

CONSTRUCTION MANAGER CONSTRUCTION

CONSULTING GEOLOGIST NOEL KRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE

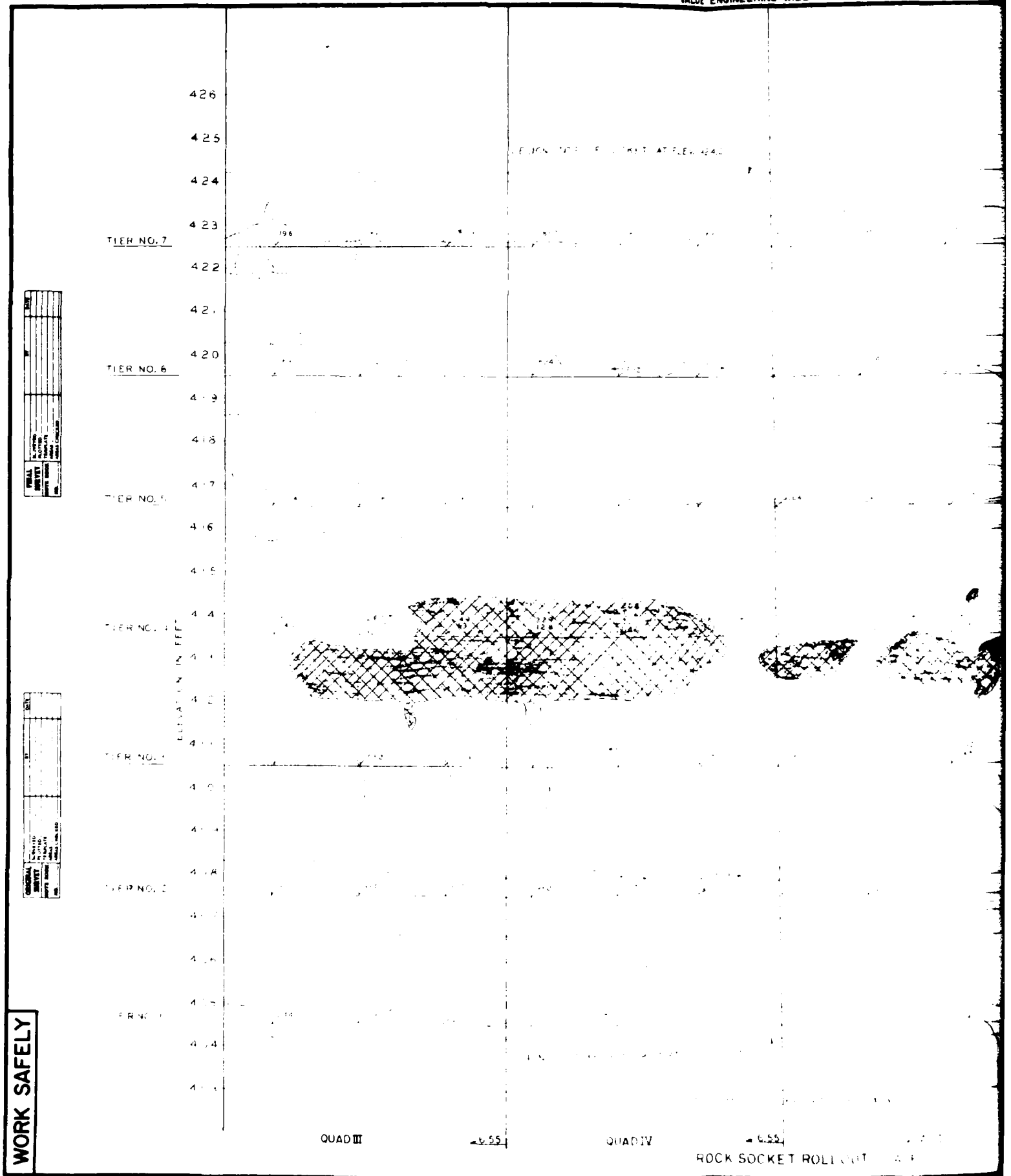
SPEC NO

DATE

DRAWING NUMBER
6B7-134/3035

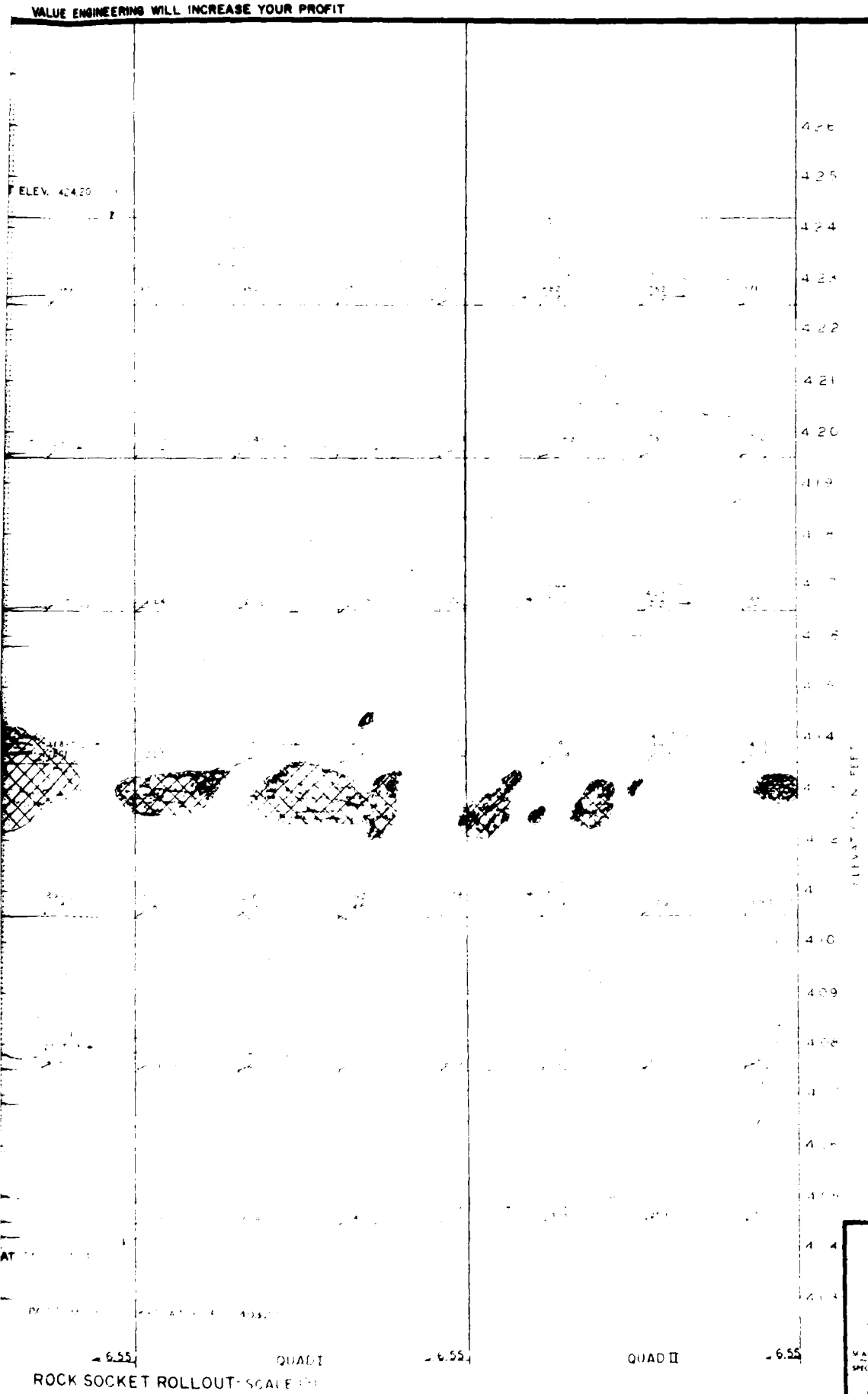
SHEET 1 OF 1

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE

REFERENCE ELEVATIONS

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

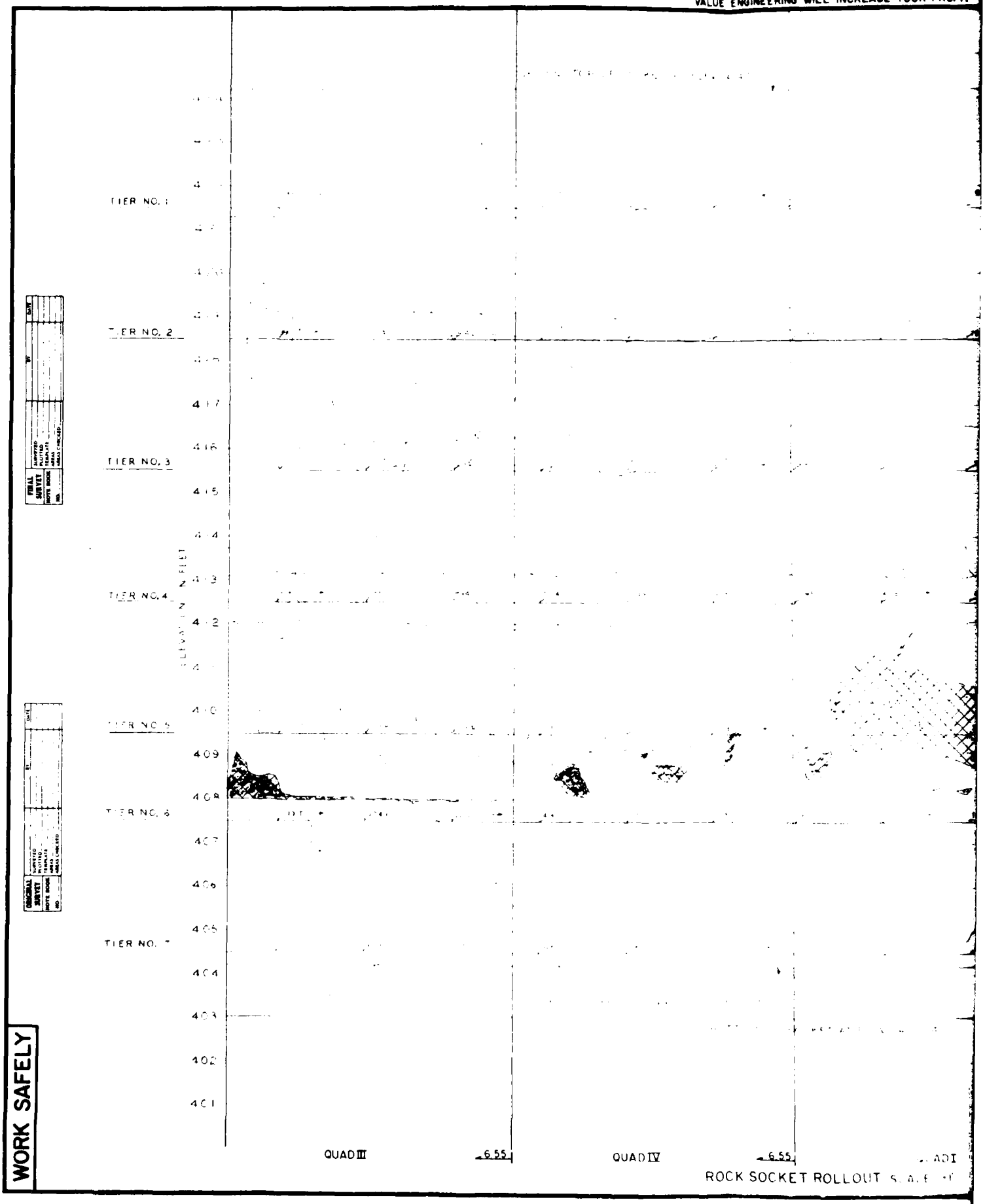
HWY 62 PIER 4 NORTH SOCKET

DRAWING NUMBER

6

DATE
4 NOV 1980

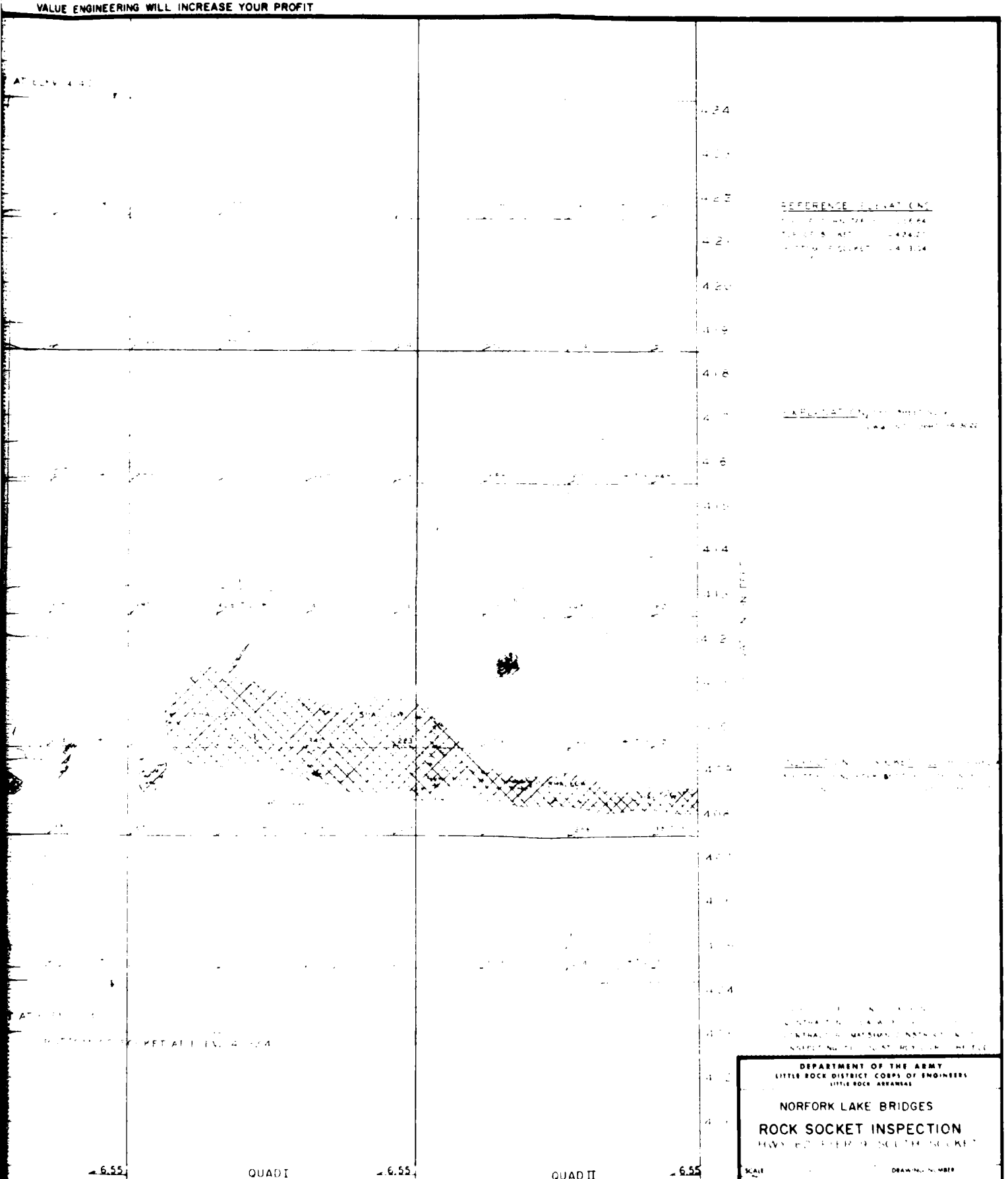
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



WORK SAFELY

ROCK SOCKET ROLLOUT

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



QUAD I

QUAD II

ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

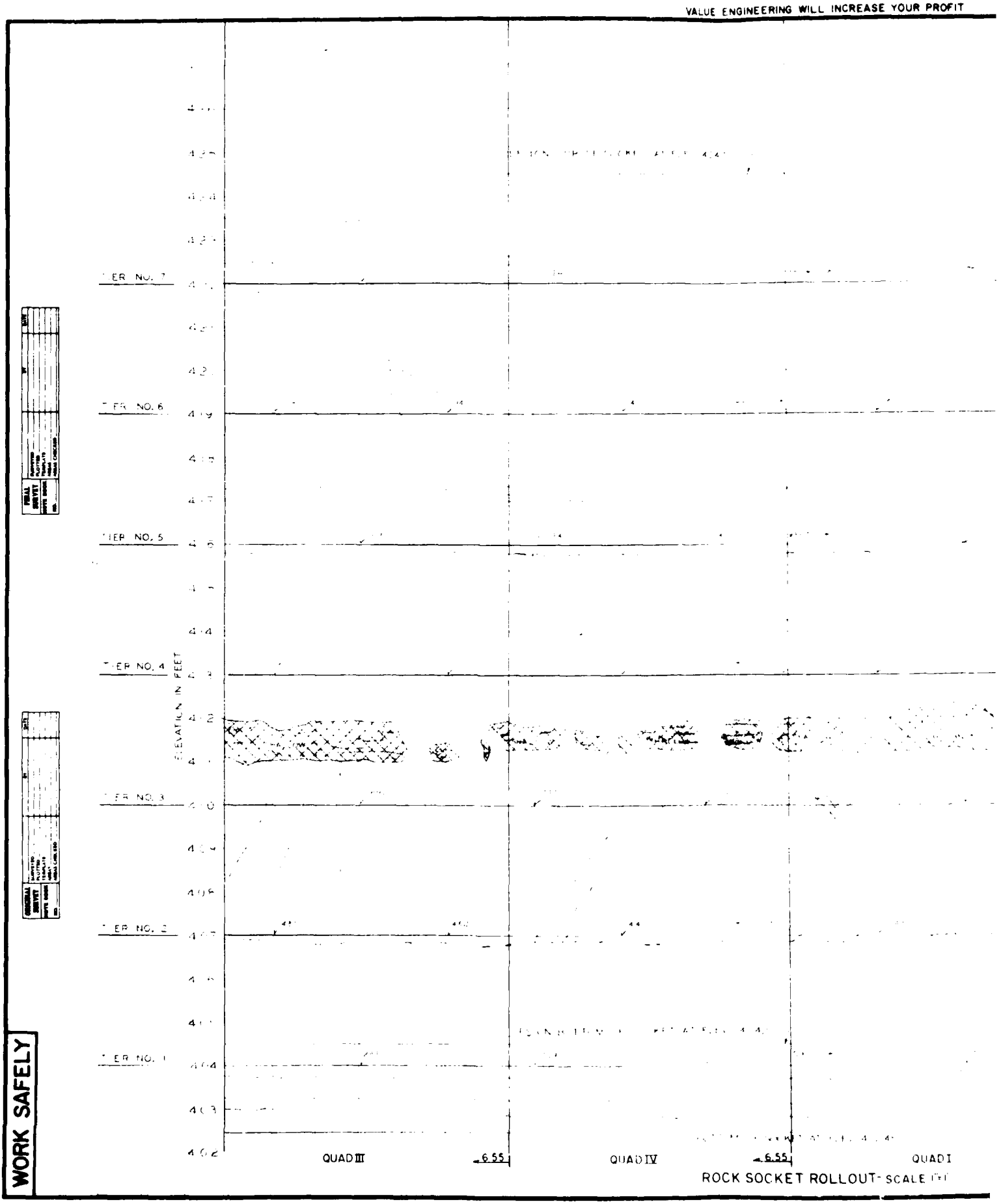
SCALE

DRAWING NUMBER

SPEC NO

DATE

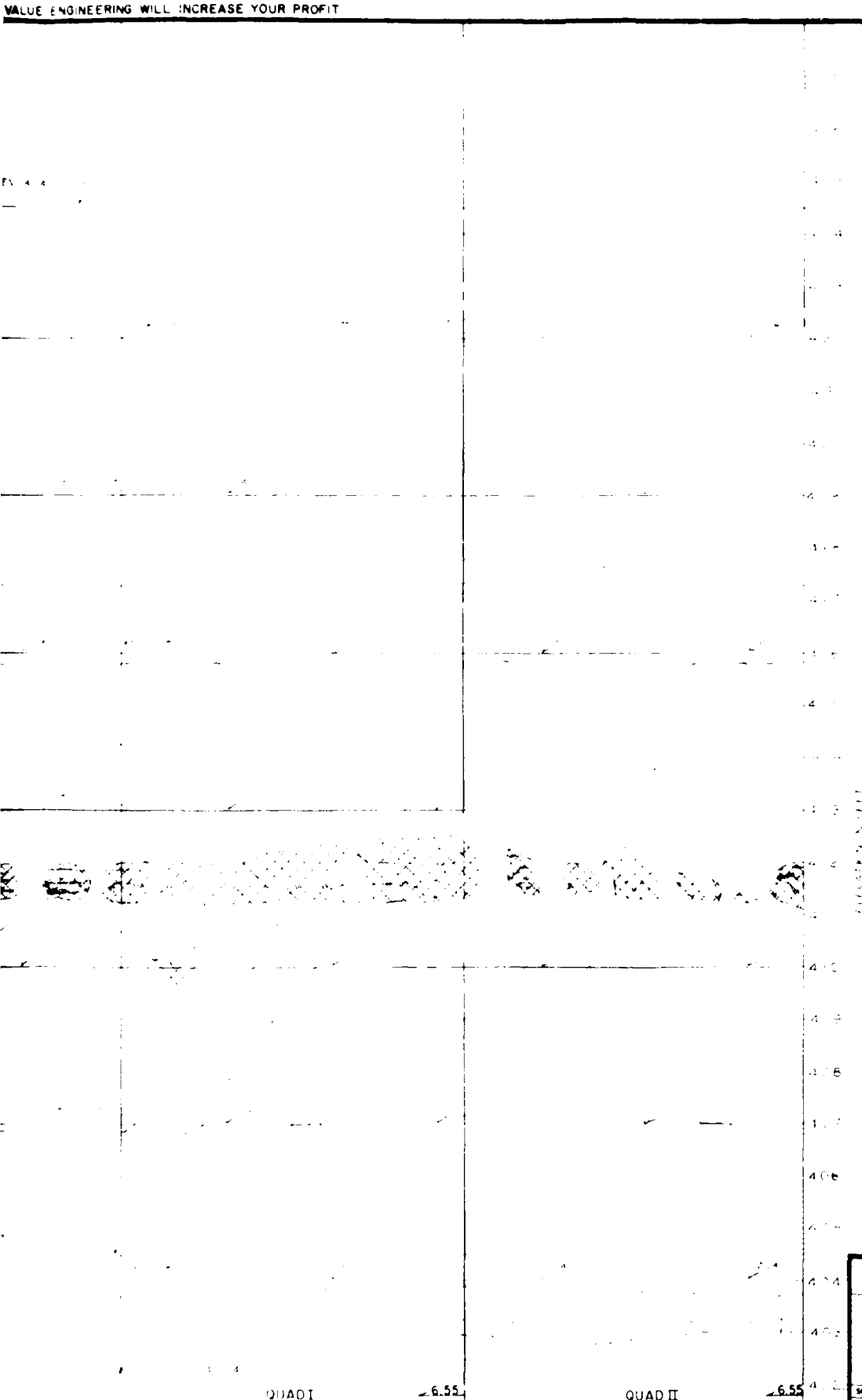
SHEET OF



ROCK SOCKET ROLLOUT- SCALE

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



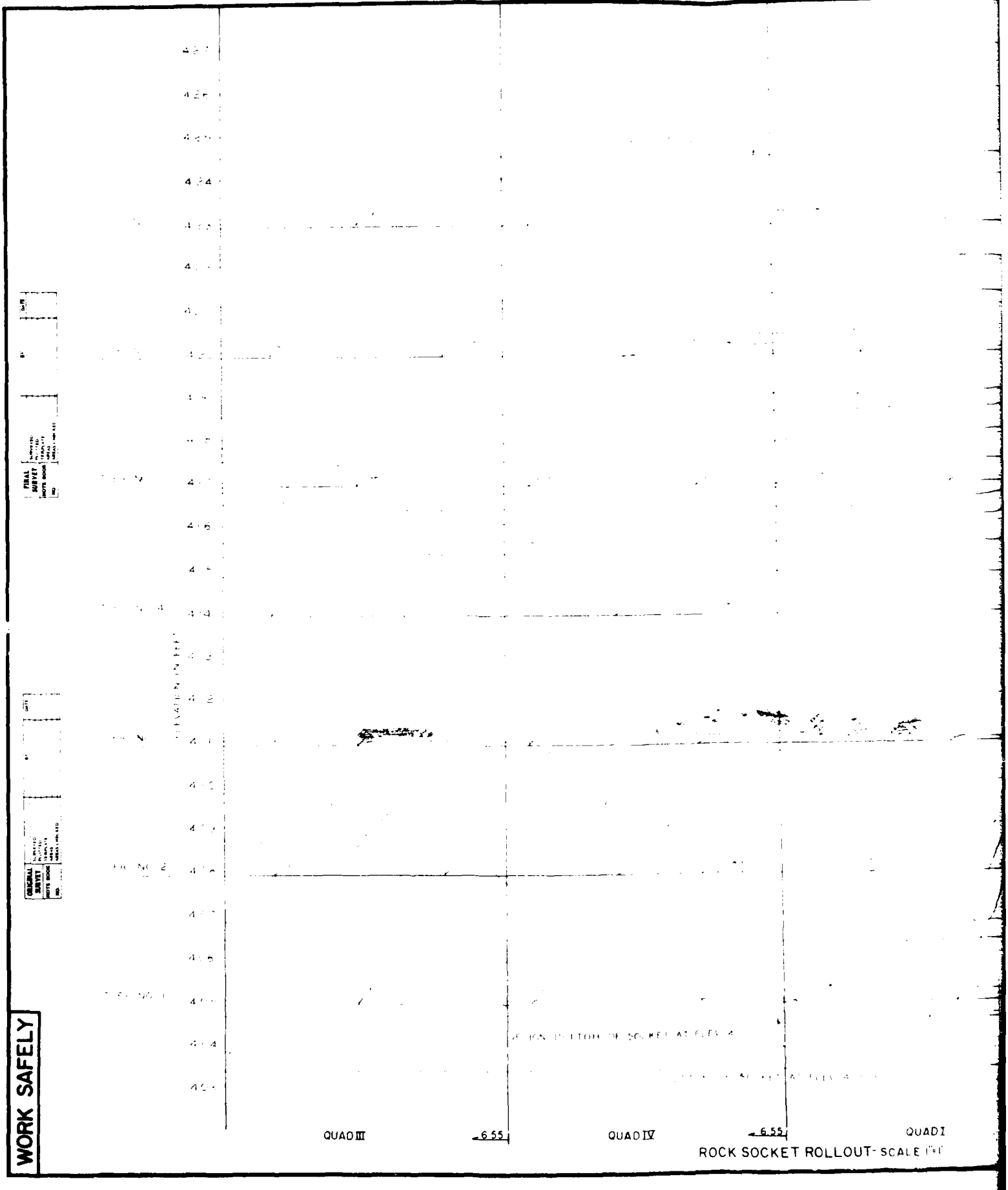
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 62 PIER 10 NORTH SOCKET

SCALE	DRAWING NUMBER
SPEC NO	9087-134/3038
DATE	SHEET 23 OF 52

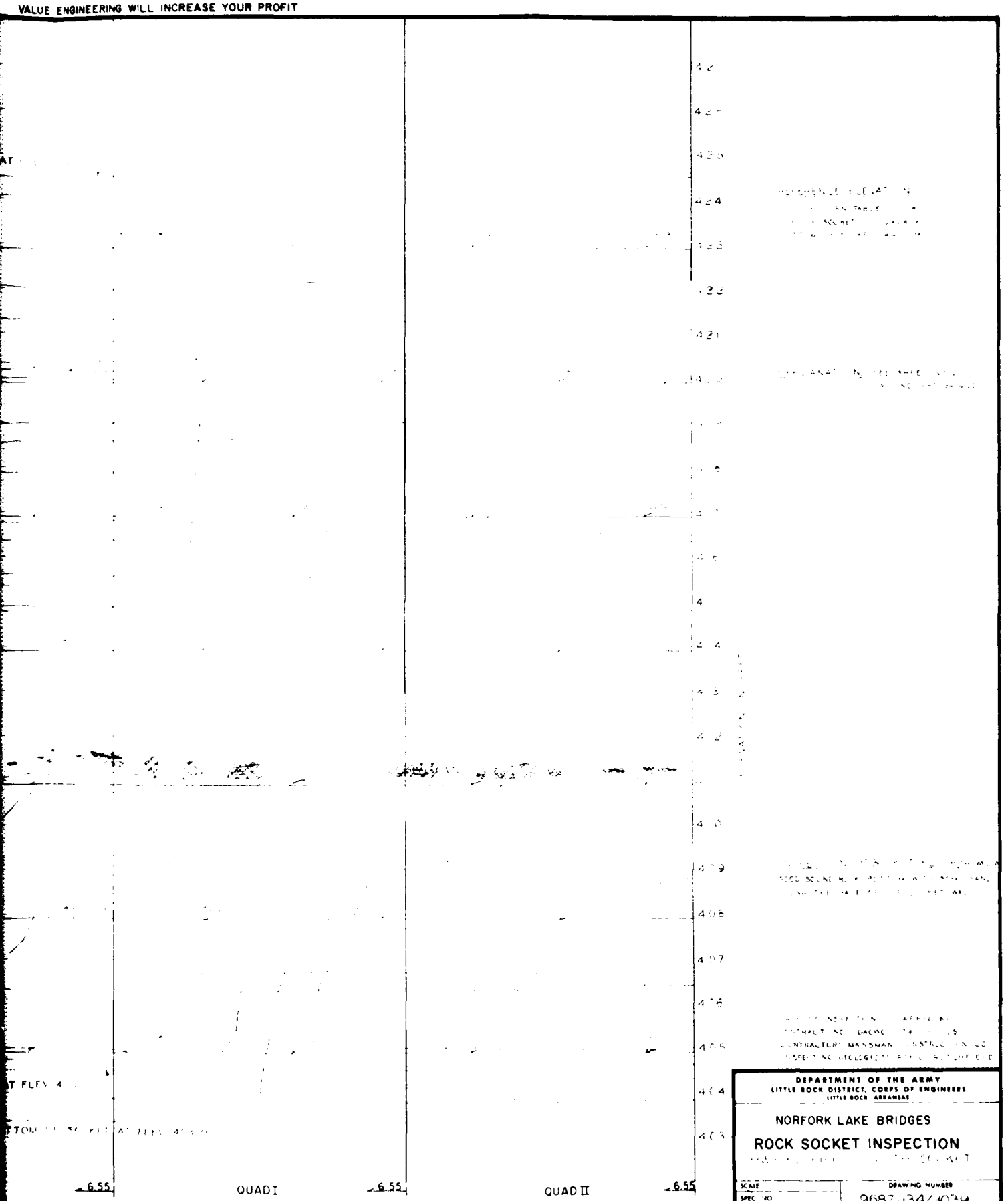
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

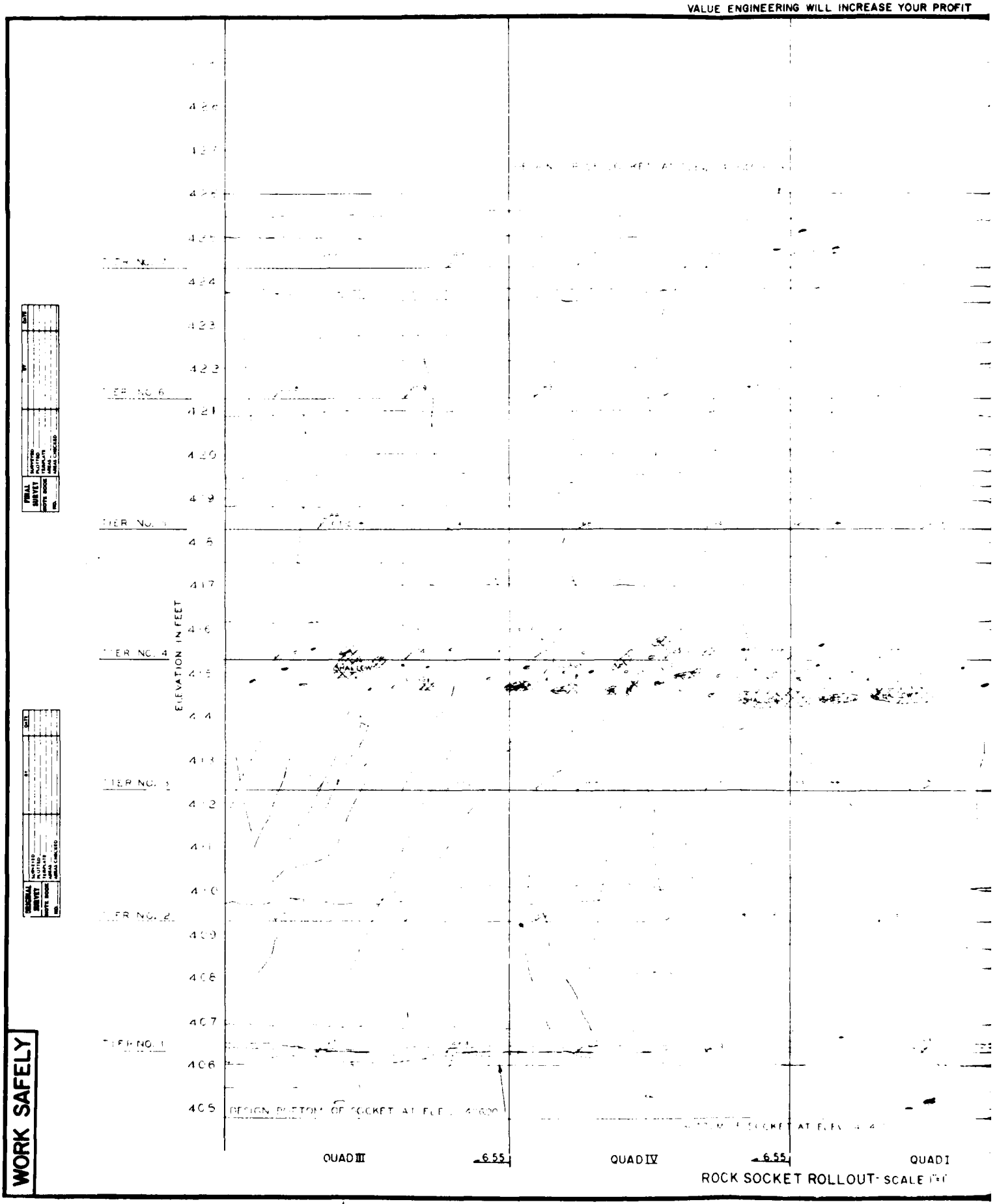
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE	DRAWING NUMBER
SPEC NO	9687-134/3039
DATE APRIL 1983	SHEET OF

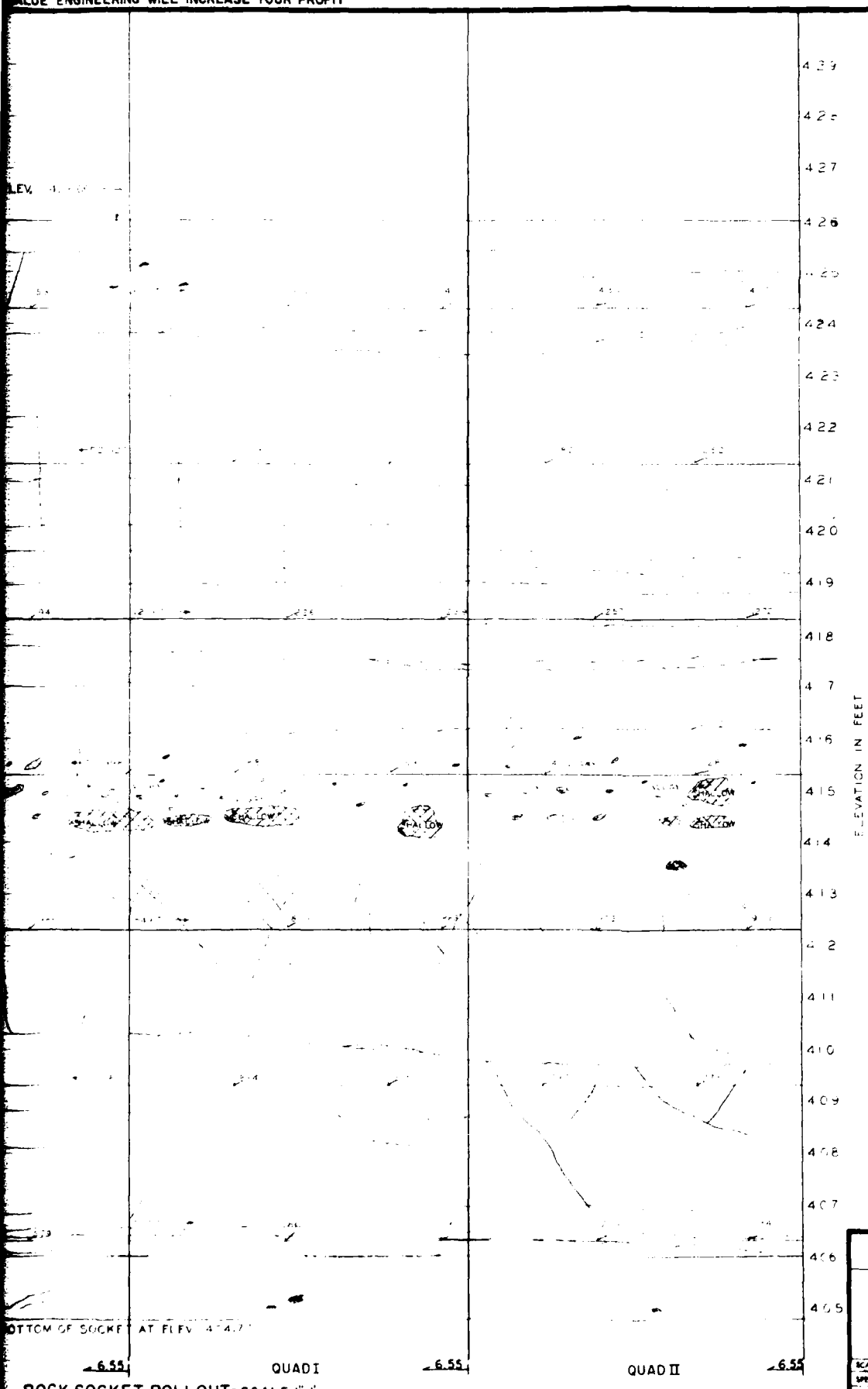
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

ALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN TABLE [illegible]

TOP OF SOCKET 426.00

BOTTOM OF SOCKET 404.77

EXPLANATION OF SHEET NOS.

[illegible] NOT [illegible]

INSPECTION OF SOCKET FLOOR AND A

[illegible] ROCK FROM A DEPTH OF

[illegible] FEET BELOW [illegible]

[illegible] FEET.

DATE OF INSPECTION [illegible] FEB 81

CONTRACT NO. DACW03-79-C-0055

CONTRACTOR: MASSMAN CONSTRUCTION CO

INSPECTING GEOLOGIST: [illegible] R. SCHAFFLE

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

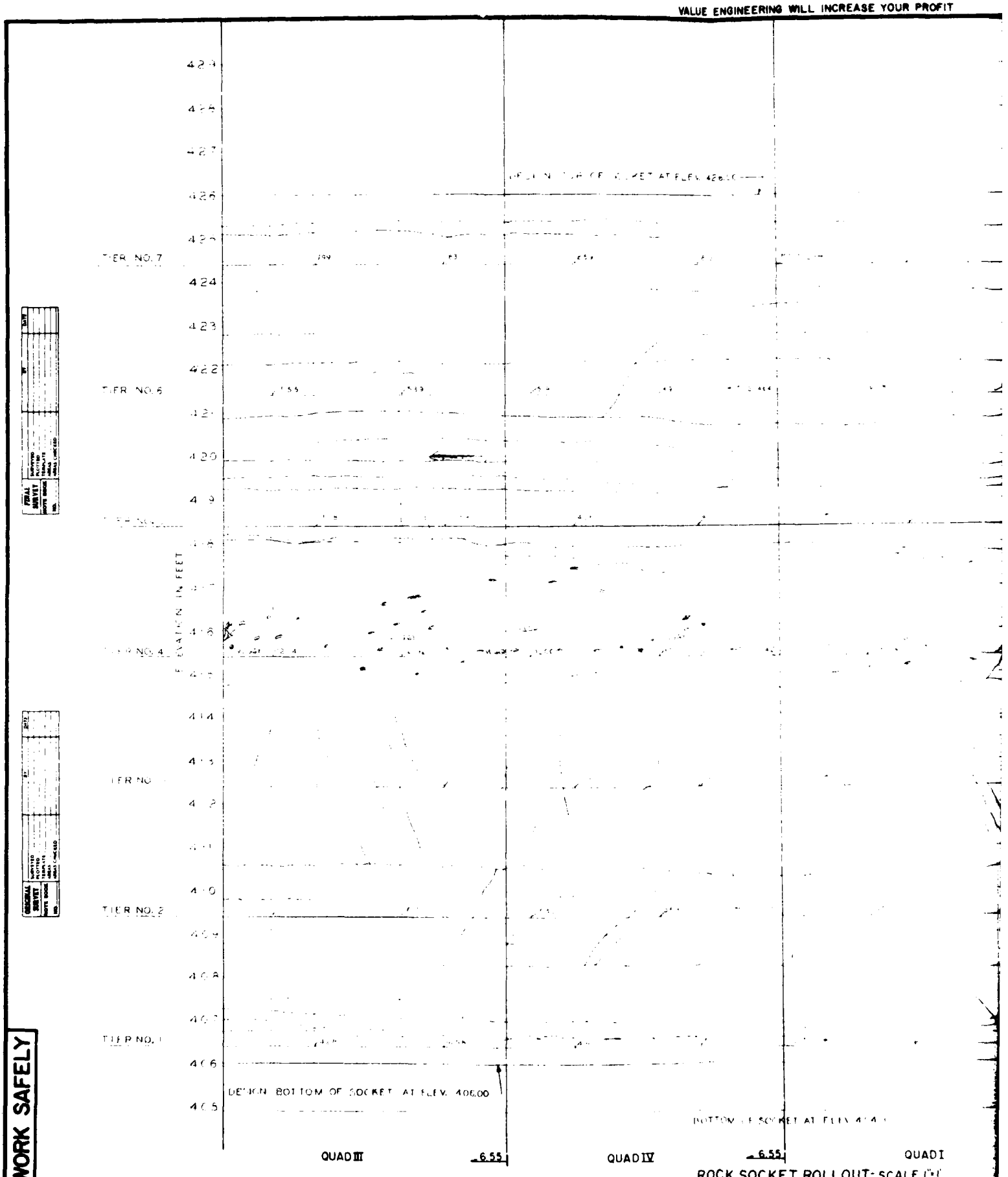
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62 PIER 11 NORTH SOCKET

SCALE	DRAWING NUMBER
SPEC. NO.	9687 134/3040
DATE APRIL 1981	SHEET 4 OF [illegible]

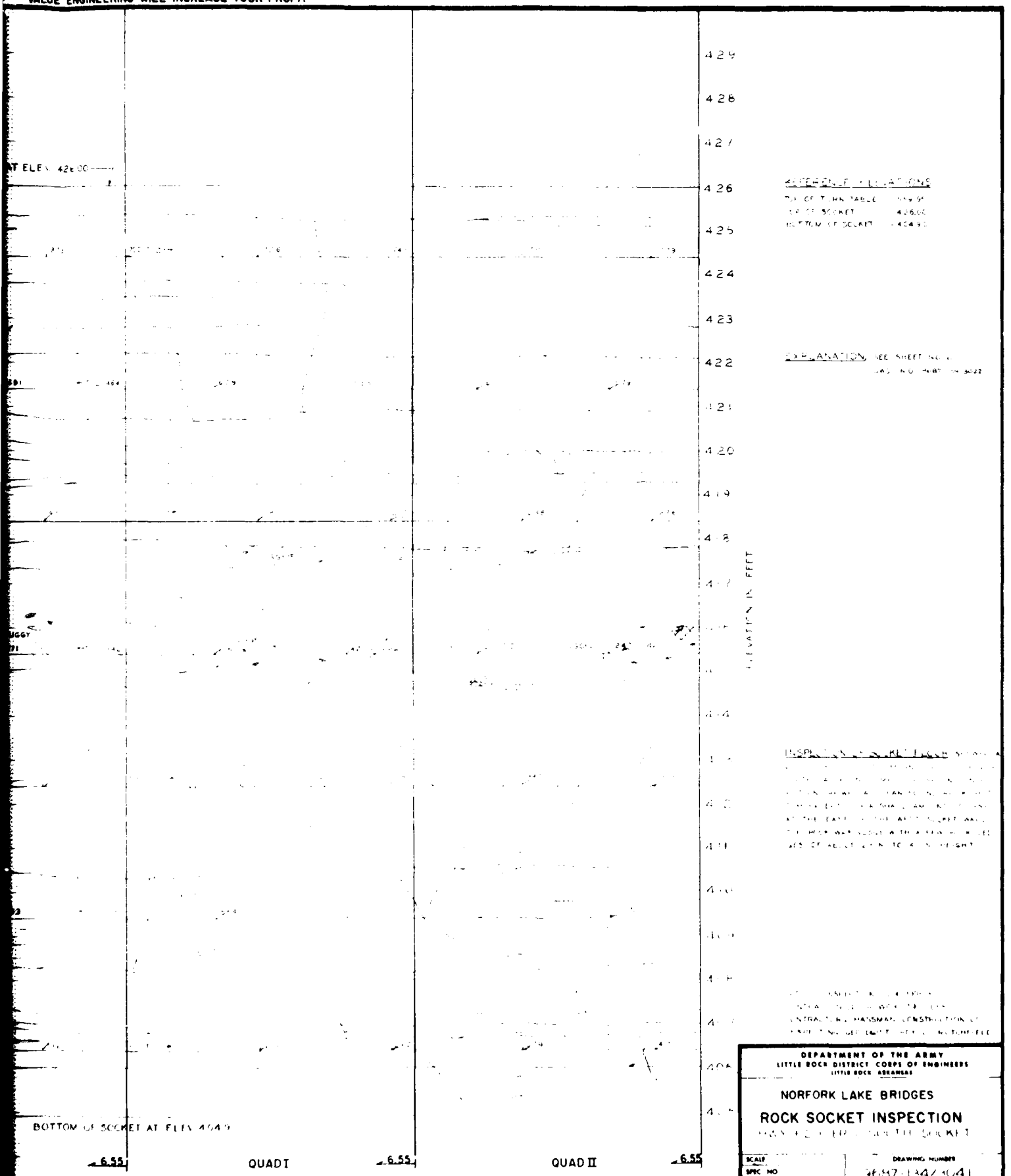
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN TABLE 429.9'
TOP OF SOCKET 426.00
BOTTOM OF SOCKET 404.9'

EXPLANATION SEE SHEET NO. 1
AND NO. 4887 IN 3022

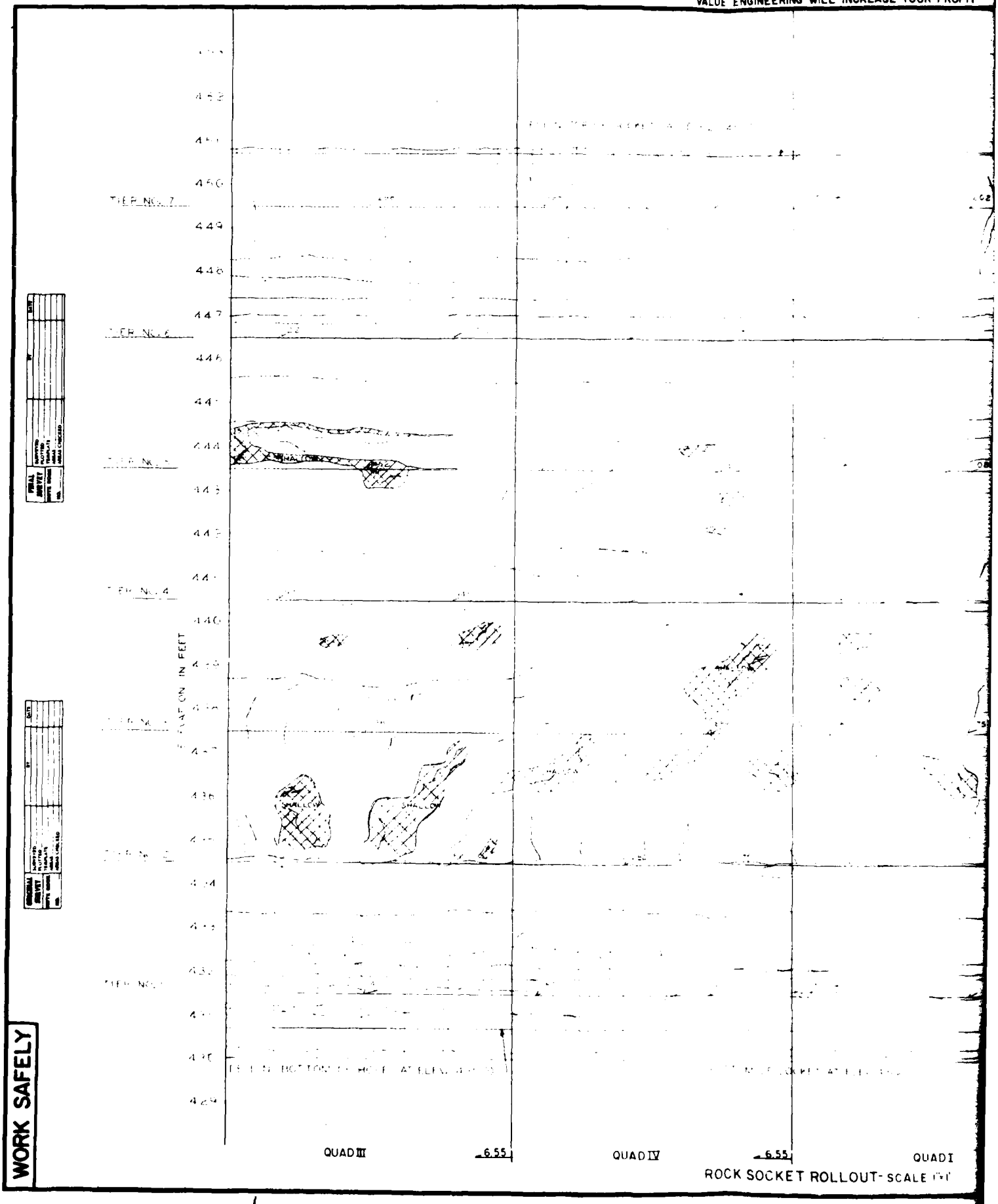
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE
SPEC NO
DATE
DRAWING NUMBER 3697-E44/3041
SHEET OF

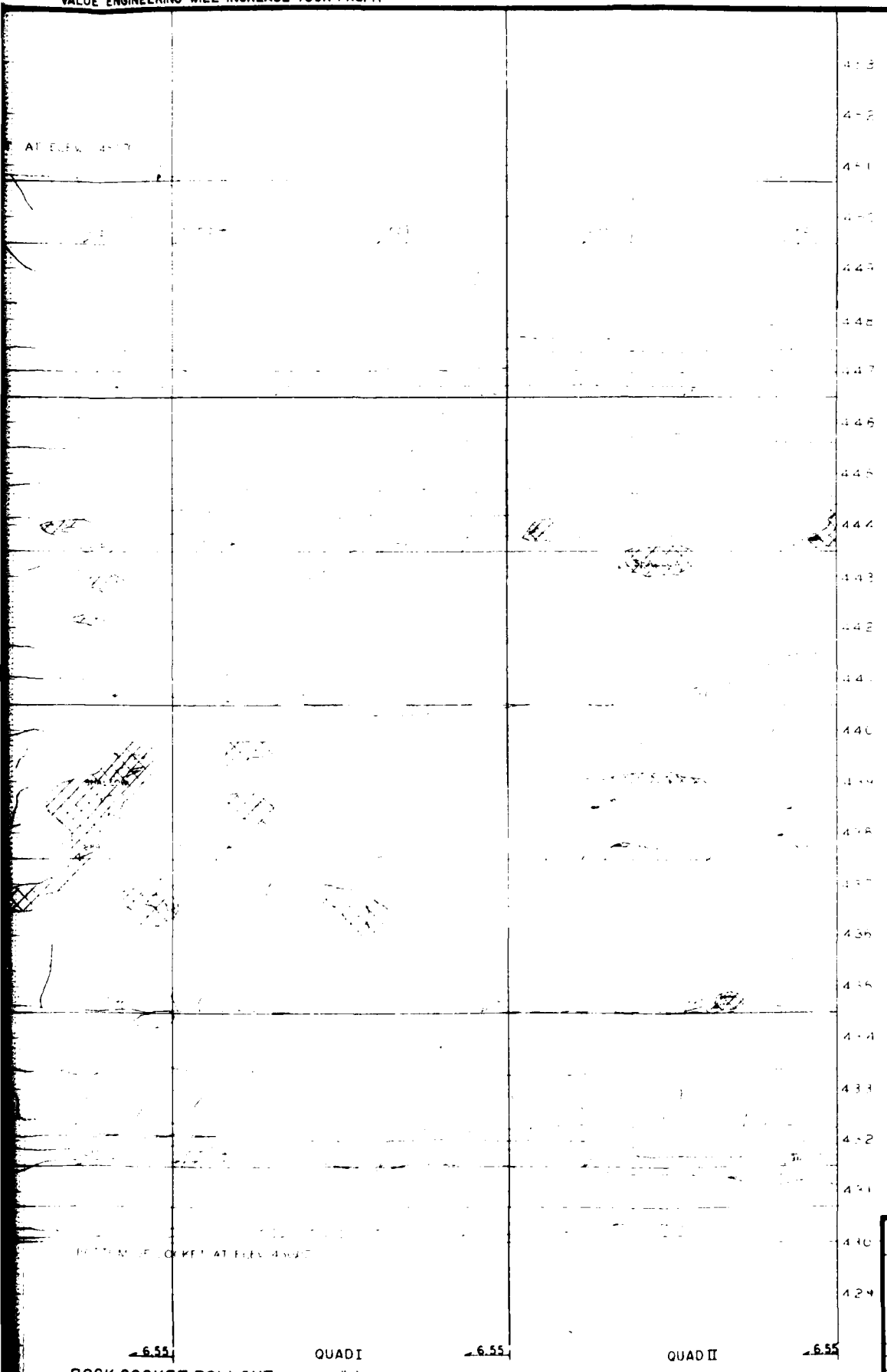
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXPLANATION

TYPICAL TYPE OF SOCKET FLOOR SHOWING A SEDIMENT ACCUMULATION AT THE SEAM AT EL. A SECTION THROUGH THE SEAM INSPECTION TECHNIQUES FOR SEAM ROCK WORK TREATMENTS

DATE OF INSPECTION CONTRACT NO. CONTRACTOR MASONRY CONSTRUCTION CO. INSPECTING GEOLOGISTS NOTED ON SHEET

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK ARKANSAS

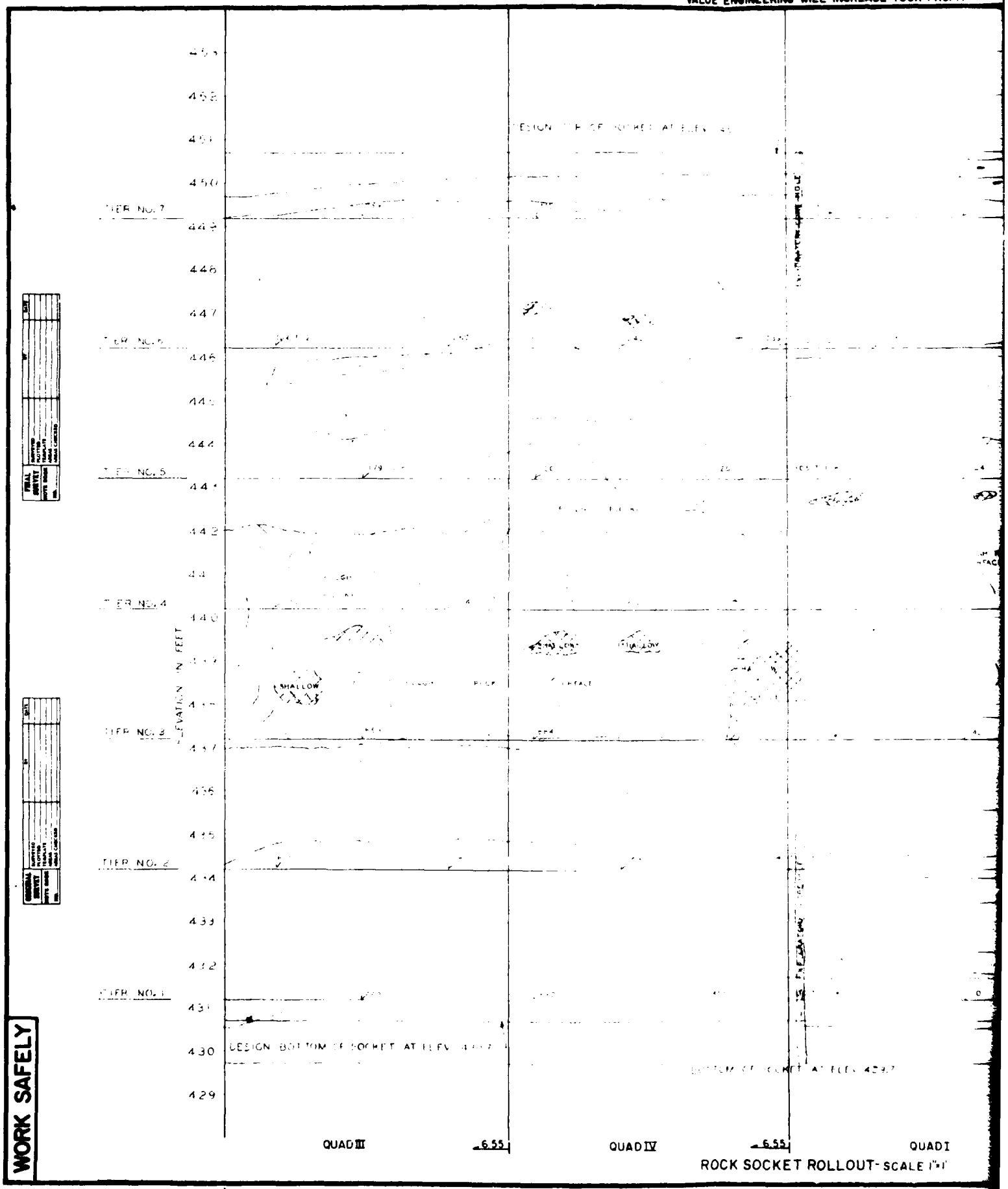
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 62, PIER 12, NORTH SOCKET

SCALE	DRAWING NUMBER
SPEC. NO	9687-134/3042
DATE APRIL 1960	SHEET 26 OF 52

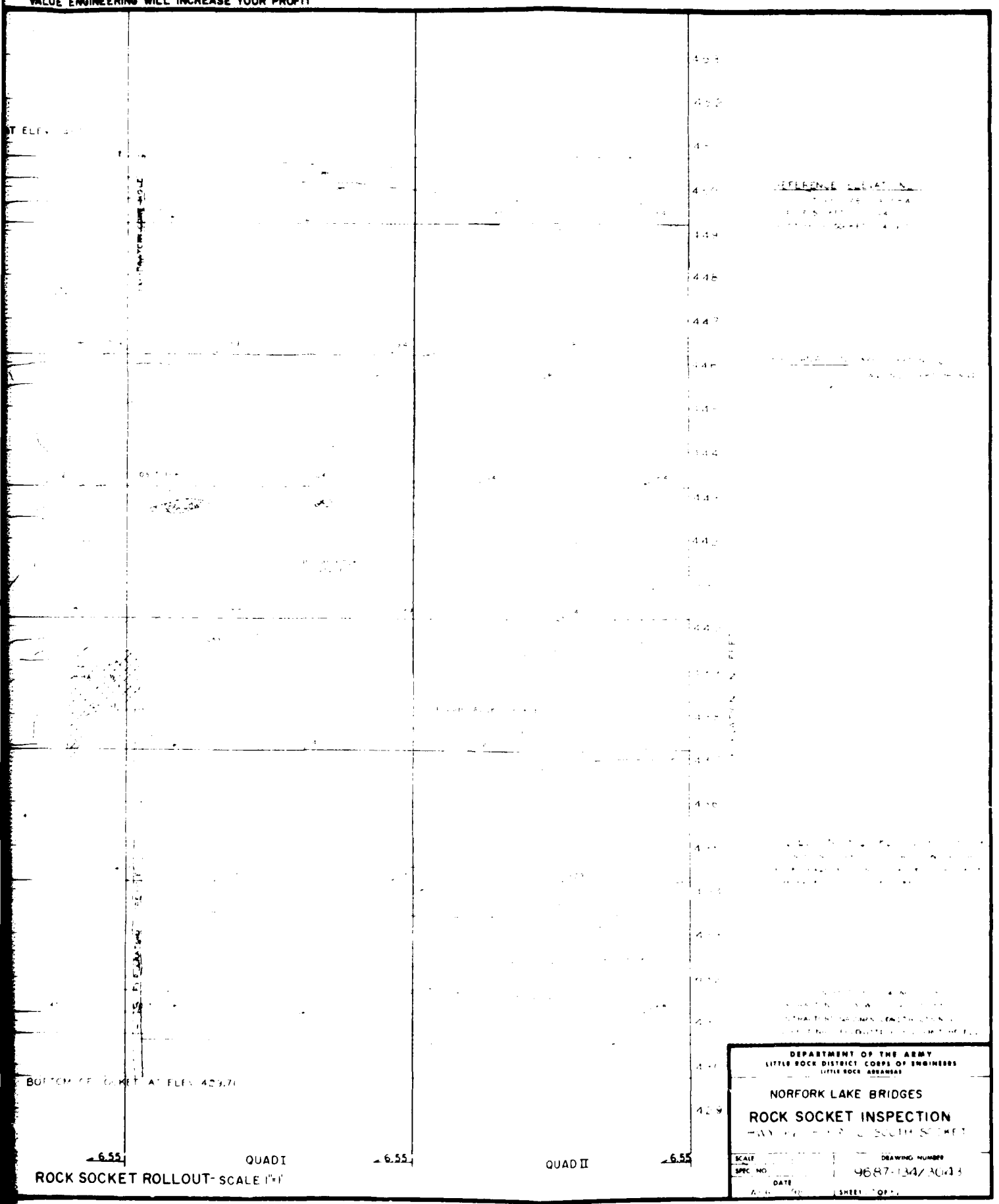
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

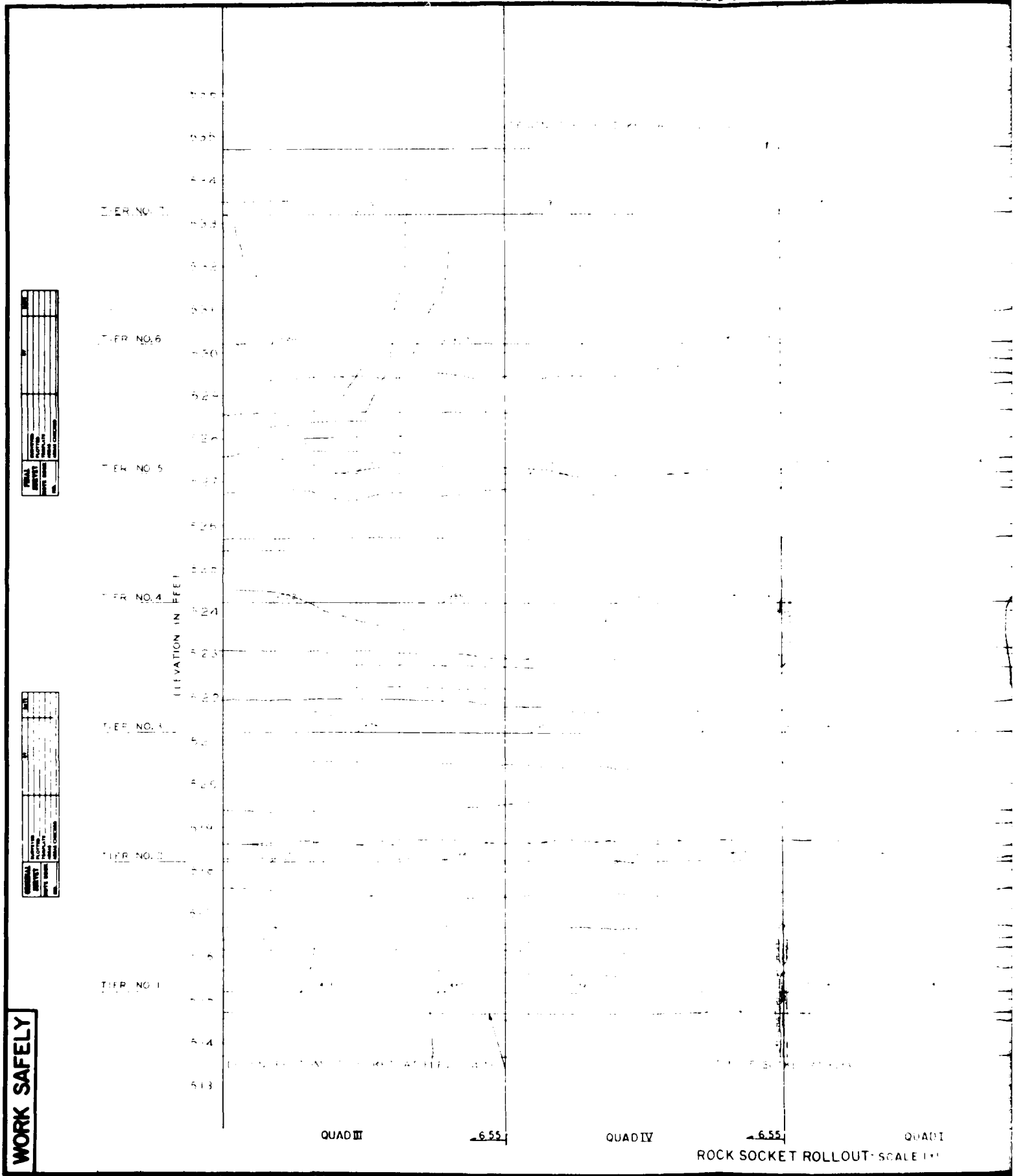
SCALE

SPEC. NO.

DRAWING NUMBER
9687-134/3043

DATE

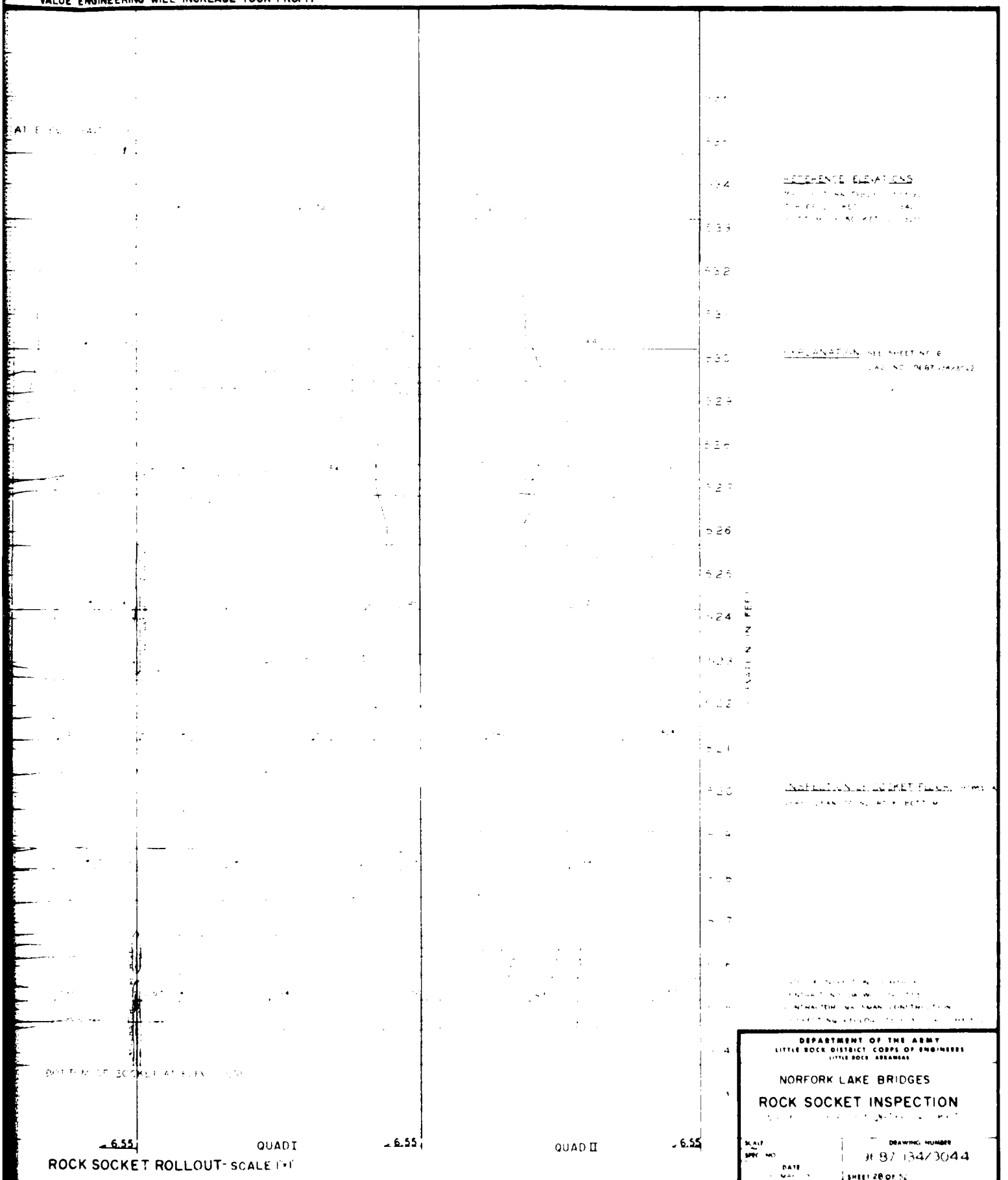
SHEET OF



ROCK SOCKET ROLLOUT- SCALE 1"

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE
SPEC. NO.
DATE
DRAWING NUMBER
87/134/3044
SHEET 28 OF 56

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WORK SAFELY

QUAD III

655

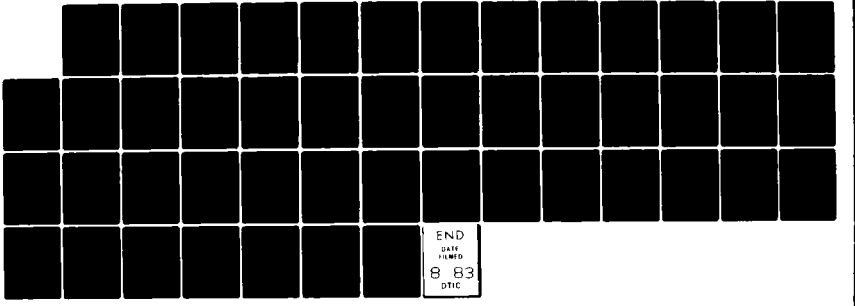
QUAD IV

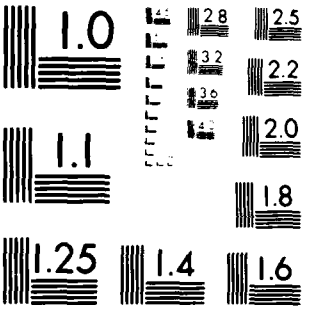
655

ROCK SOCKET ROLL

AD-A130 553 NORFOLK LAKE HIGHWAY BRIDGES BAXTER COUNTY ARKANSAS WHITE RIVER AND TRIBU..(U) ARMY ENGINEER DISTRICT LITTLE ROCK ARK R L CRUTCHFIELD JUN 83 5/5

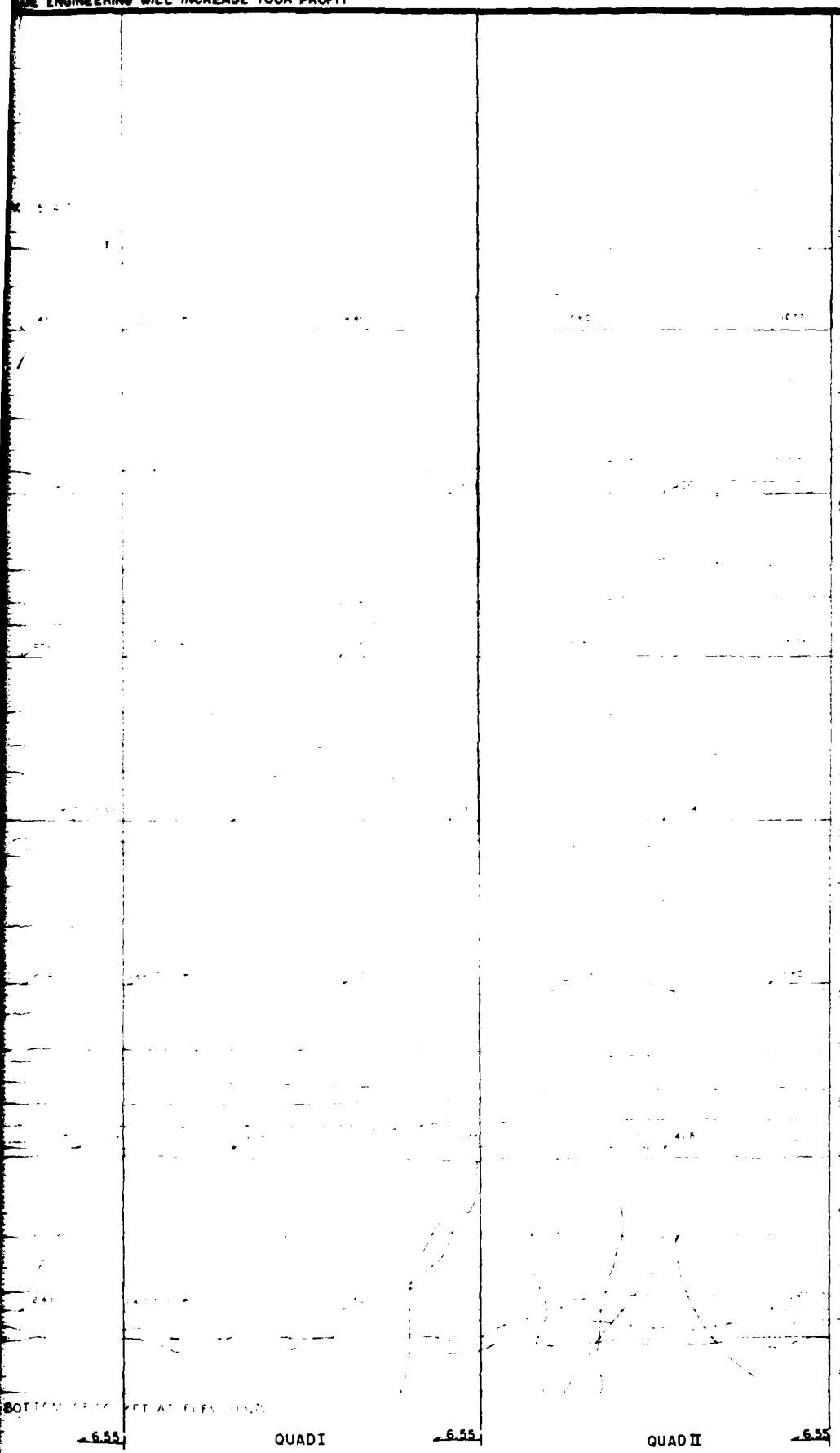
UNCLASSIFIED F/G 13/13 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS

ME ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXPLANATION SEE SHEET NO. 6
CAD NO. 3687-M-3022

INSPECTION OF SOCKET FLOOR, SHOWED A

A MINIMUM OF [illegible] IN THE DEEP
SECTION, LOWER [illegible] SCUM
AND BOTTOM.

DATE OF INSPECTION [illegible] MAR 83
CONTRACT NO. DACW03-79-C-0047
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

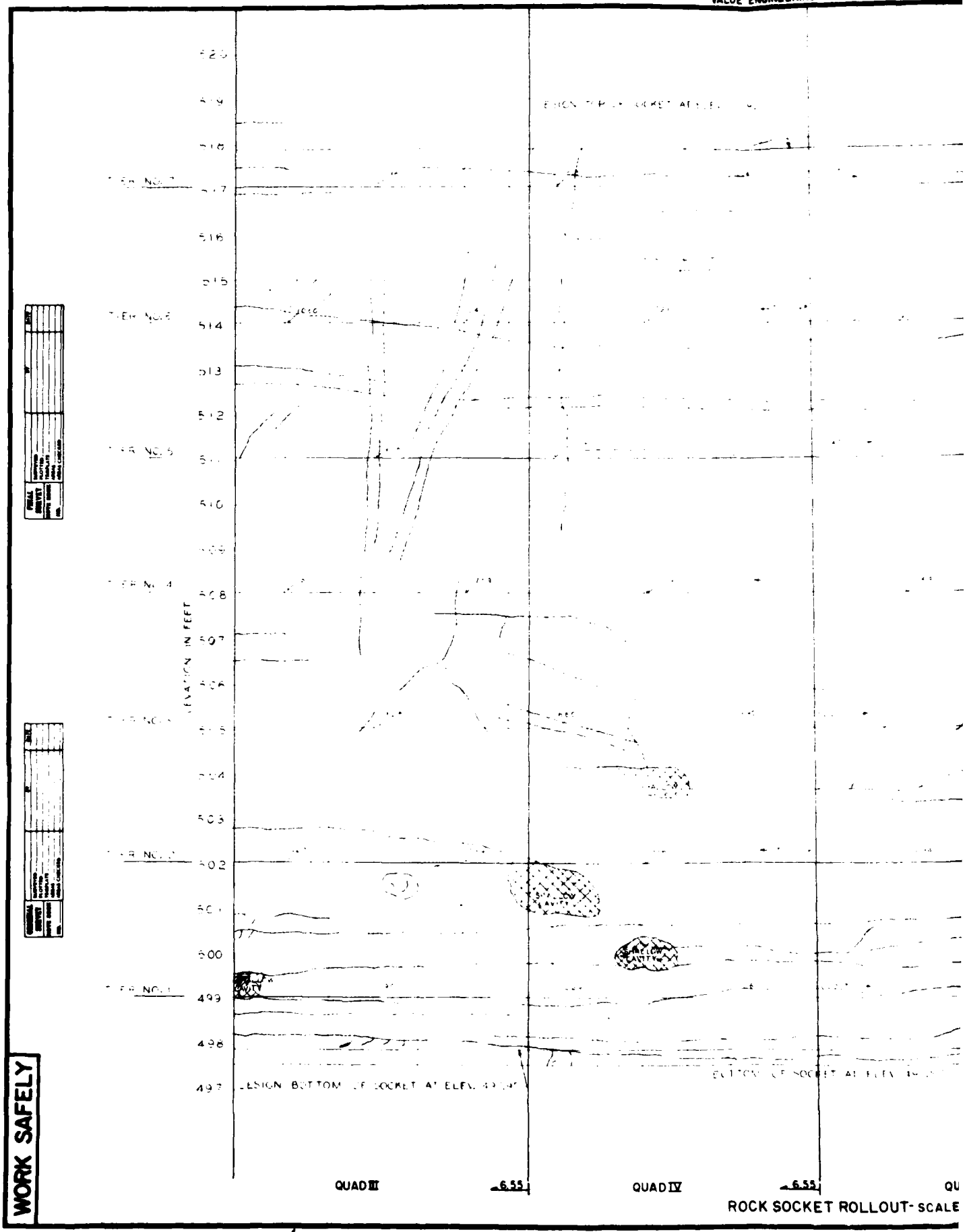
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
-WY 62 PIER 13 SOUTH SOCKET

SCALE:	DRAWING NUMBER
SPEC. NO.	3687-134/3045
DATE APRIL 1983	SHEET 2 OF [illegible]

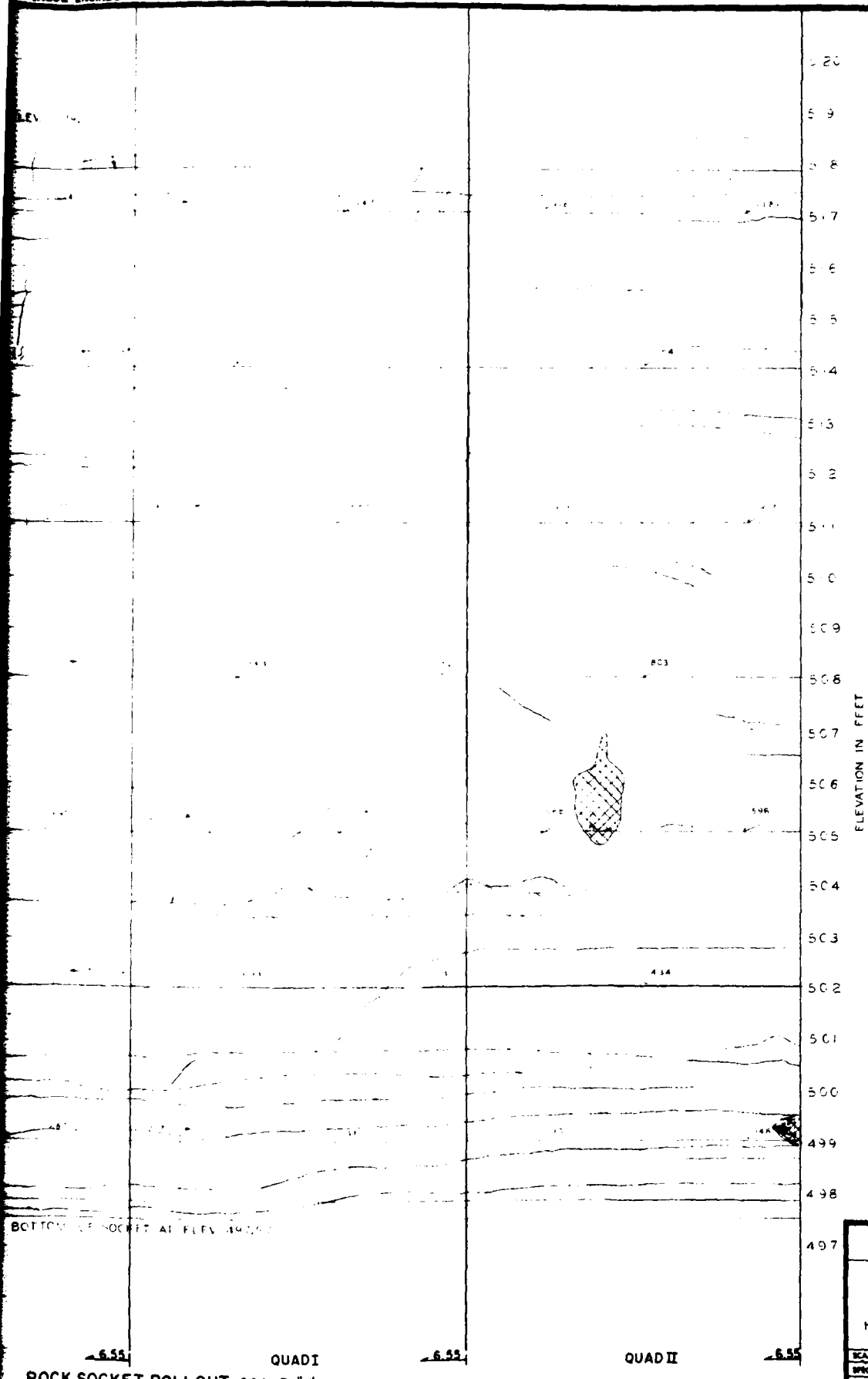
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WORK SAFELY

ROCK SOCKET ROLLOUT- SCALE

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF ENTABLATURE 519.84

TOP OF SOCKET 517.75

BOTTOM OF SOCKET 497.5

EXPLANATION

JOINTS & FRACTURES, MAY EXTEND VERTICALLY, HORIZONTALLY, OR DIAGONALLY. DASHED LINE WHERE APPROXIMATE

BLOCKY ROCK SURFACE, USUALLY WITH NUMEROUS SMALL FRACTURES.

VUGGY (OR DRUSY) SMALL CAVITIES LINED WITH MINERAL CRYSTALS, USUALLY CALCITE, DOLOMITE, OR QUARTZ IN LOCAL ROCK.

CAVITY, USUALLY OPEN, EXPLANATORY NOTE IF FILLED OR IF ONLY A SHALLOW RECESS. DASHED LINE WHERE APPROXIMATE

CONCRETE, AS USED TO FILL VOIDS IN EAST SOCKET OF PIER 1.

708 / F-2 → 718 TIER ELEVATION LINE, SHOWS ELEVATION OF TV CAMERA DURING MAPPING, V DIRECTAPE NUMBER AND TAPE METER READING, DIRECTION OF CAMERA ROTATION, AND TICK MARKS AT CAMERA STOPS.

NOTES: ALL SOCKETS ARE DRILLED IN THE COTTER - JEFFERSON CITY DOLOMITE OF THE OZARKIAN PERIOD, PALEOZOIC ERA.

NO FAULTS WERE OBSERVED IN ANY SOCKET.

INSPECTION OF SOCKET FLOOR, SHOWED A COVERING OF OVERALL DEBRIS AT FIRST INSPECTION. AFTER THE INNER CONCRETE FORMS WERE SEALED FOUND A CLEAN, SOUND ROCK BOTTOM WITH A LITTLE SAND AND HAY AROUND THE BASE OF THE SOCKET WALLS.

DATE OF INSPECTION: [illegible] 1983
CONTRACT NO. DACW03-78-C-0055
CONTRACTOR MAXIMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

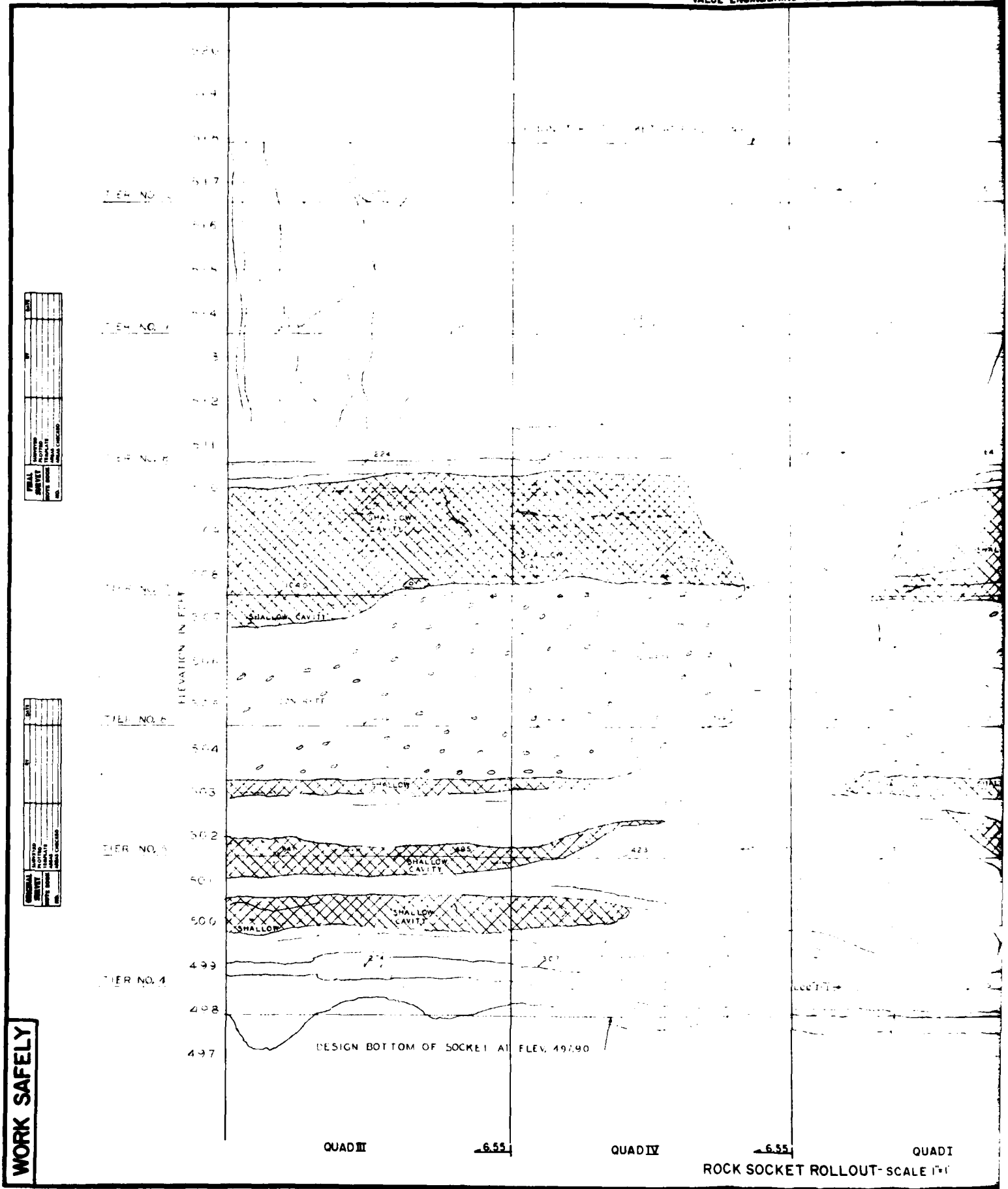
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 1, WEST SOCKET

SCALE: 1"=1'	DRAWING NUMBER
SPEC. NO.	9687-134/3046
DATE APRIL 1983	SHEET 30 OF 52

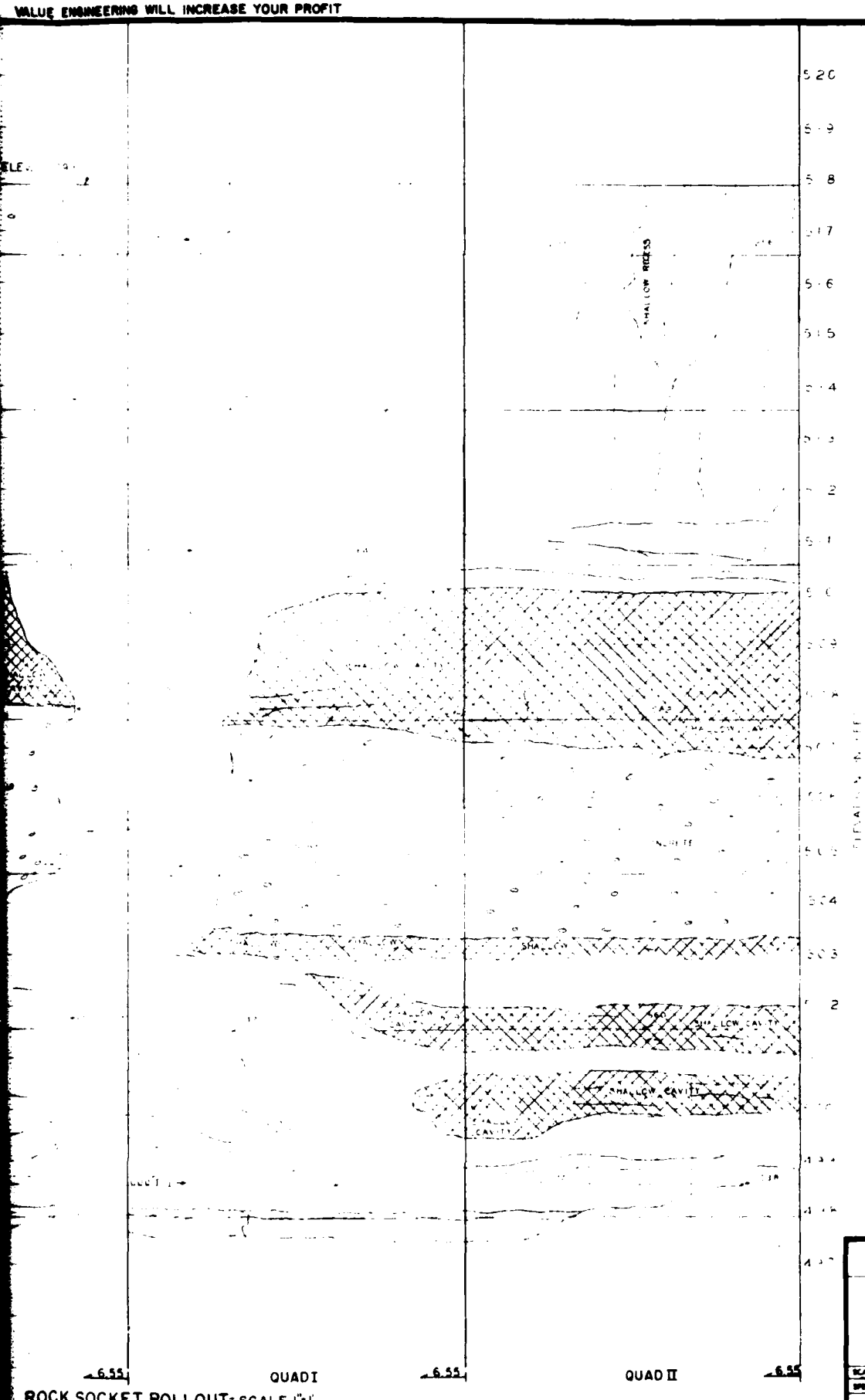
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE	556.6
TOP OF SOCKET	517.90
BOTTOM OF SOCKET	489.62

EXPLANATION, SEE SHEET NO. 4
CWS NO. 9687-134/3046

NOTE

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

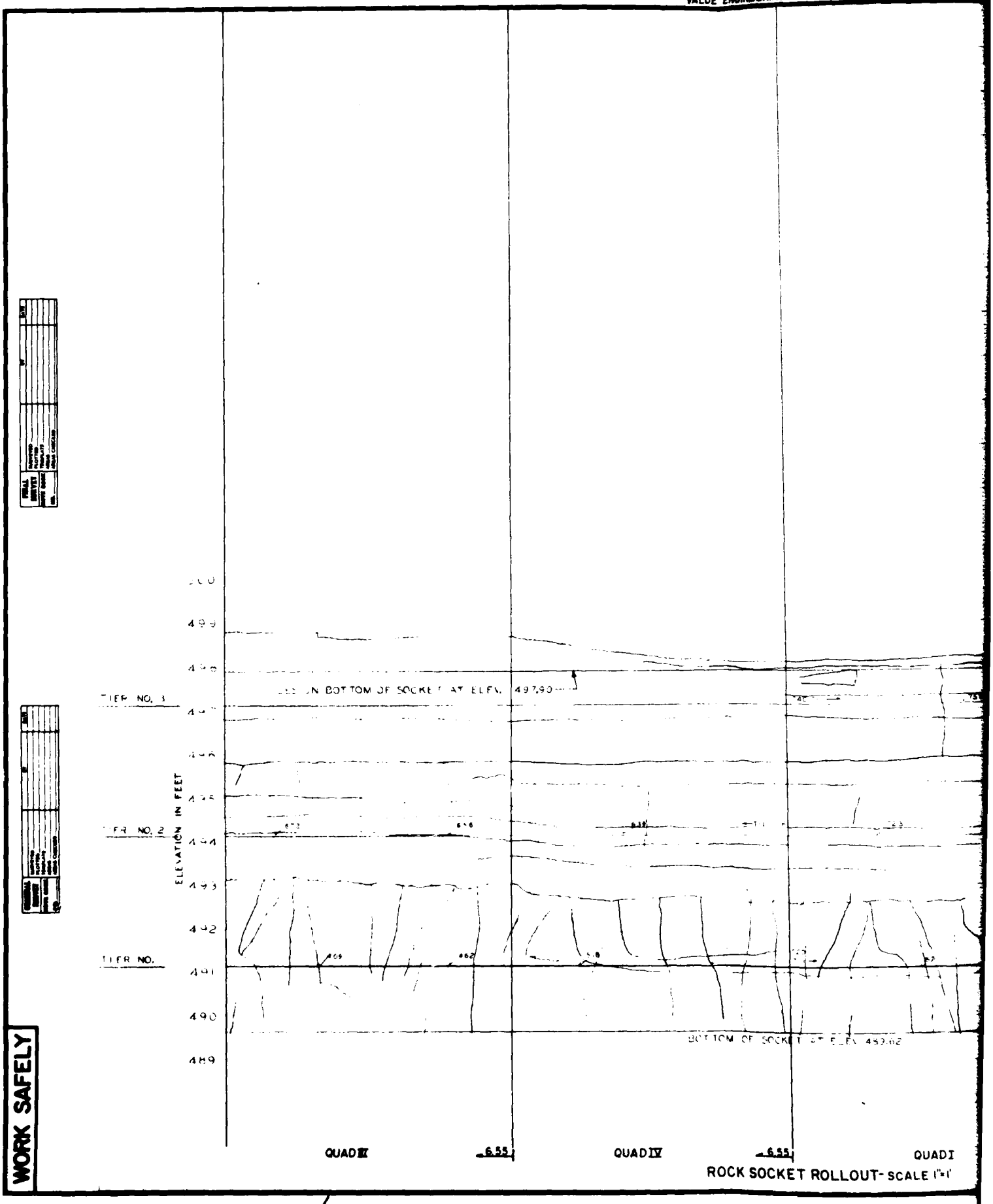
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

EAST SOCKET

SCALE
SPEC. NO.
DRAWING NUMBER
9687-134/3047
DATE
APRIL 1984
SHEET 31 OF 52

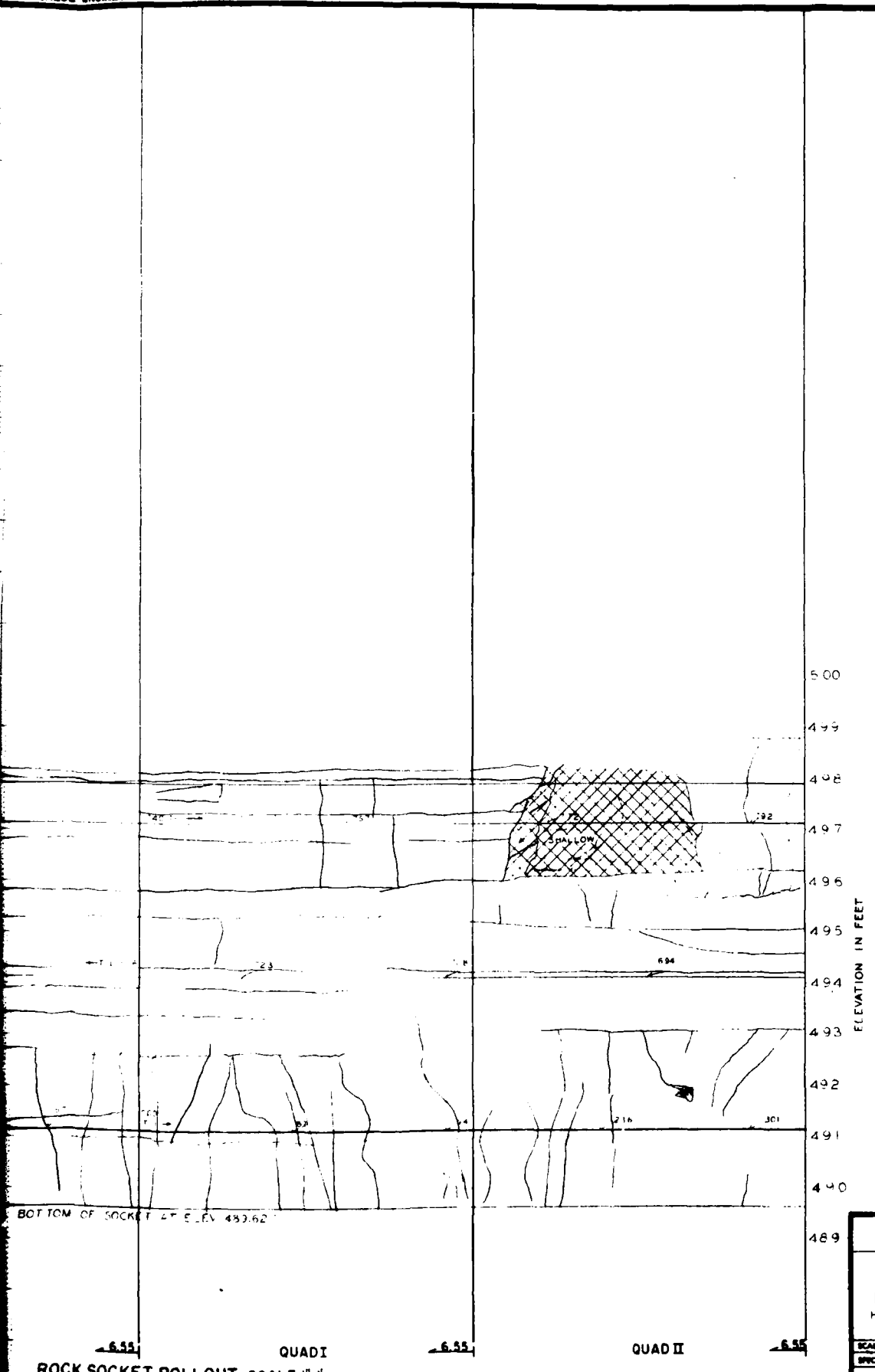
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE 526.0'
TOP OF SOCKET 517.90
BOTTOM OF SOCKET 488.62

EXPLANATION, SEE SHEET NO. 3C
DWG NO 9687 34/3046

UPPER SOCKET INSPECTION, TC ELEV. 517.90 IS SHOWN ON SHEET NO. 31
DWG. NO. 9687-134/3048

INSPECTION OF SOCKET FLOOR SHOWED A CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION: 10 AUG 198
CONTRACT NOS DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

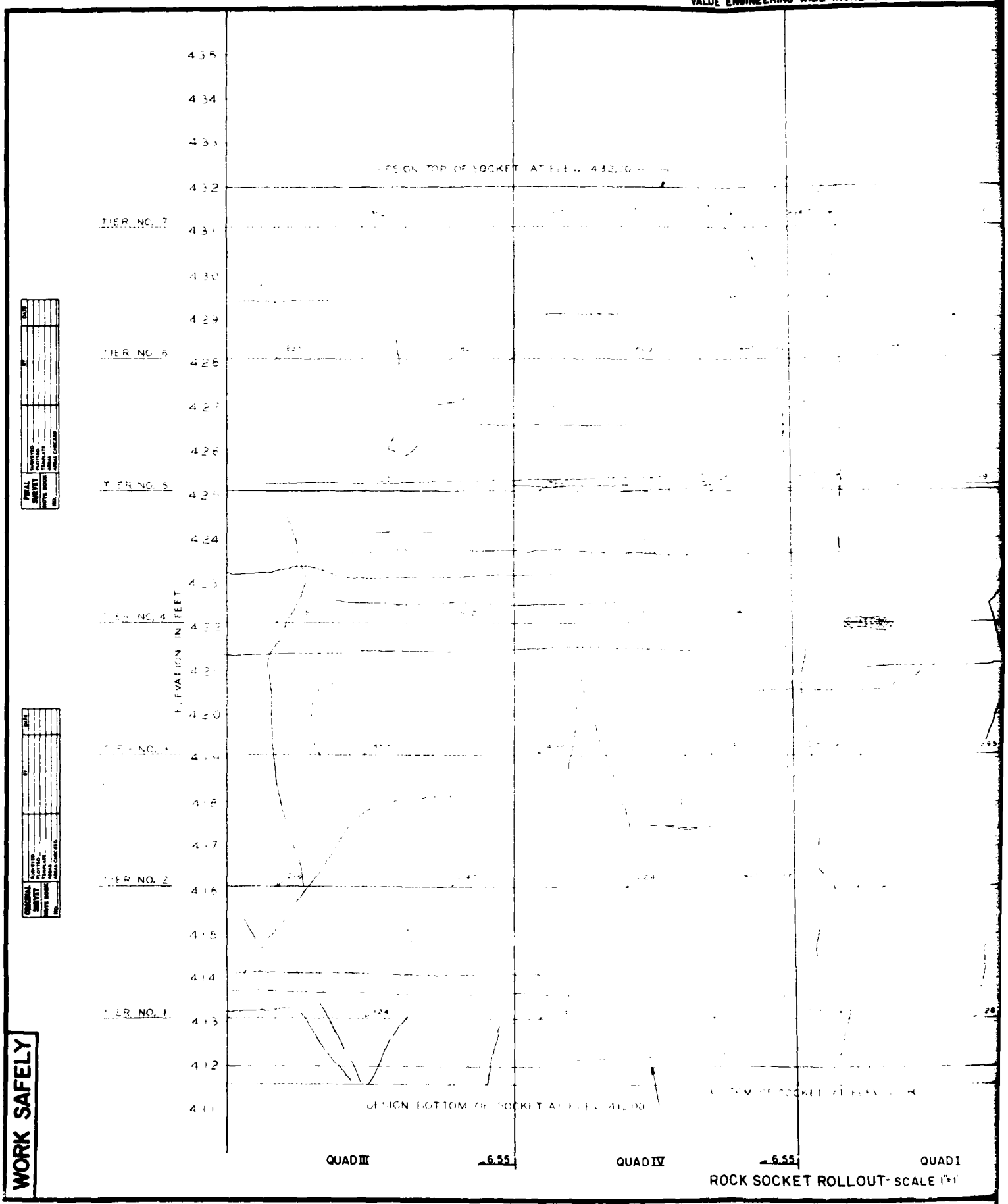
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 1, EAST SOCKET

SCALE 1"=1'	DRAWING NUMBER
SPEC. NO.	9687-134/3048
DATE APRIL 1983	SHEET 32 OF 32

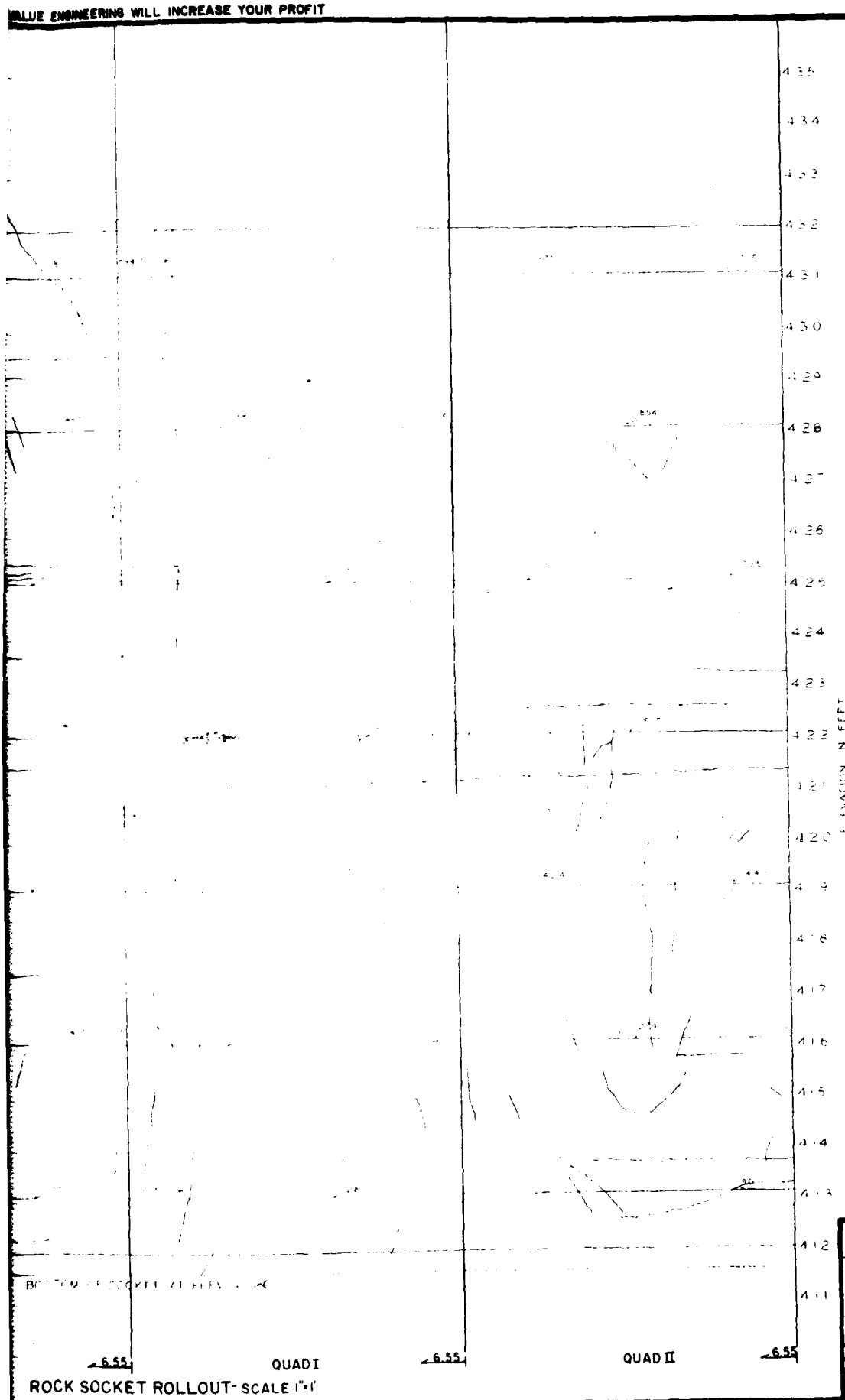
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



REFERENCE ELEVATIONS

TOP OF TURNTABLE 438.50
TOP OF SOCKET 432.00
BOTTOM OF SOCKET 411.60

EXPLANATION SEE SHEET NO 30
DWG NO: 9687-34/3046

INSPECTION OF SOCKET FLOOR POWER A SERIES OF SOUNDINGS WERE MADE AT EACH INSPECTION AFTER THE FIRST CONCRETE POURS WERE MADE TO VERIFY A CLEAN SOUND ROCK BOTTOM

DATE OF INSPECTION SEP 83
CONTRACT NO: DACW03-79-C-0005
CONTRACTOR MAITTMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

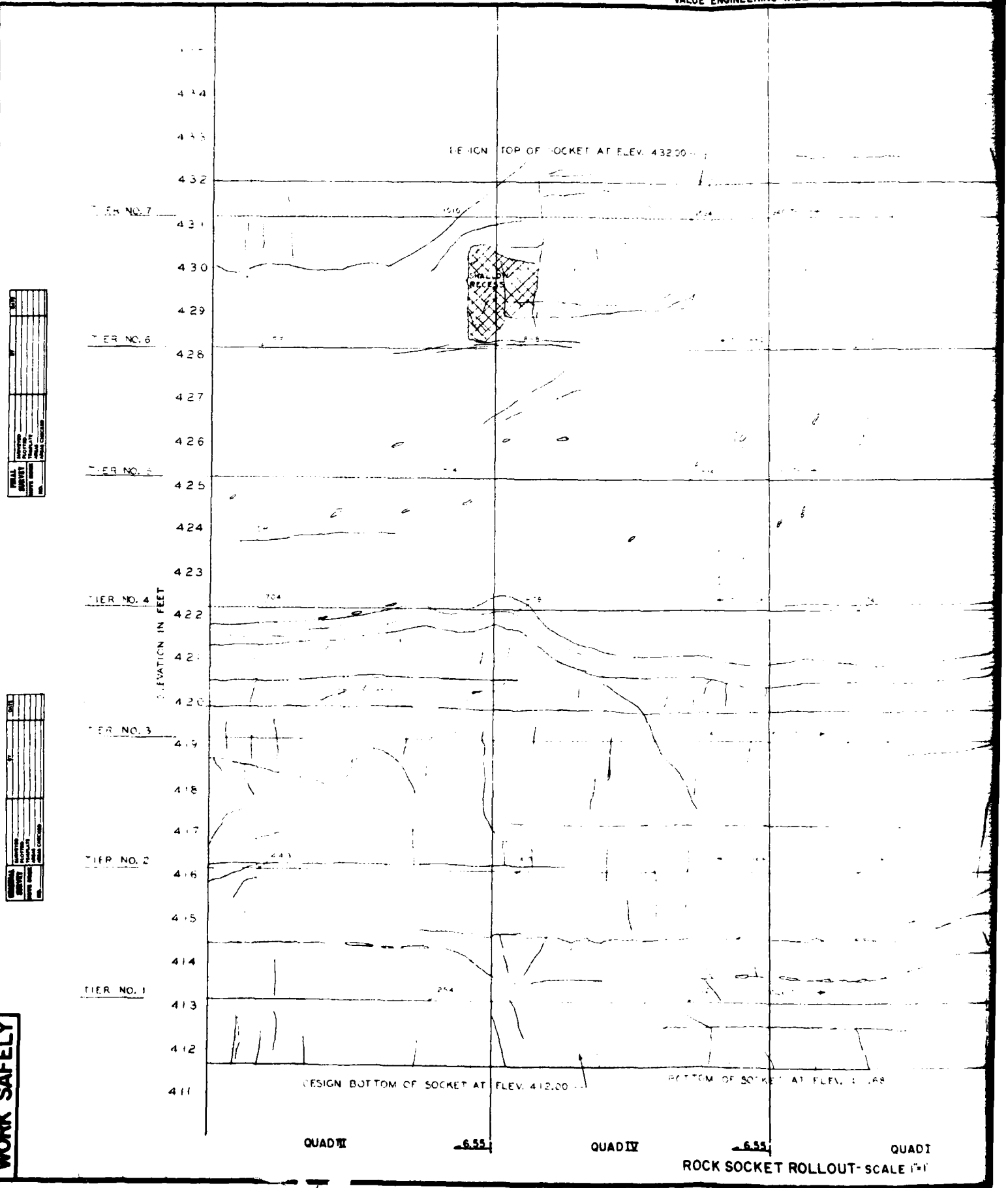
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 2, EAST SOCKET

SCALE:	DRAWING NUMBER
SPEC. NO.	9687-134/3049
DATE APRIL 1983	SHEET 33 OF 56

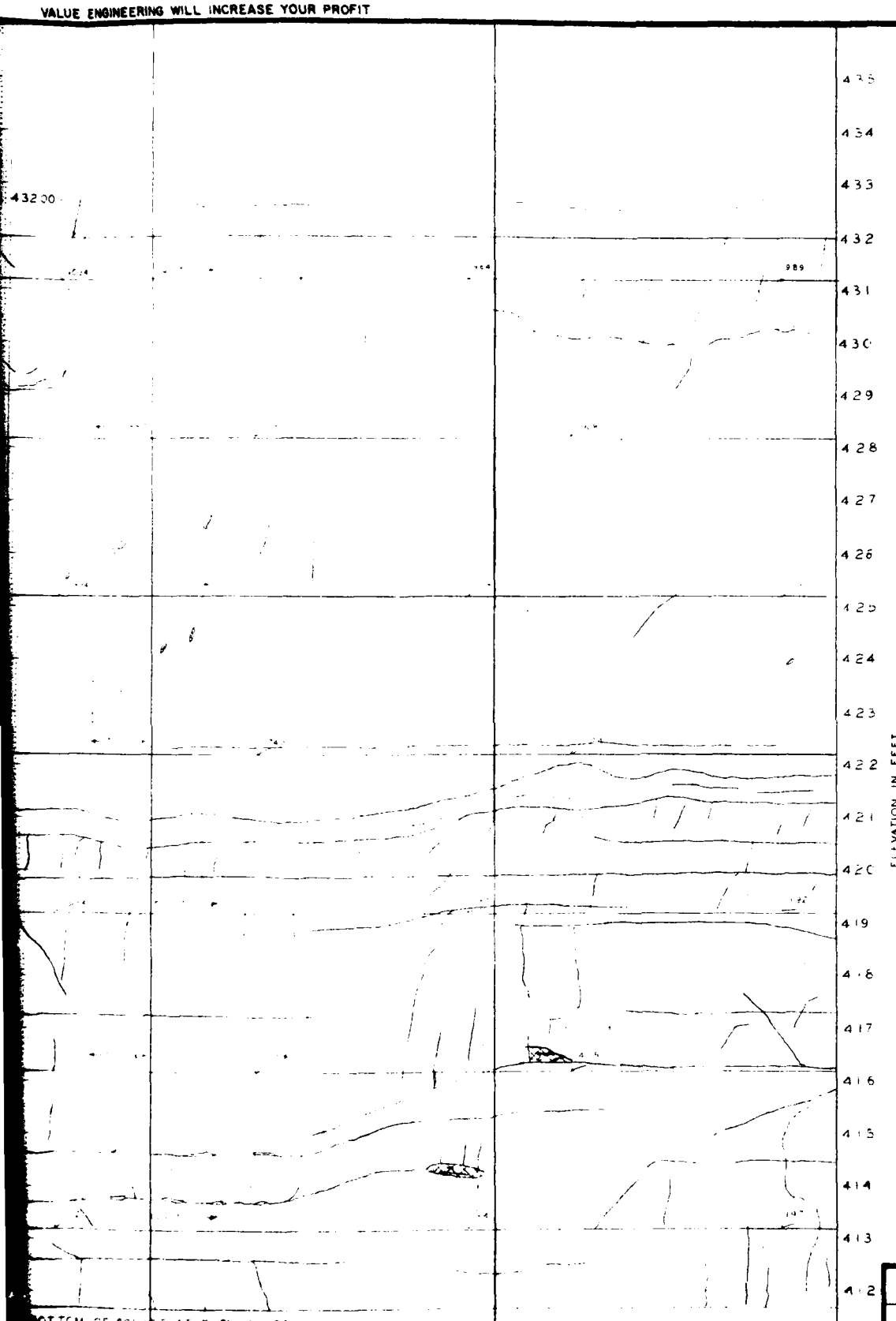
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN TABLE = 560.11
TOP OF SOCKET = 432.00
BOTTOM OF SOCKET = 411.68

EXPLANATION, SEE SHEET NO. 30
DWG NO. 9687-134/3046

INSPECTION OF SOCKET FLOOR SHOWED A CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION: 16 SEP 1981
CONTRACT NO.: DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

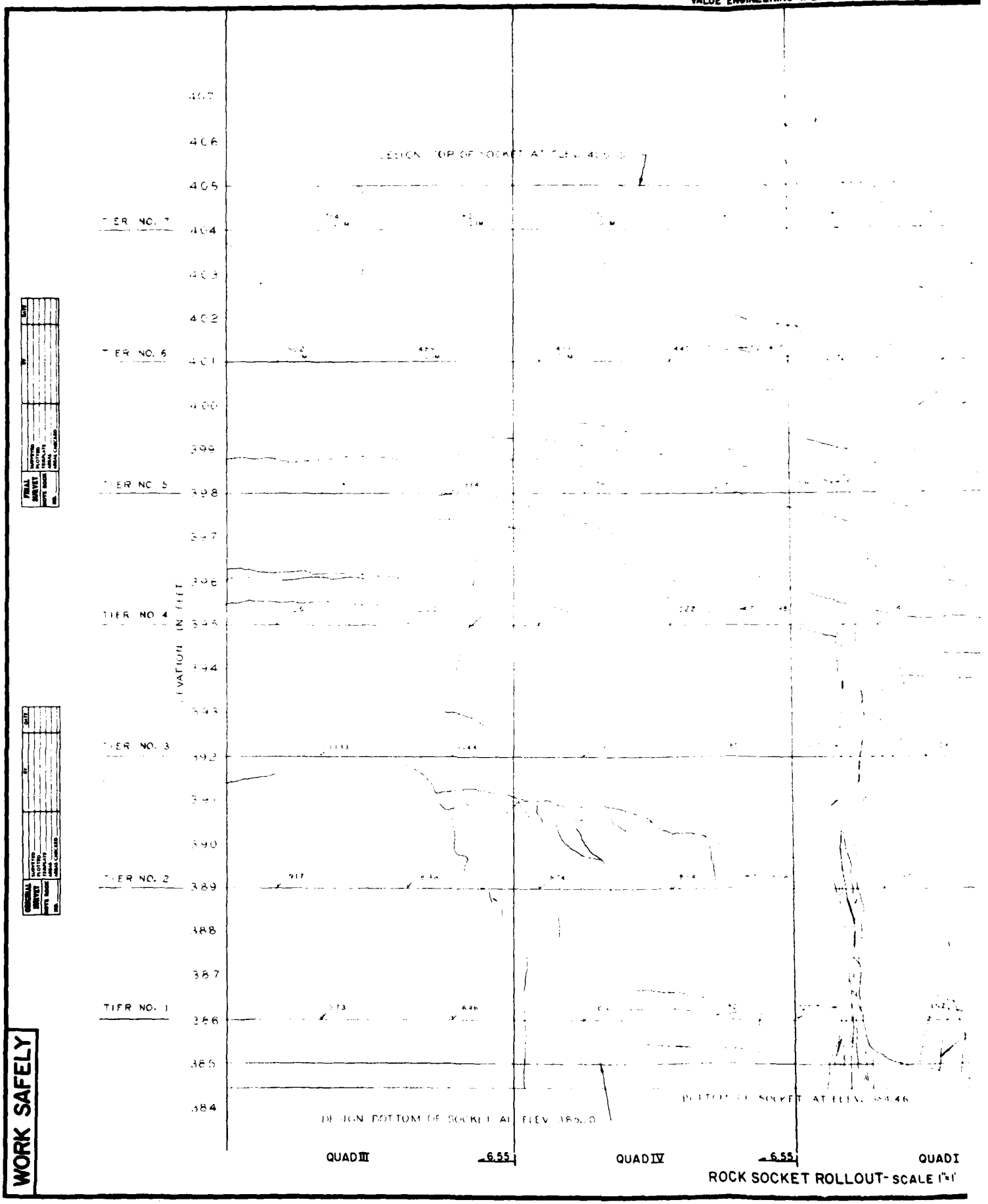
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 2, WEST SOCKET

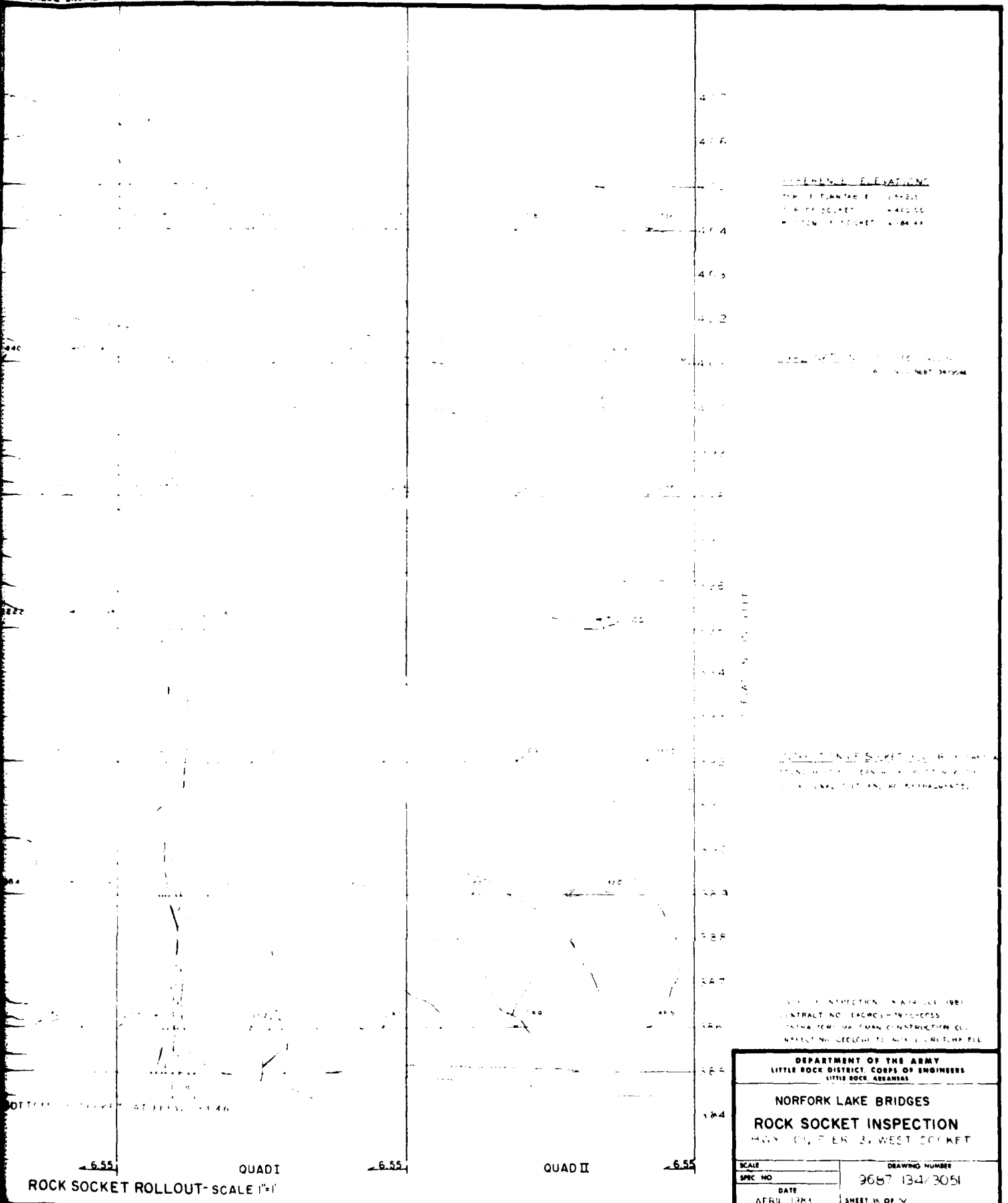
SCALE: 1"=1'	DRAWING NUMBER
SPEC. NO.	9687-134/3050
DATE APRIL 1983	SHEET 31 OF 52



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

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ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

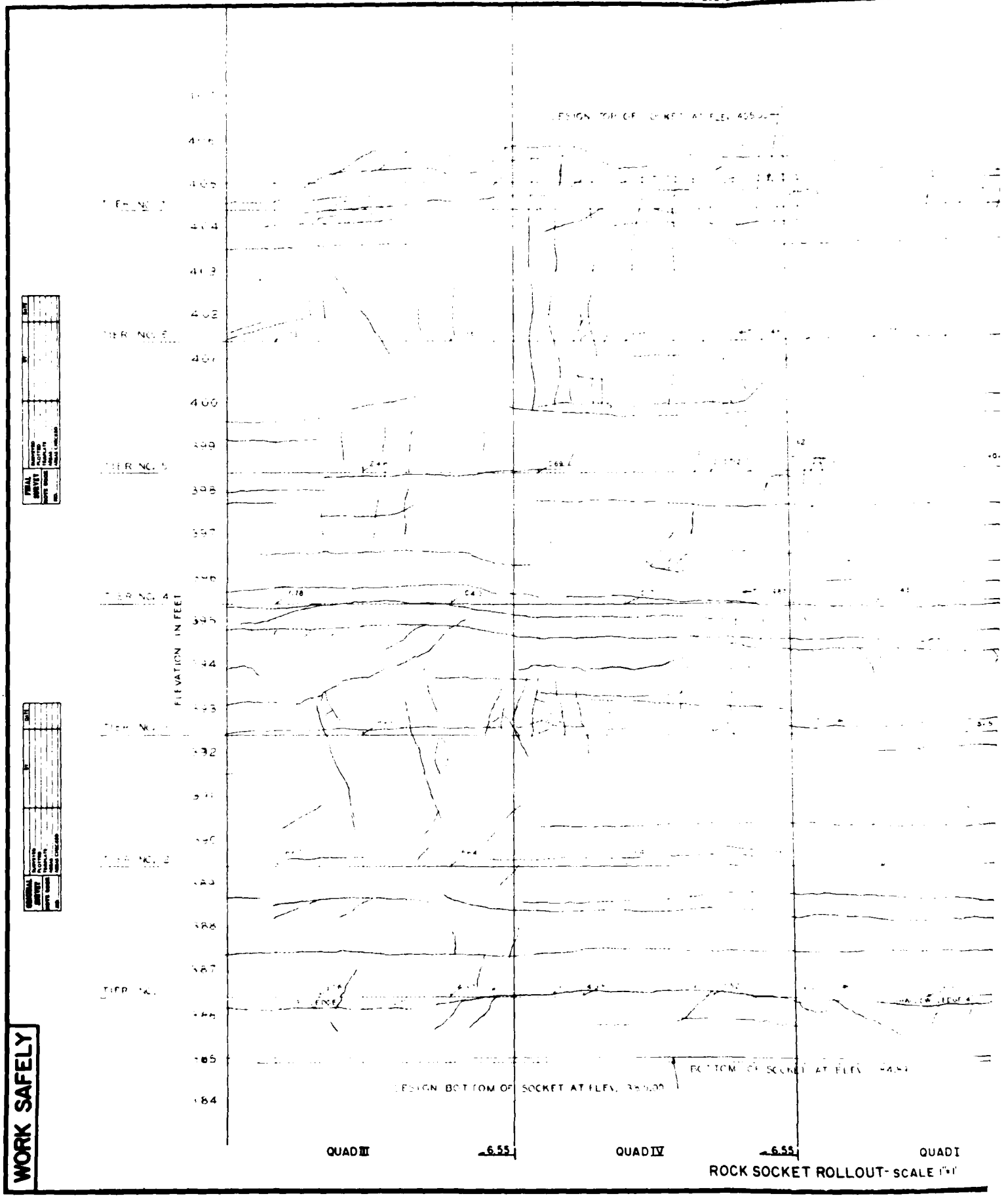
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

PIER 3, WEST SOCKET

SCALE	DRAWING NUMBER
SPEC NO	9687 134/3051
DATE APRIL 1984	SHEET 15 OF 16

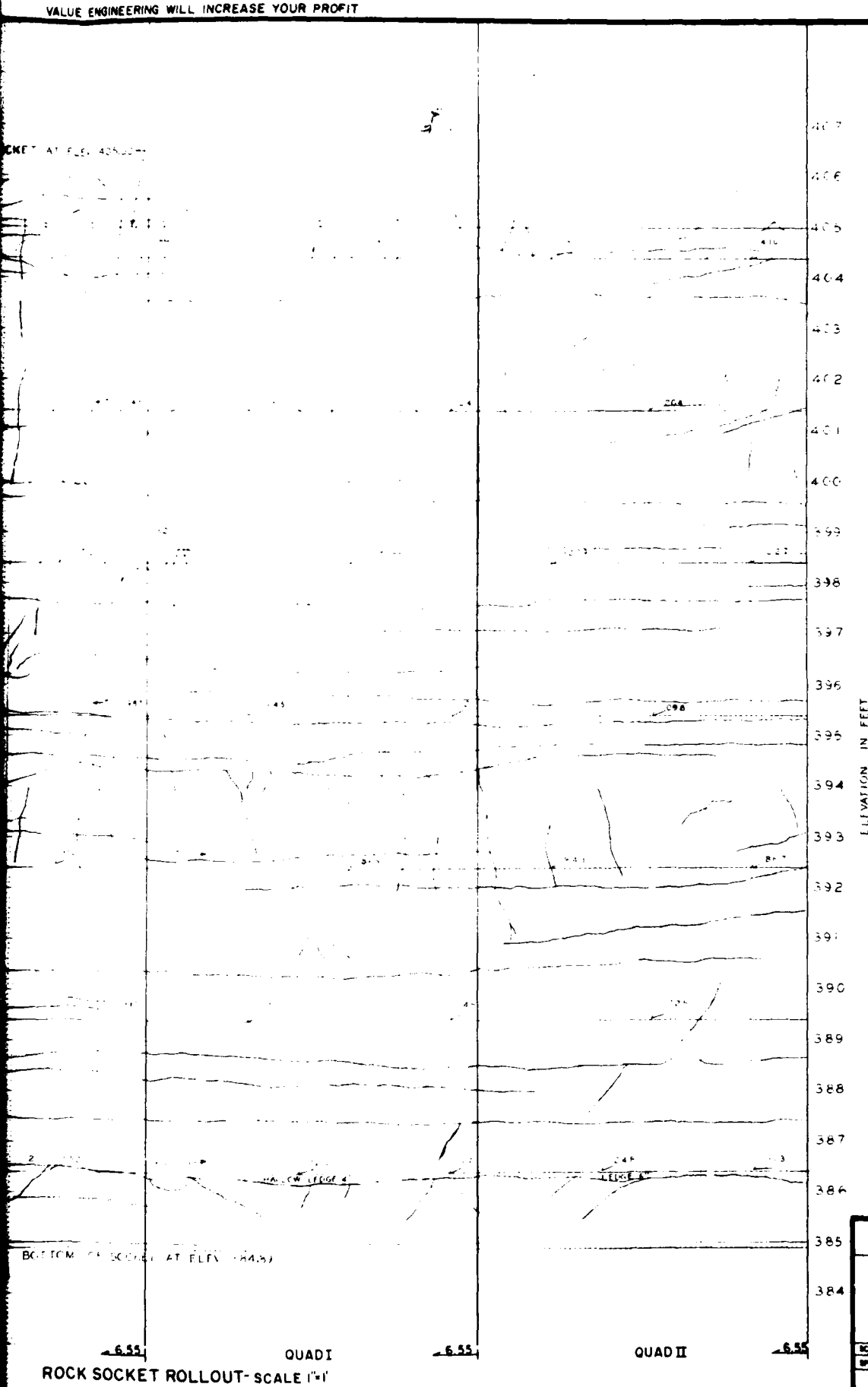
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS
TOP OF PIER AS PER TABLE 35.7.5
TOP OF SOCKET +409.00
BOTTOM OF SOCKET -84.89

EXPLANATION, SEE SHEET NO. 30
DWG. NO. 9687-134/3046

INSPECTION OF SOCKET FLOOR, SHOWED A SMOOTH, SOUND ROCK BOTTOM WITH OCCASIONAL SMALL AMOUNTS OF SAND AND GRAVEL.

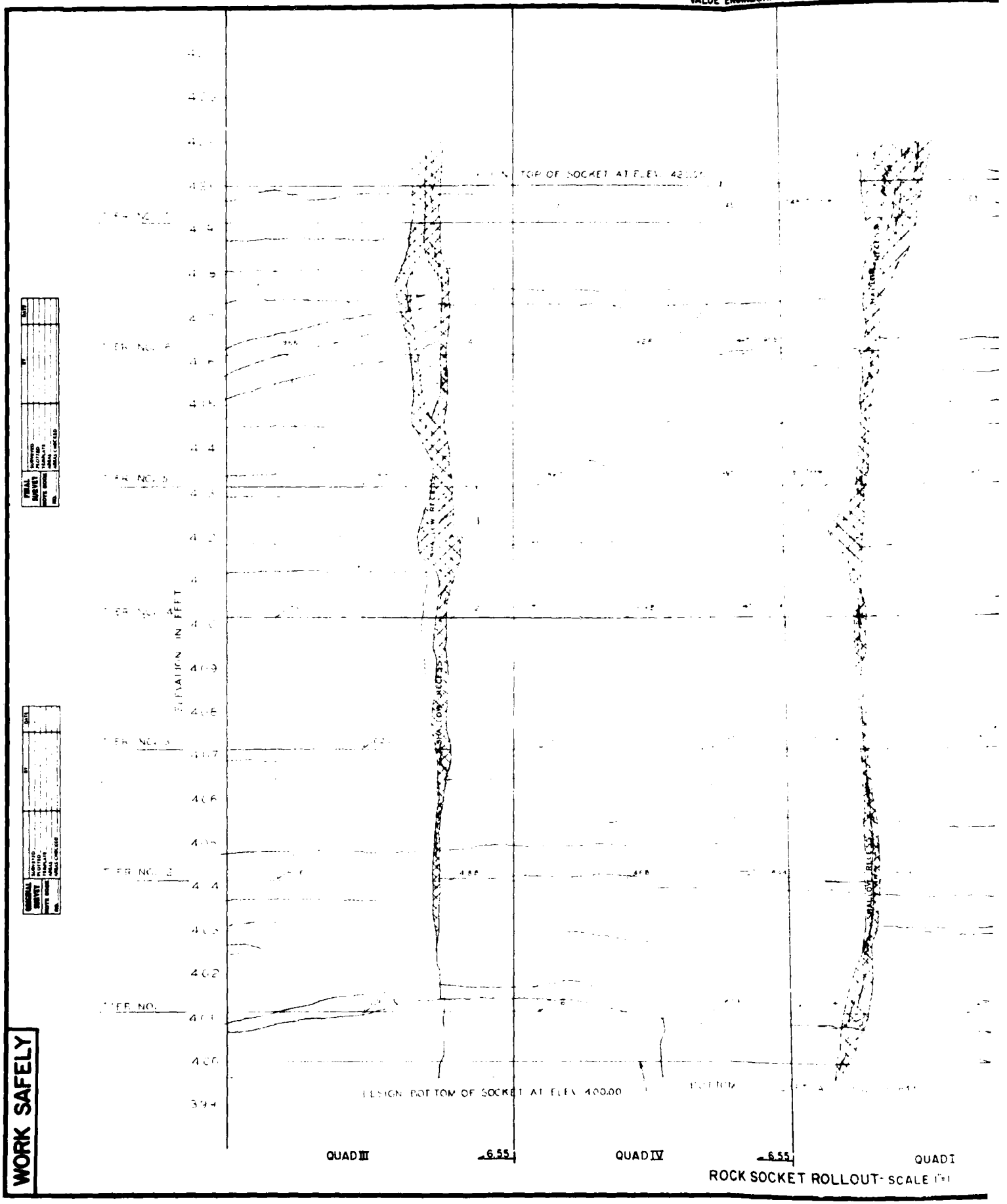
DATE OF INSPECTION: 21 & 22 JUL 1981
CONTRACT NO.: DACW03 79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES
ROCK SOCKET INSPECTION
HWY 101, PIER 3, EAST SOCKET

SCALE: 1"=1'	DRAWING NUMBER: 9687-134/3052
SPEC. NO.	
DATE: APRIL 1983	SHEET 31 OF 34

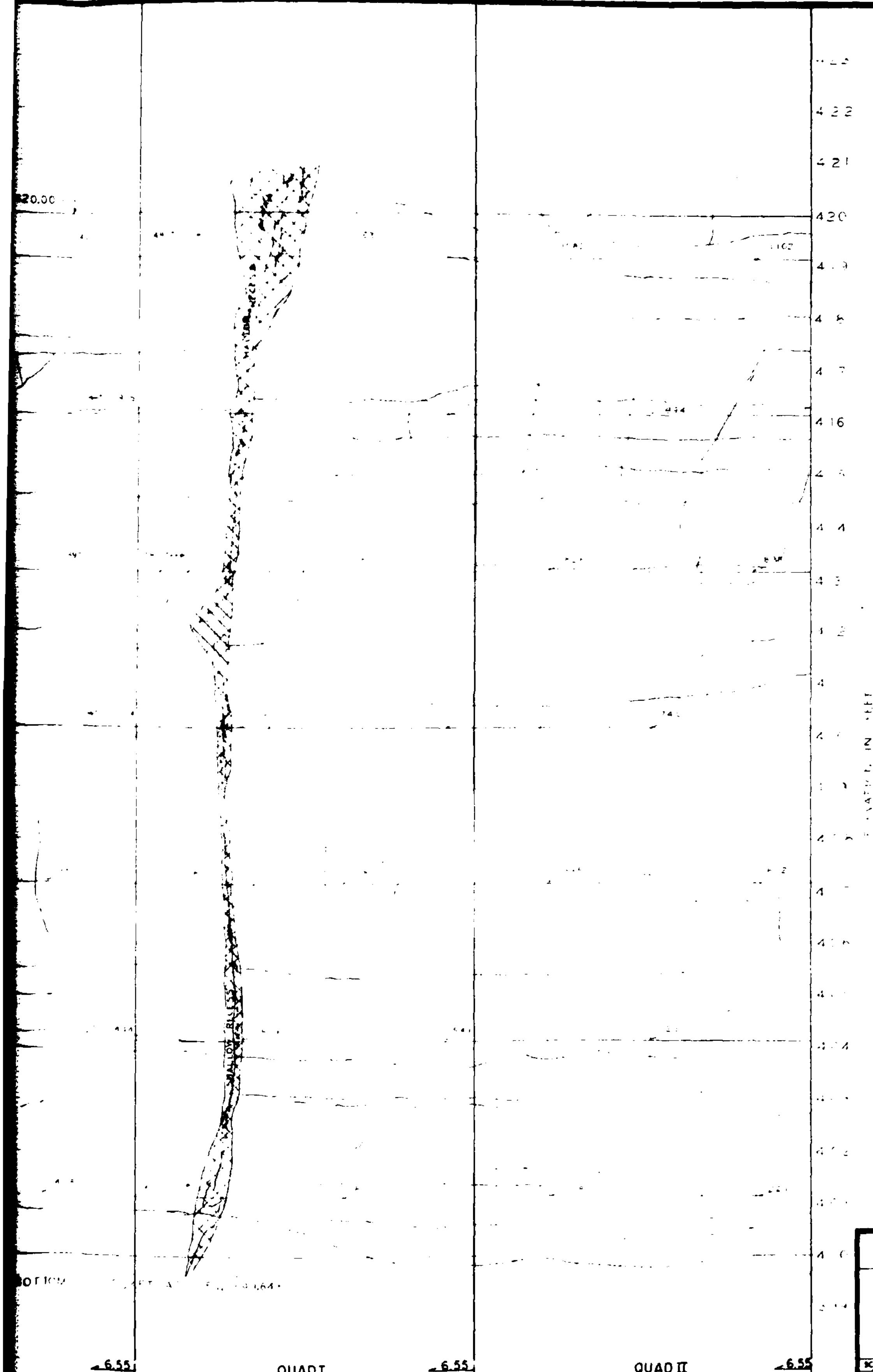
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

EXPLANATION

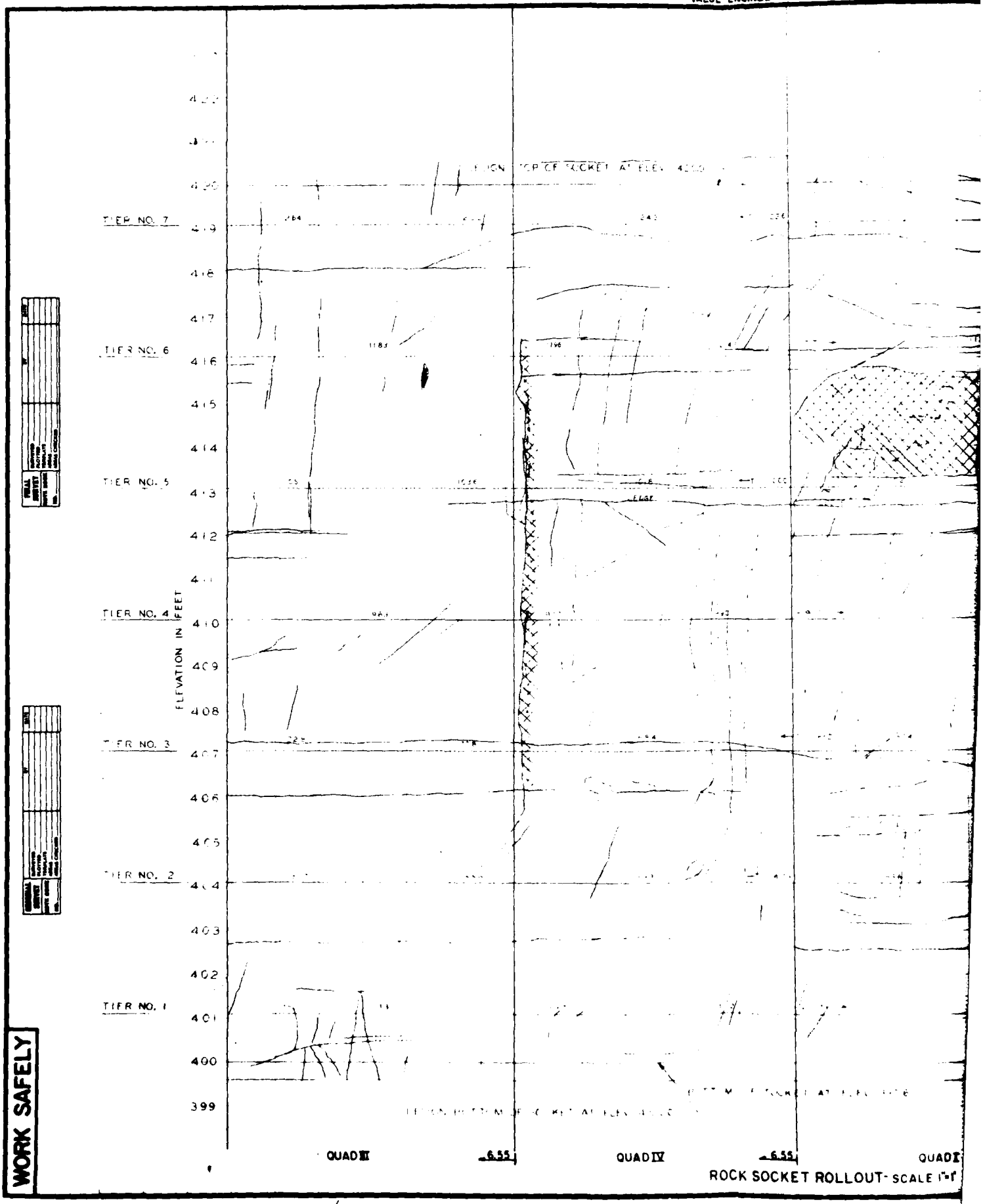
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

SCALE	DRAWING NUMBER
SPEC NO	9687-134/305[illegible]
DATE	
A[illegible] 1983	SHEET [illegible] OF [illegible]

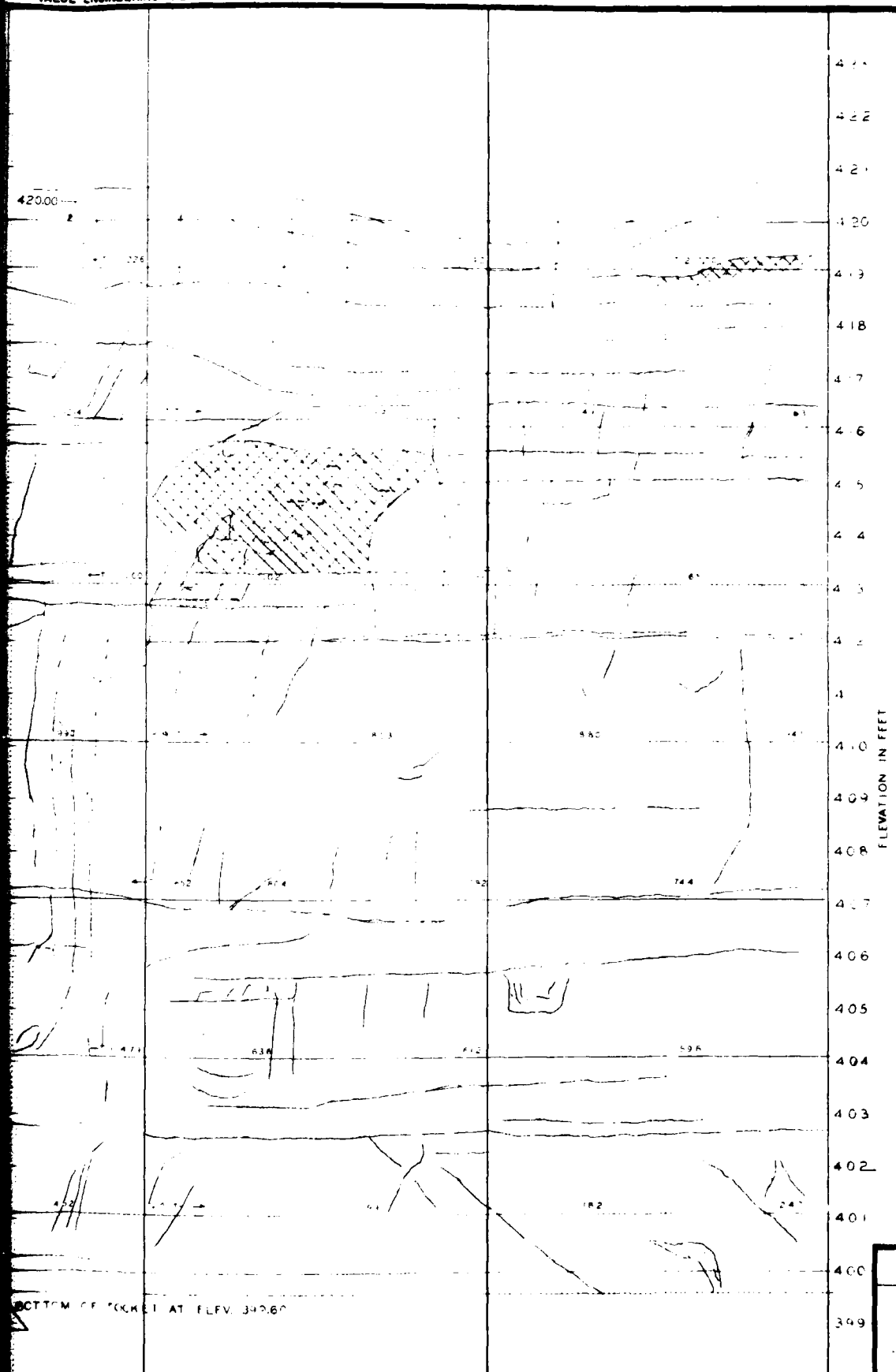
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF SOCKET = 420.00

EXPLANATION, SEE SHEET NO. 30
WG NO. 9687-34/3046

INSPECTION OF SOCKET FLOOR, SHOWED A CLEAN, SOUND ROCK BOTTOM.

DATE OF INSPECTION 24 AUG 198
CONTRACT NO. DACW03-78-C-0055
CONTRACTOR MASSMAN CONSTRUCTION CO
INSPECTING GEOLOGIST ROY L. MITCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

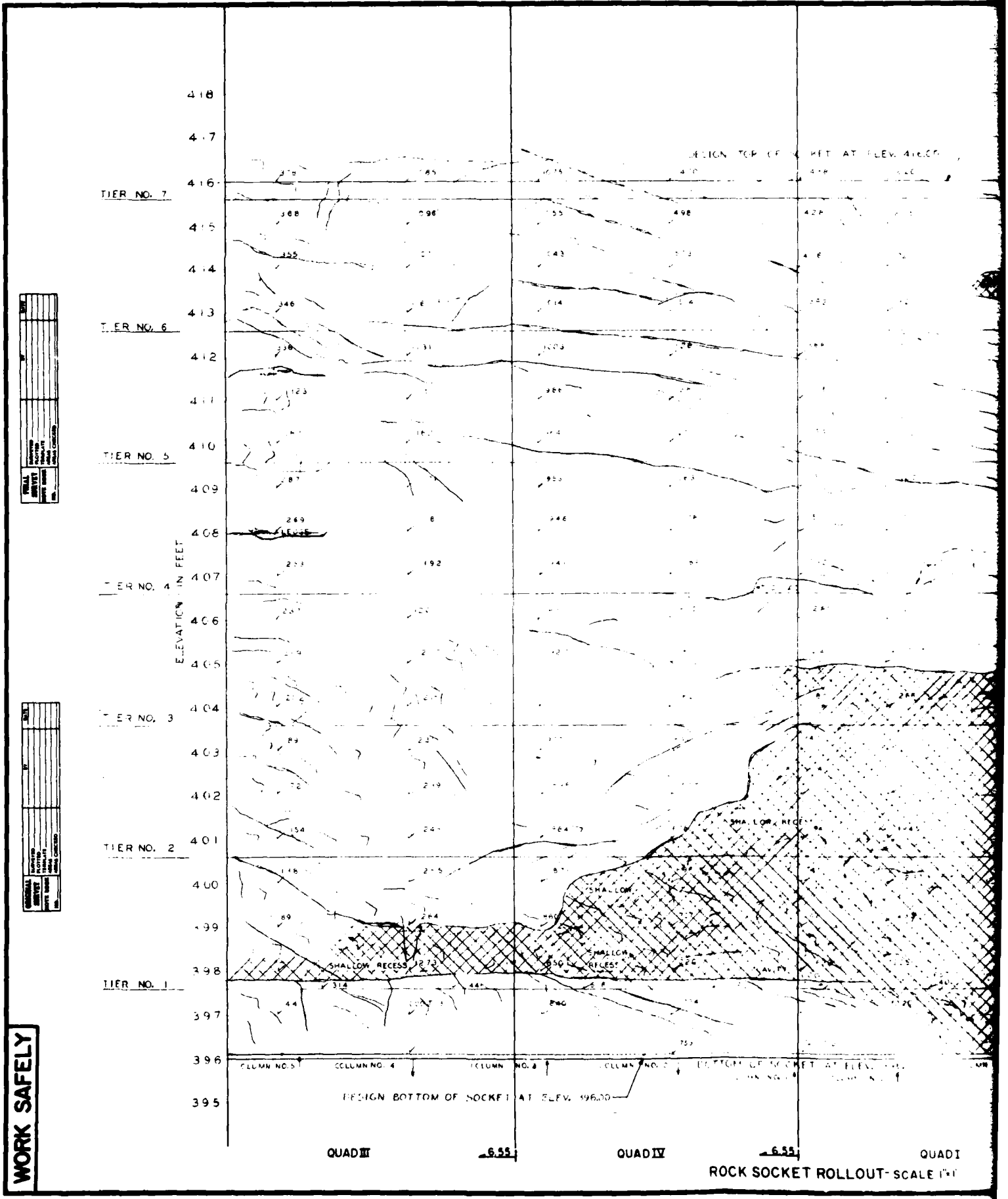
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

PIER 3, EAST SOCKET

SCALE 1"	DRAWING NUMBER 9687-134/3054
SPEC. NO	
DATE APRIL 1983	SHEET 29 OF 32

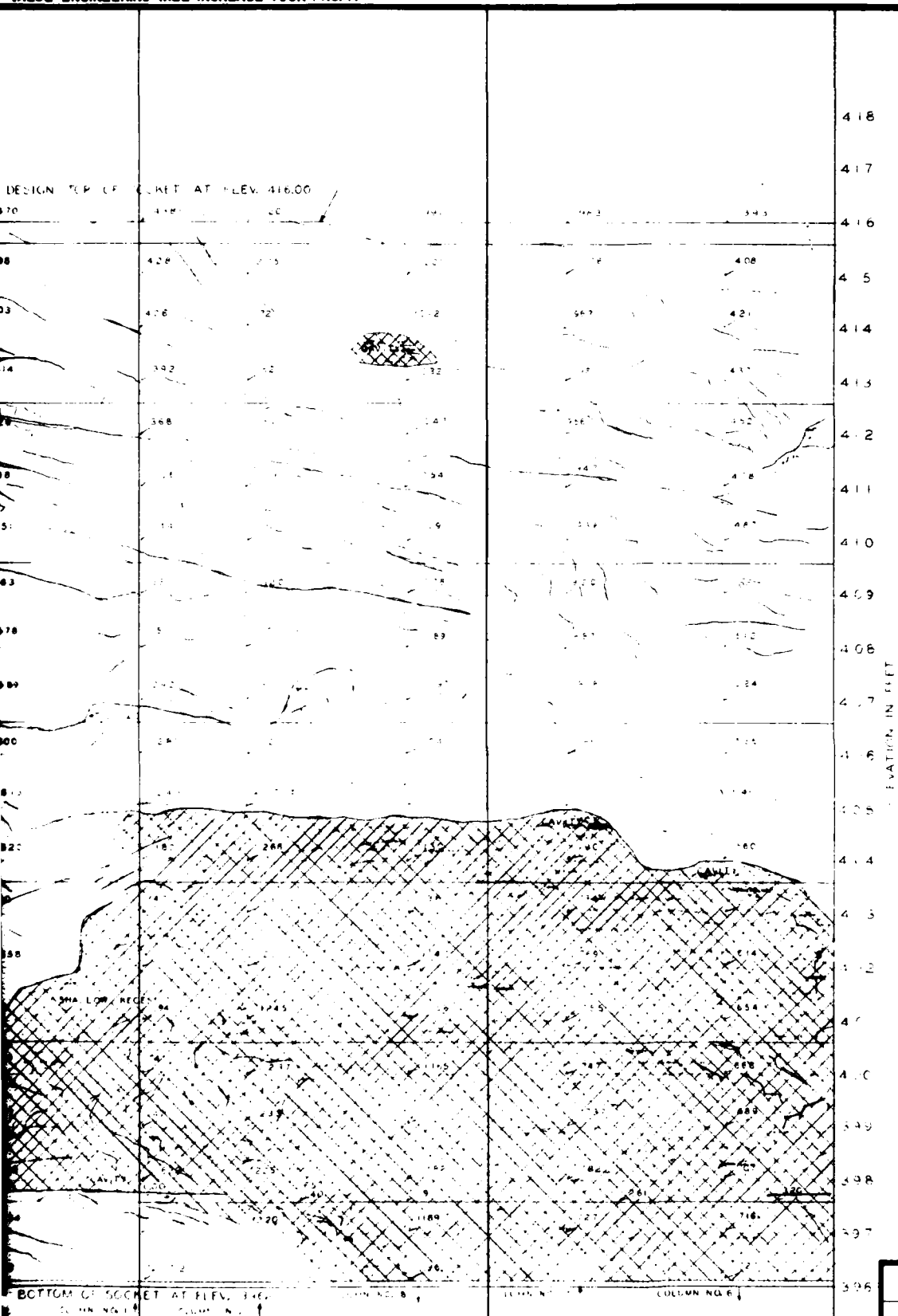
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE = 462.5

TOP OF SOCKET = 416.00

BOTTOM OF SOCKET = 396.0

DESIGN TOP OF SOCKET = 416.00

EXPLANATION SEE SHEET NO. 39

DWG NO. 9687-134/3048

INSPECTION OF SOCKET FLOOR SHOWED A

SOUND ROCK BOTTOM WITH

SOME SAND ROCK FRAGMENTS

SEE SOCKET INSPECTION, TOTEN

SHOWN ON SHEET NO. 40

DWG NO. 9687-134/3056

DATE OF INSPECTION 8-12-82

CONTRACT NO. DACW03-78-C-0005

CONTRACTOR: MA-MAC CONSTRUCTION CO.

INSPECTING OFFICIAL NOT LT. GRAY MEELE

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

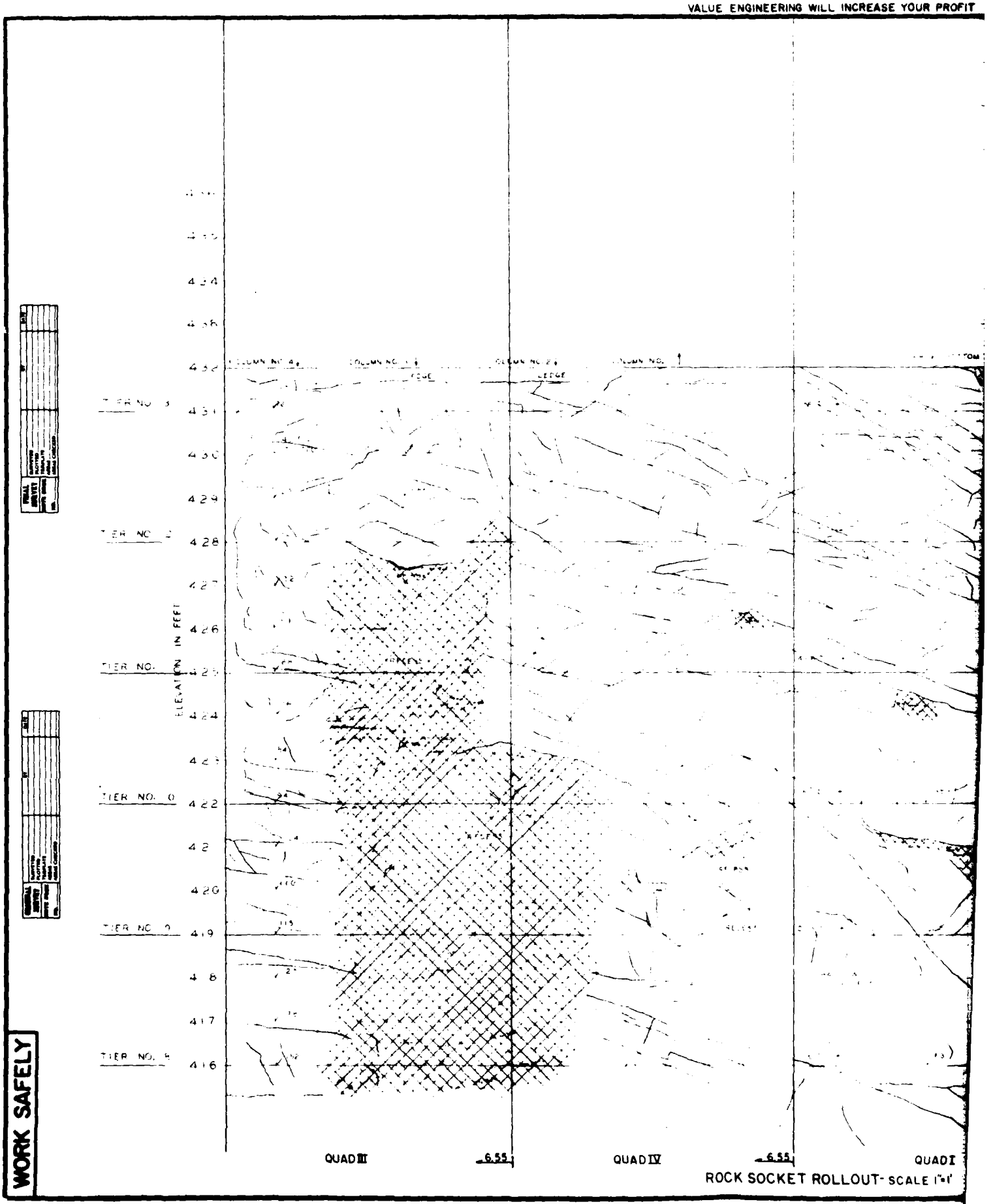
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 5, WEST SOCKET

SCALE: 1"=1'	DRAWING NUMBER
SPEC. NO	9687-134/3055
DATE APRIL 1983	SHEET 38 OF 42

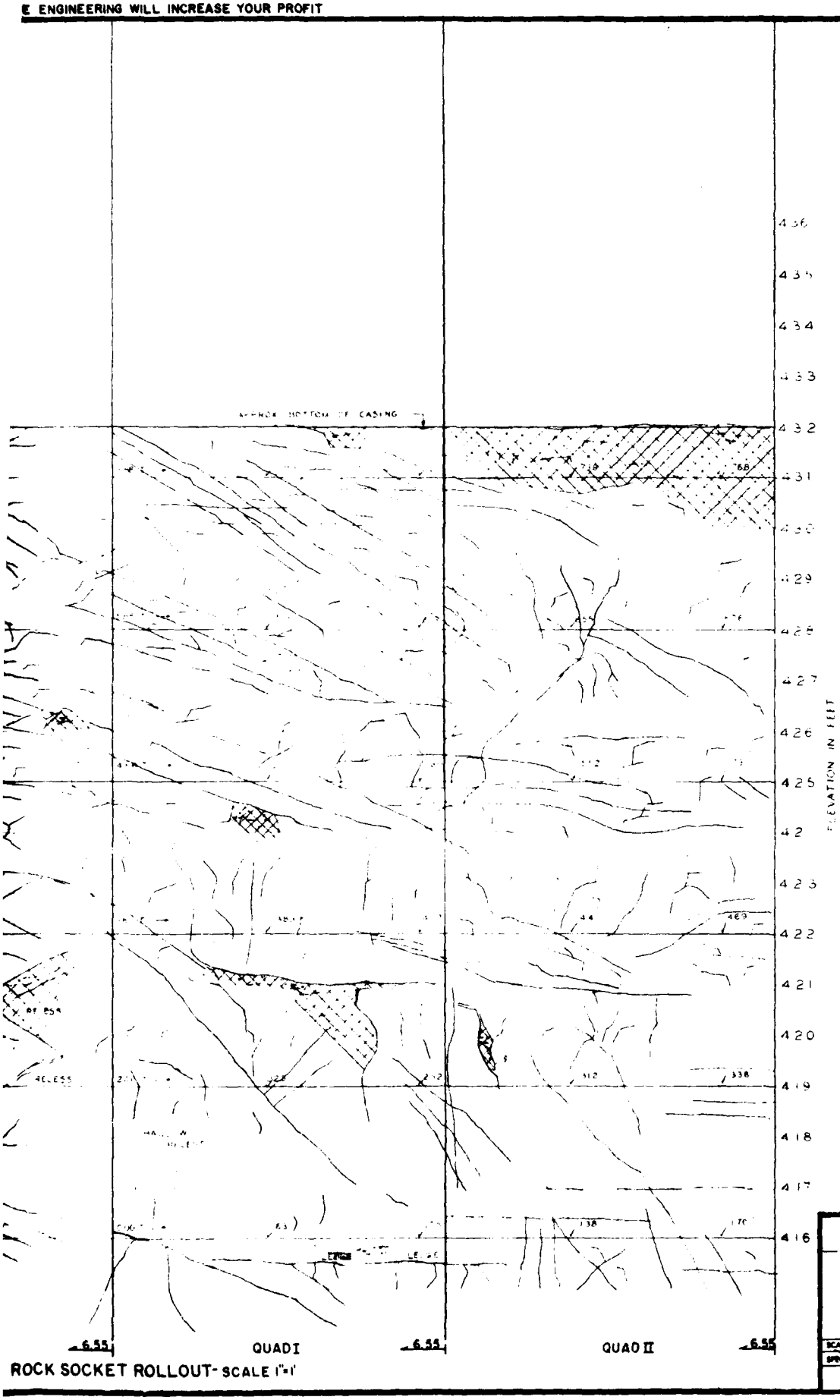
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

E ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURNTABLE = 462.4'
TOP OF SOCKET = 430.00
BOTTOM OF SOCKET = 396.40
DESIGN TOP OF SOCKET = 6.00

EXPLANATION: SEE SHEET NO 30
DWG NO. 9687-134/3046

LOWER SOCKET INSPECTION TO ELEV 408
IS SHOWN ON SHEET NO 38
DWG NO 9687-134/3055

DATE OF INSPECTION 19 JUNE 1981
CONTRACT NO: DACW03-78-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO
INSPECTING GEOLOGIST: ROY E. CRUTCHFIELD

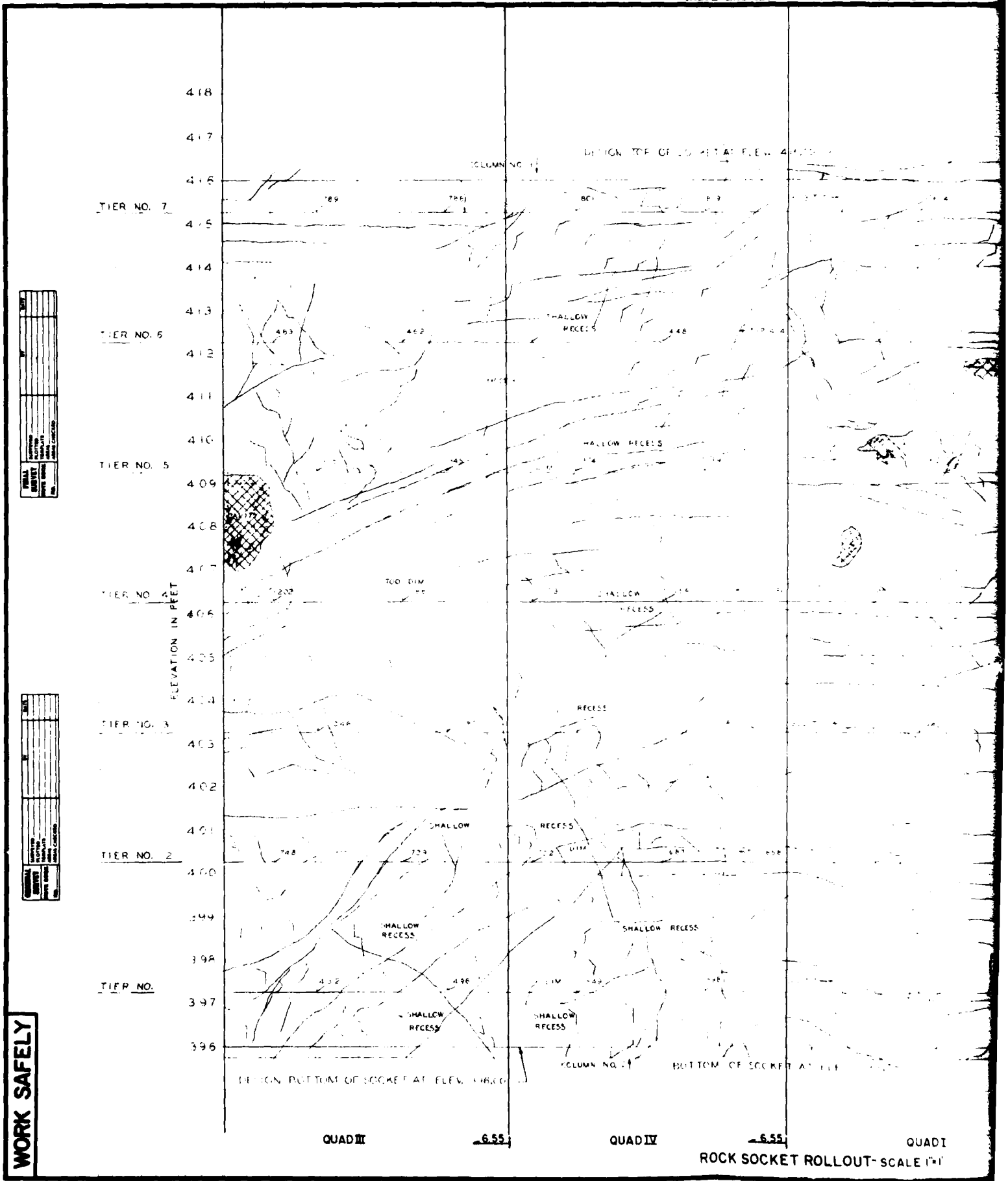
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 5, WEST SOCKET

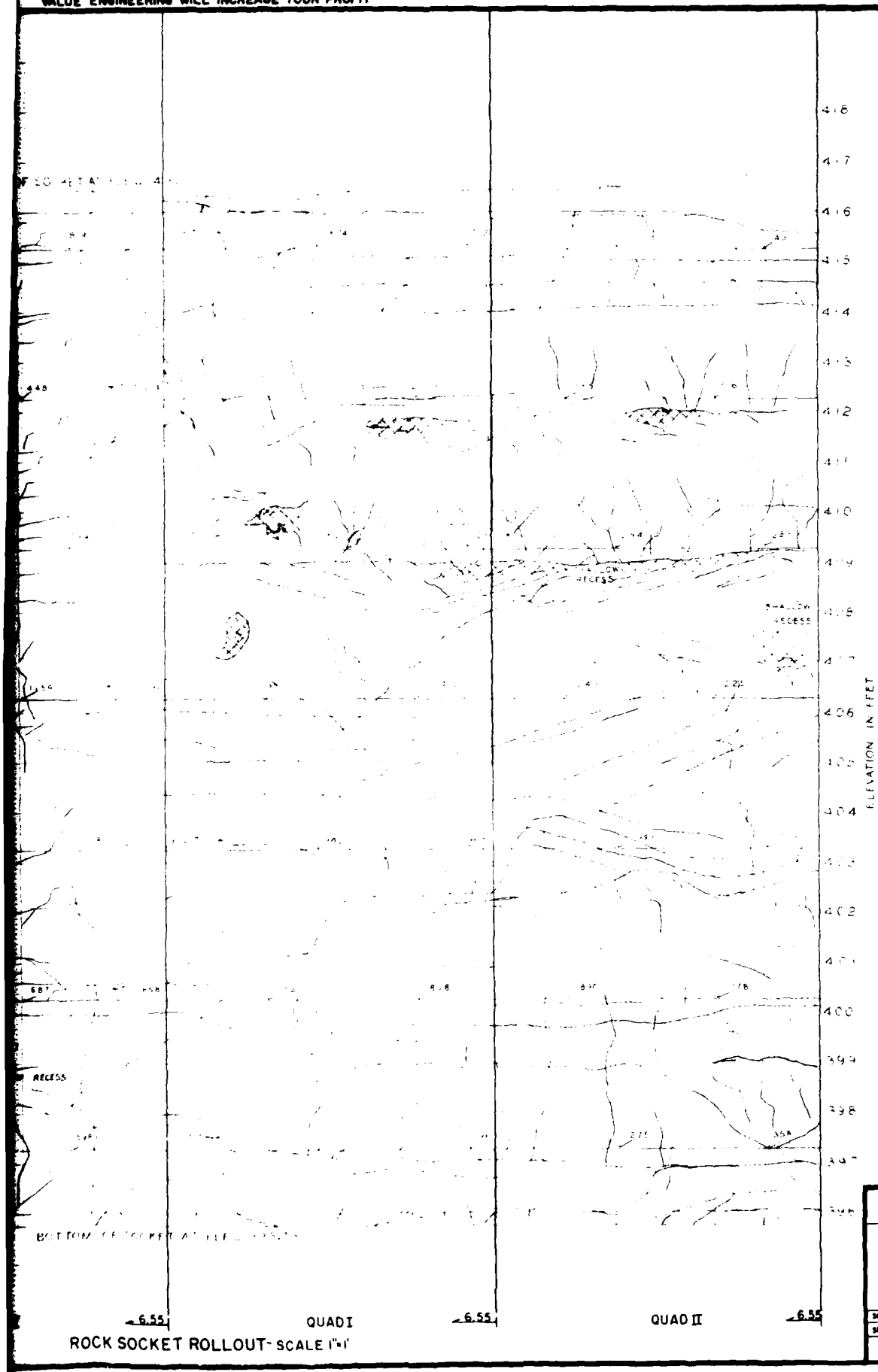
SCALE:	DRAWING NUMBER
SPEC. NO.	9687-134/3056
DATE: APRIL 1983	SHEET 40 OF 52



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURNTABLE [illegible]
TOP OF SOCKET +430.00
BOTTOM OF SOCKET 395.75
DESIGN TOP OF SOCKET=416.00

EXPLANATION, SEE SHEET NO. 33
WO. NO. 9687-134/3046

INSPECTION OF SOCKET FILLER, SHOWED A CLEAN SOUND ROCK BOTTOM ALTHOUGH FRACTURED AND BLOCKY

UPPER SOCKET INSPECTION, [illegible] ELEV. [illegible] SHOWN ON SHEET NO. 42
WO. NO. 9687-134/3058

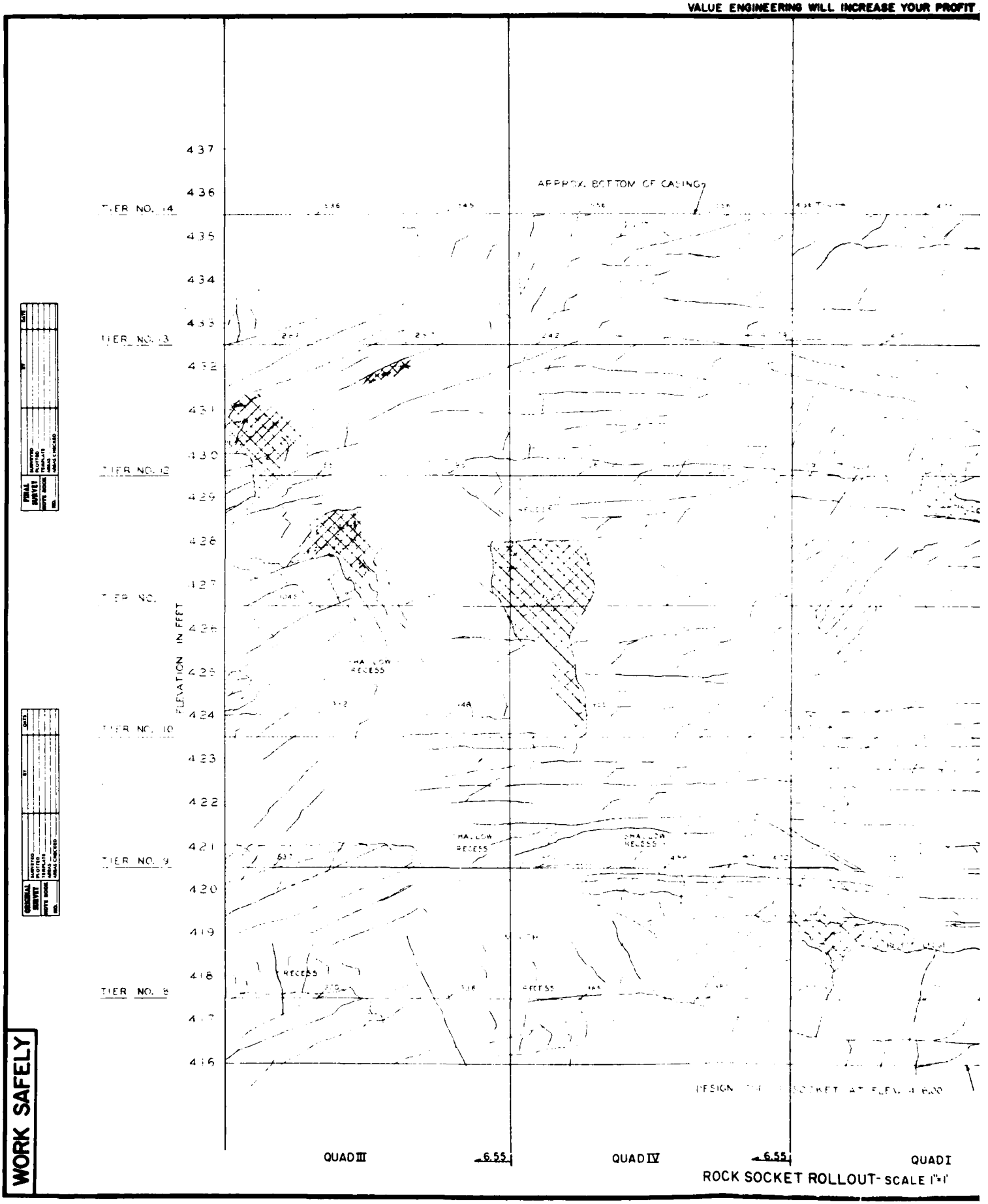
DATE OF INSPECTION: [illegible] JUNE 198[illegible]
CONTRACT NO. DACW[illegible]
CONTRACTOR: MAUSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. VALTENFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 5, EAST SOCKET

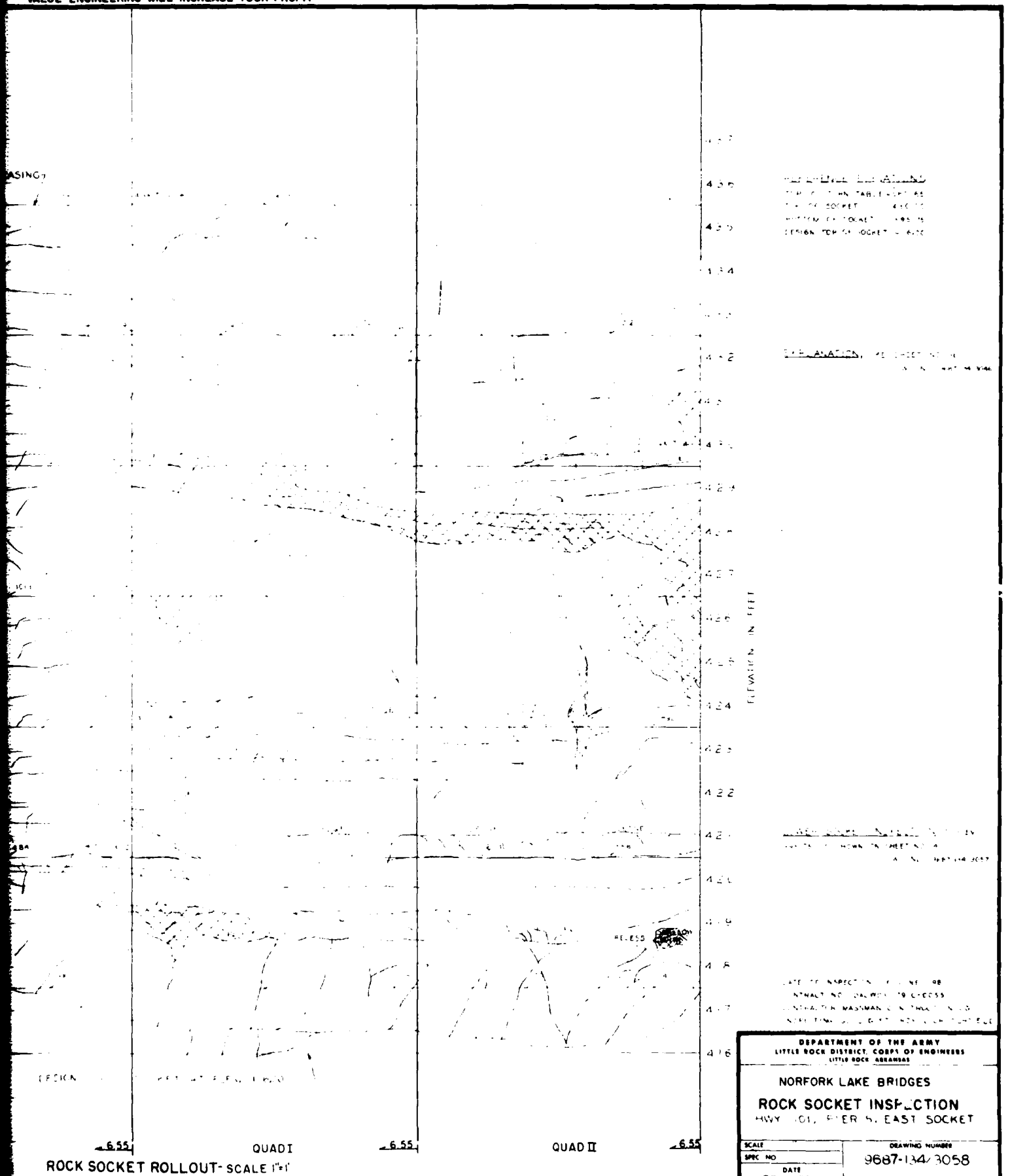
SCALE:	DRAWING NUMBER
SPEC. NO.	9687-134/3057
DATE: APRIL 1983	SHEET 41 OF N



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

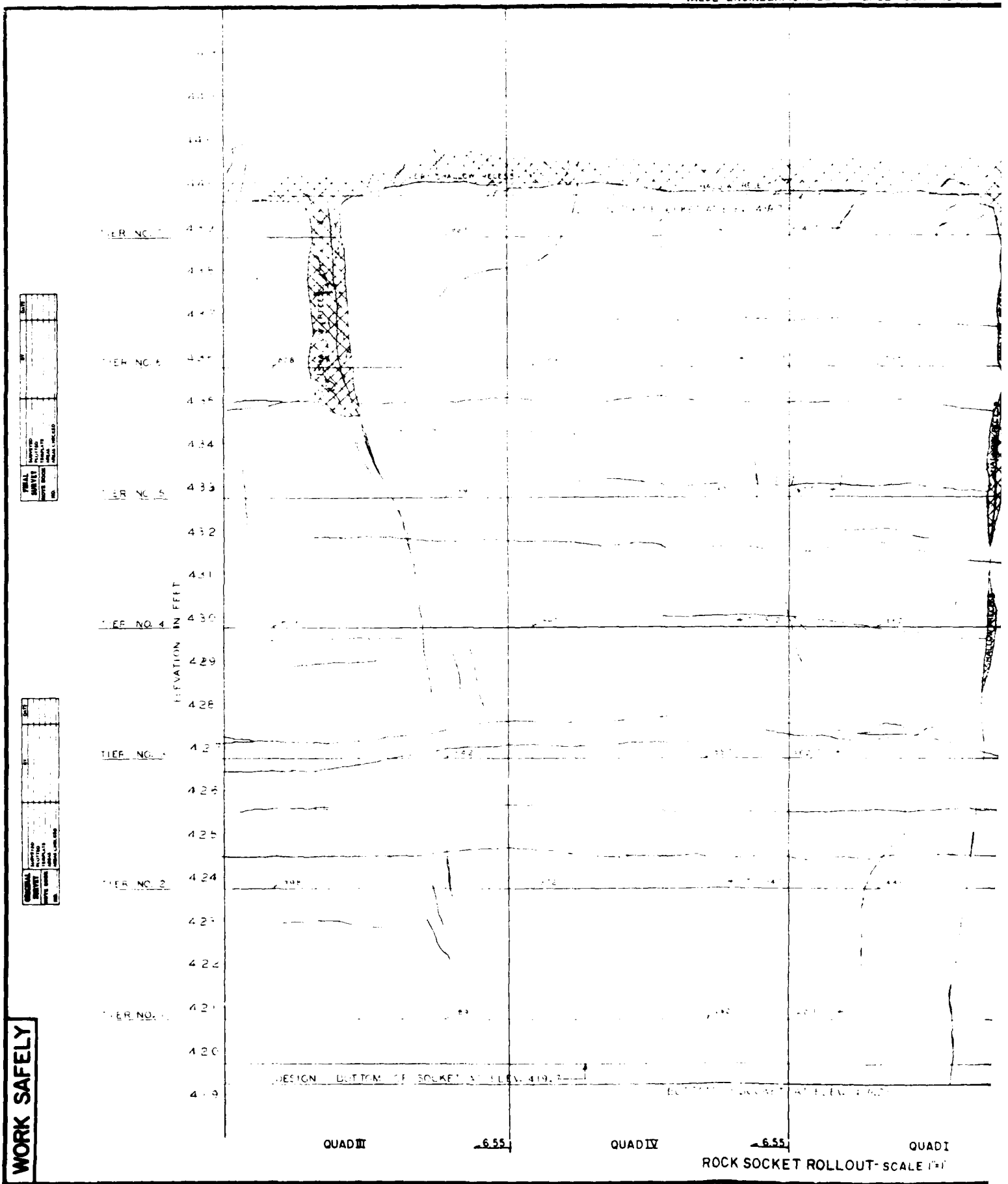
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 5, EAST SOCKET

SCALE	DRAWING NUMBER
SPEC NO	9687-134/3058
DATE APRIL 1984	SHEET 4/ OF 52

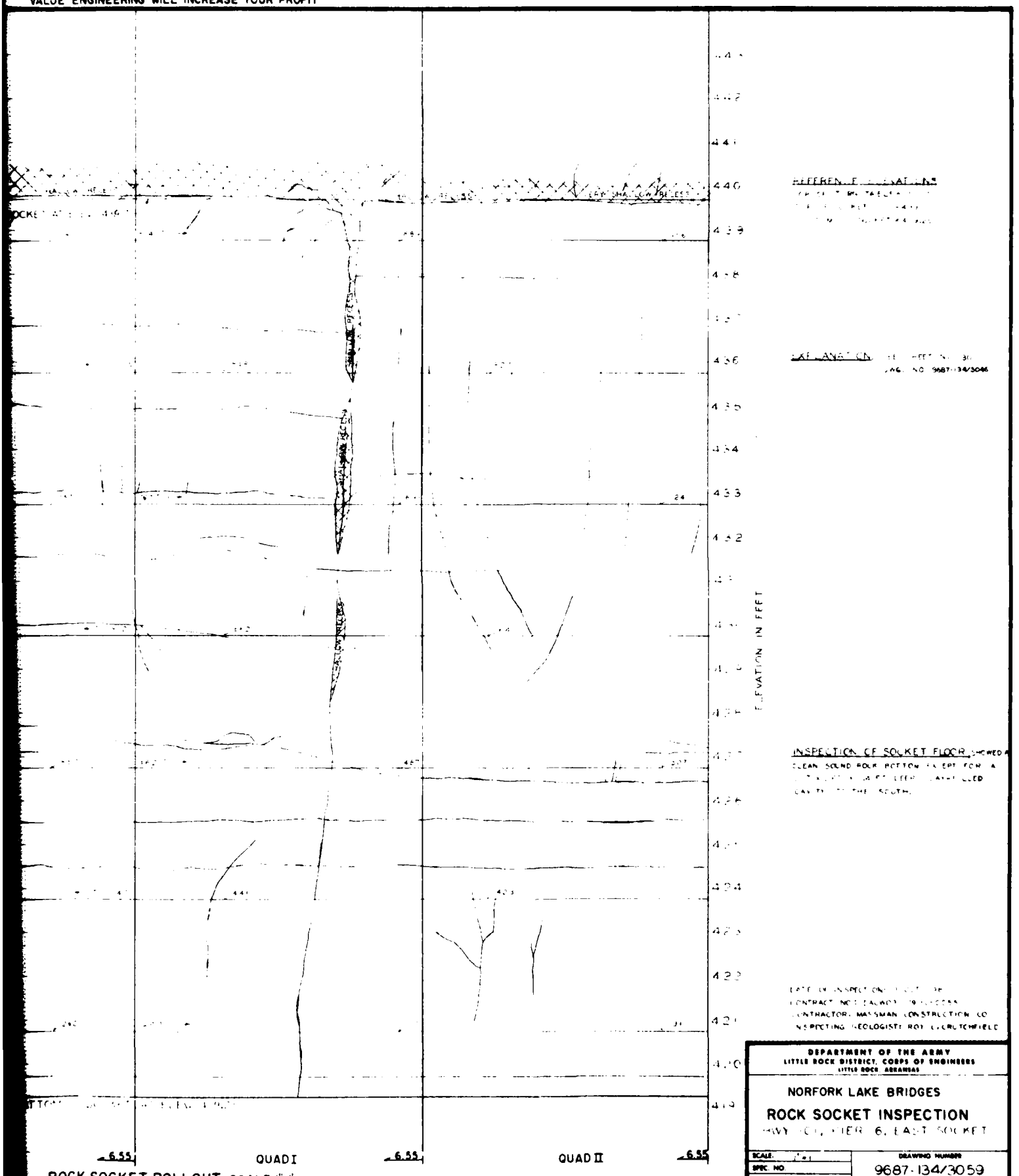
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

EXCAVATION

INSPECTION OF SOCKET FLOOR SHOWED A CLEAN SOUND ROCK BOTTOM EXCEPT FOR A

DATE OF INSPECTION

CONTRACT NO.

CONTRACTOR: MASSMAN CONSTRUCTION CO.

INSPECTING GEOLOGIST: ROY CRUTCHFIELD

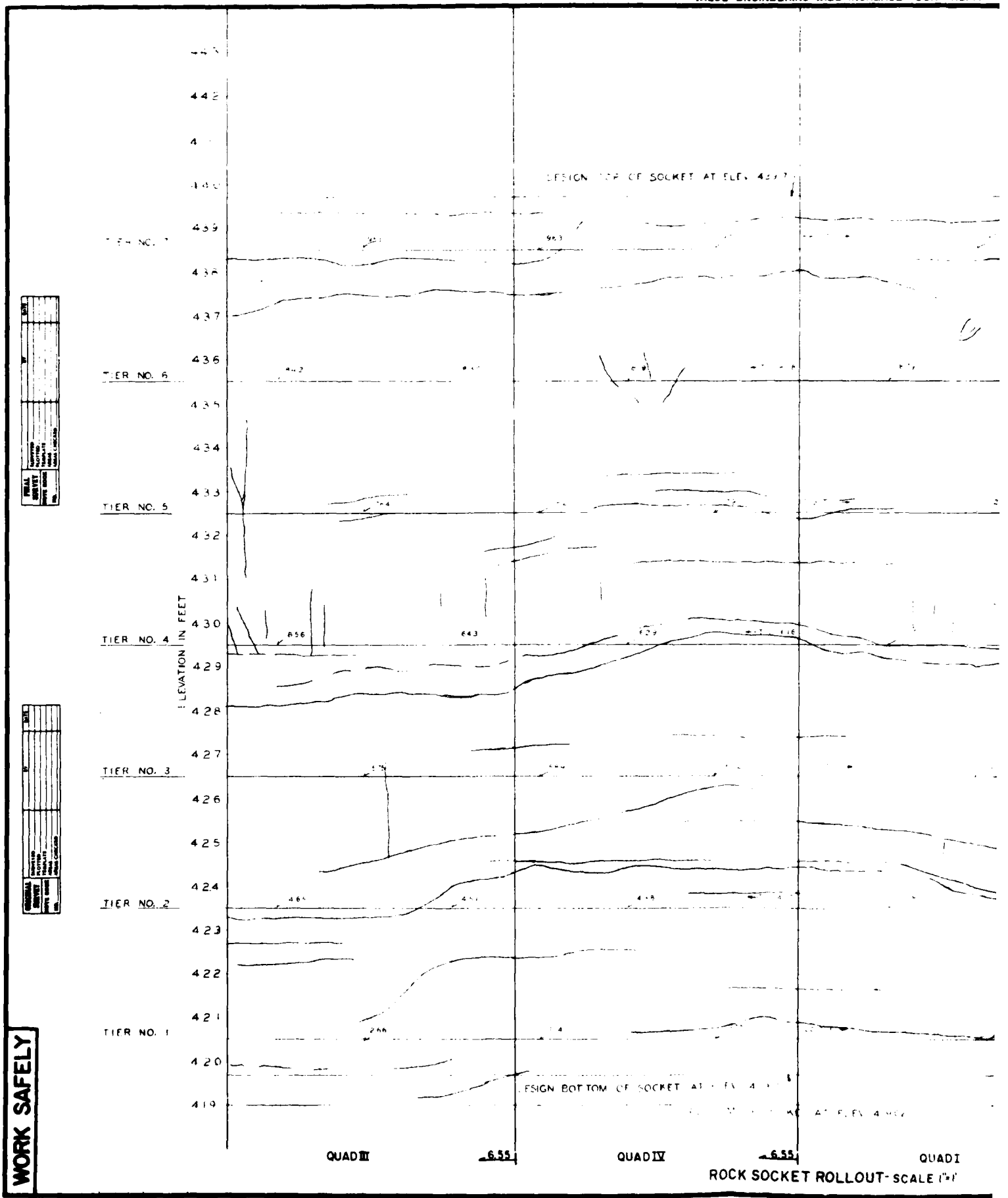
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 6, EAST SOCKET

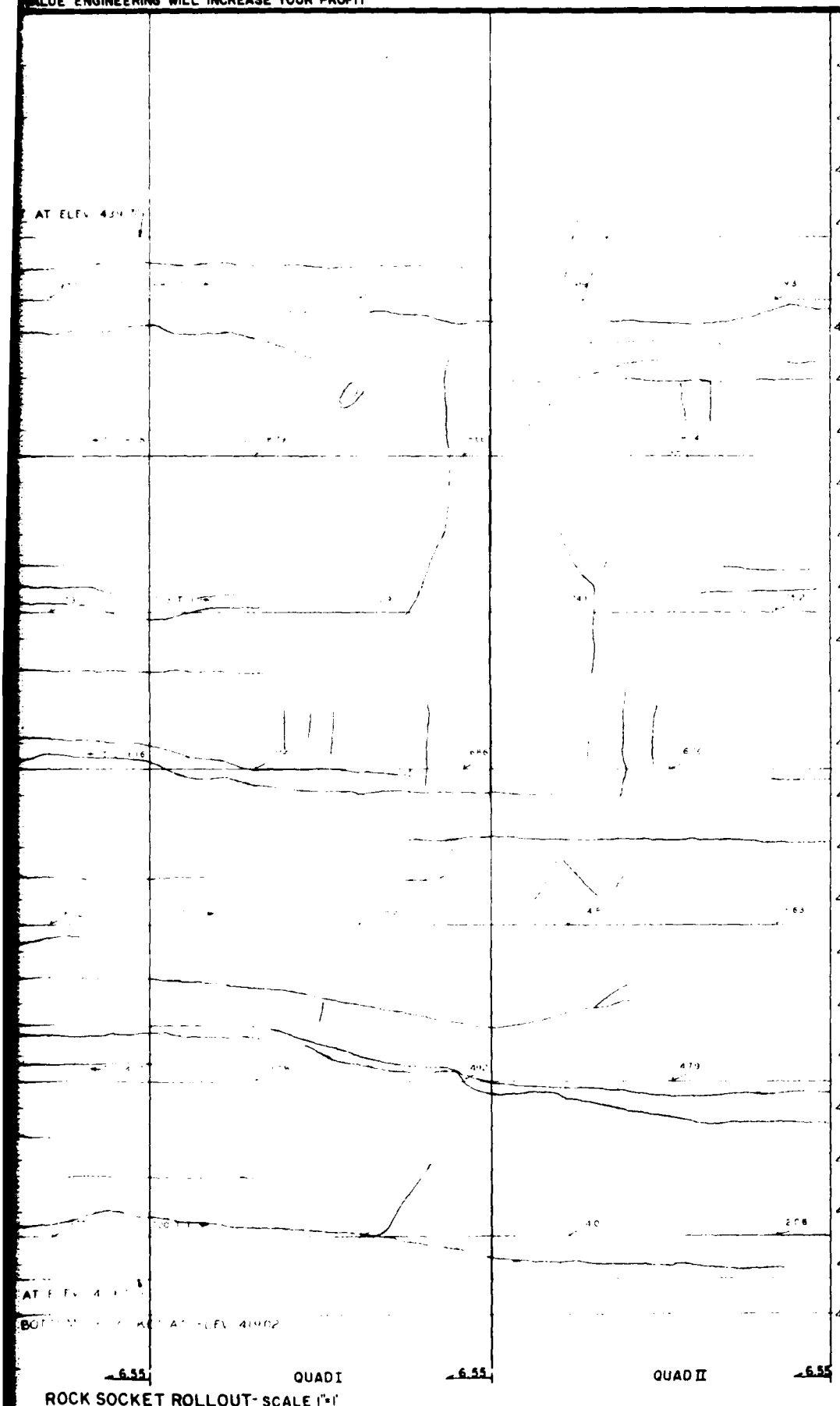
SCALE: 1"=1'	DRAWING NUMBER: 9687-134/3059
SPEC. NO.	
DATE: APRIL 1983	SHEET 43 OF 52



ROCK SOCKET ROLLOUT- SCALE 1"=

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS
TOP OF TUNNEL TABLE = 437.58
TOP OF SOCKET = 435.17
BOTTOM OF SOCKET = 419.02

EXPLANATION, SEE SHEET No. 30
DWG NO. 9687-134/3046

INSPECTION OF SOCKET FLOOR SHOWED A SOUND ROCK BOTTOM WITH A THIN, WAVY COVERING OF SILT OVER MUCH OF THE AREA.

DATE OF INSPECTION: 6 OCT 1981
CONTRACT NO: DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L CRUTCHFIELD

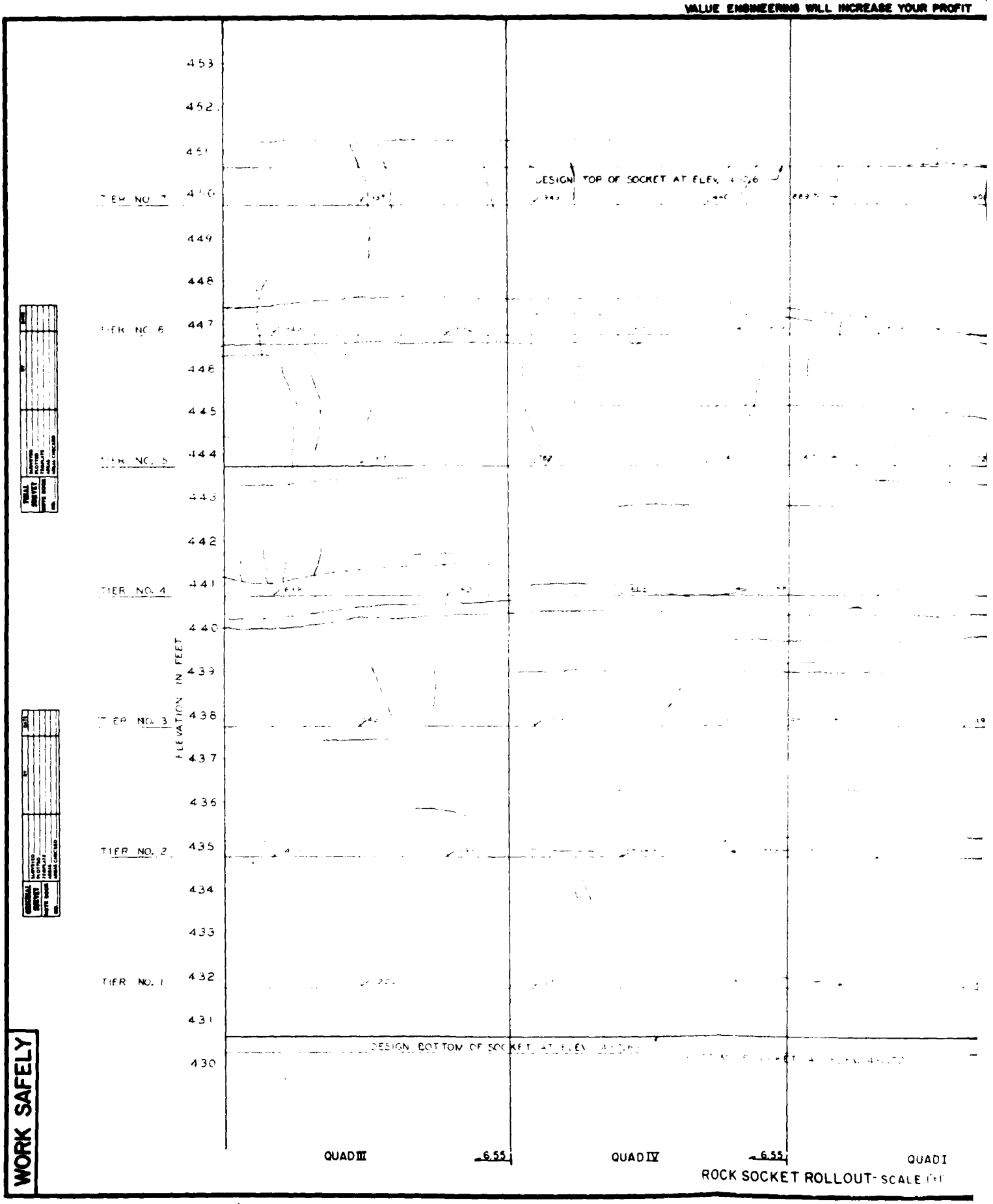
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 6, WEST SOCKET

SCALE: 1"=1'	DRAWING NUMBER
SPEC. NO.	9687-134/3060
DATE APRIL 1983	SHEET 44 OF 52

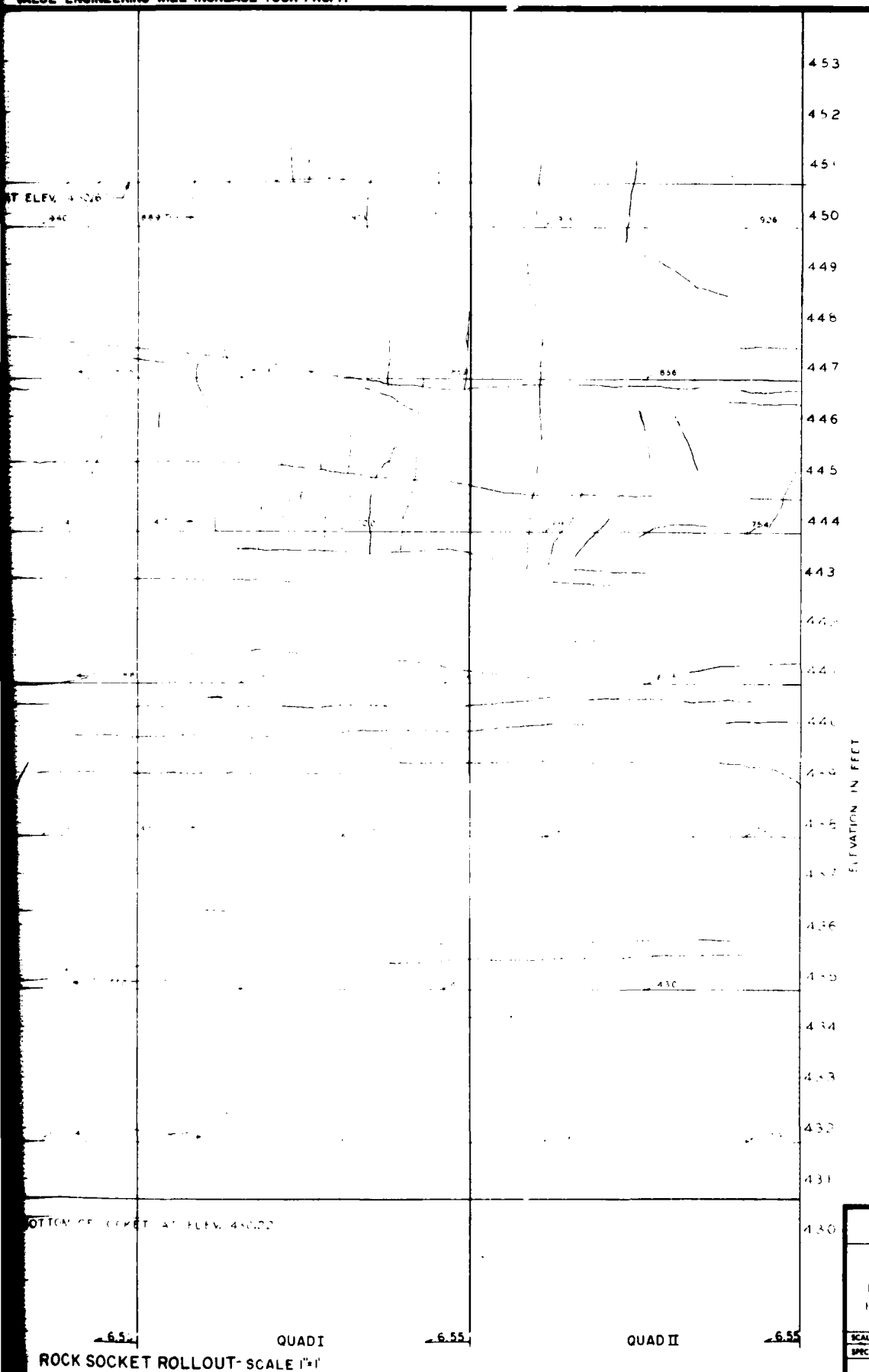
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



T ELEV. 4[illegible]

OTTOM OF SOCKET AT ELEV. 430.00

6.5

QUAD I

6.55

QUAD II

6.55

ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE 553.11

TOP OF SOCKET 450.60

BOTTOM OF SOCKET 447.22

EXCAVATION SEE SHEET NO. 30

DWG. NO. W-BT-34/3046

INSPECTION OF SOCKET FLOOR, SHOWED A

[illegible] BOTTOM WITH [illegible] NATIONAL

PAVE AND [illegible]

DATE OF INSPECTION 4 & 16 NOV 1981

CONTRACT NO.: DACW03-[illegible]

CONTRACTOR: MASSMAN CONSTRUCTION CO

INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

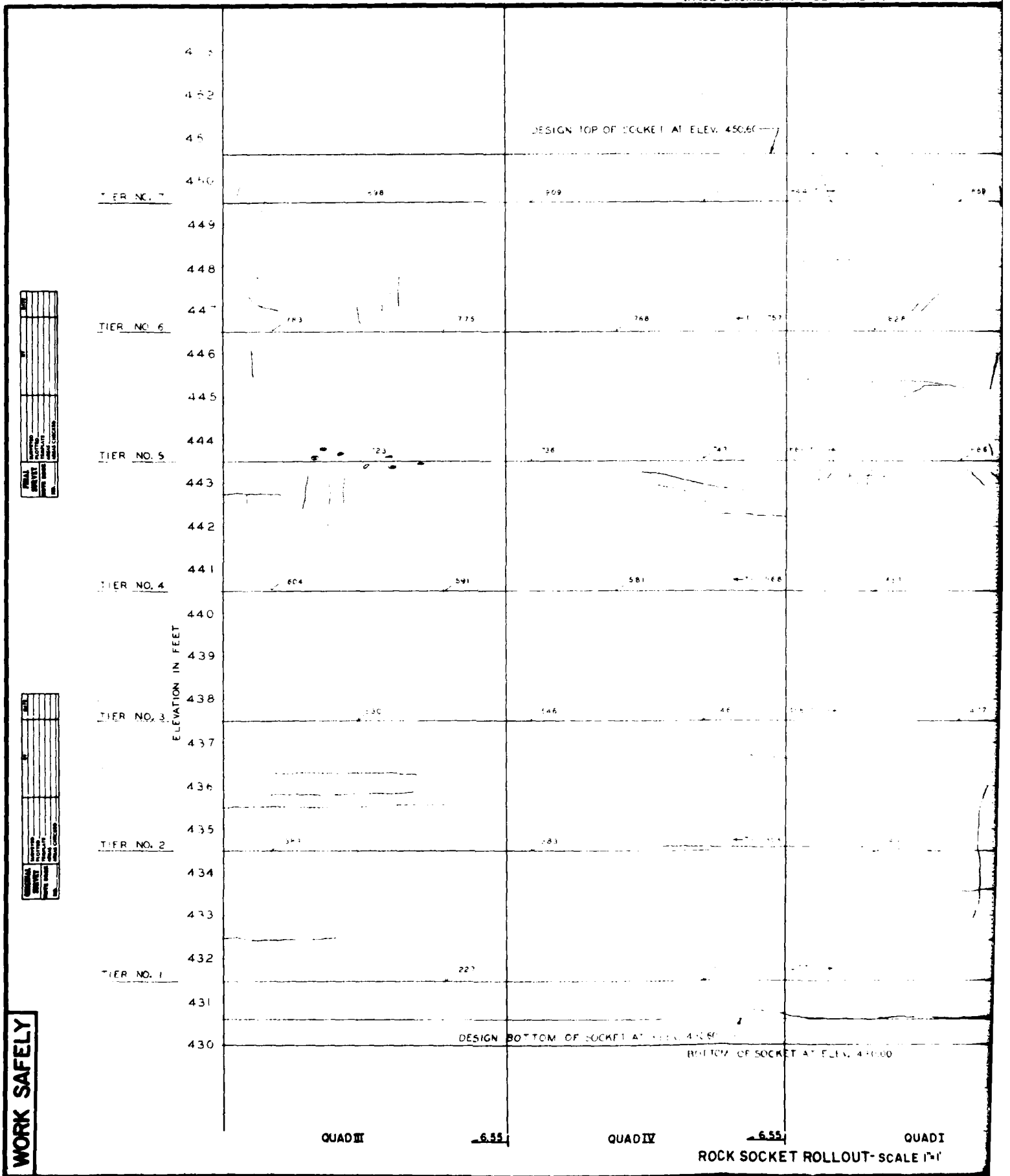
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 7, WEST SOCKET

SCALE:	DRAWING NUMBER
SPEC. NO.	9687-134/3061
DATE APRIL 1983	SHEET 45 OF 52

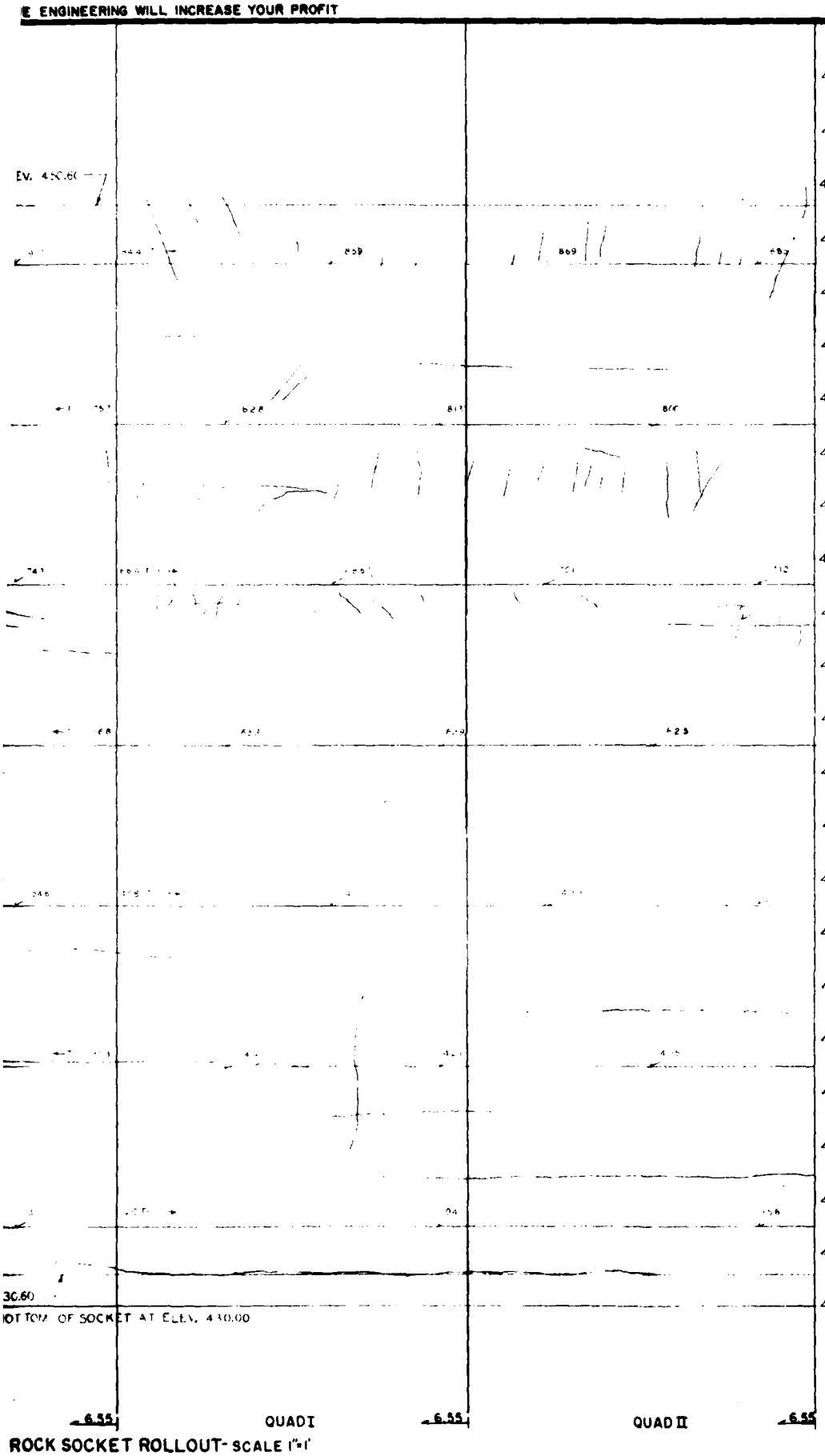
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

E ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE	555.15
TOP OF SOCKET	450.60
BOTTOM OF SOCKET	430.00

EXPLANATION, SEE SHEET NO. 30
DWG. NO. 9687-134/3046

INSPECTION OF SOCKET FLOOR, SHOWED A CLEAN, SOUND ROCK BOTTOM

DATE OF INSPECTION: 14 NOV 1981
CONTRACT NO: DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

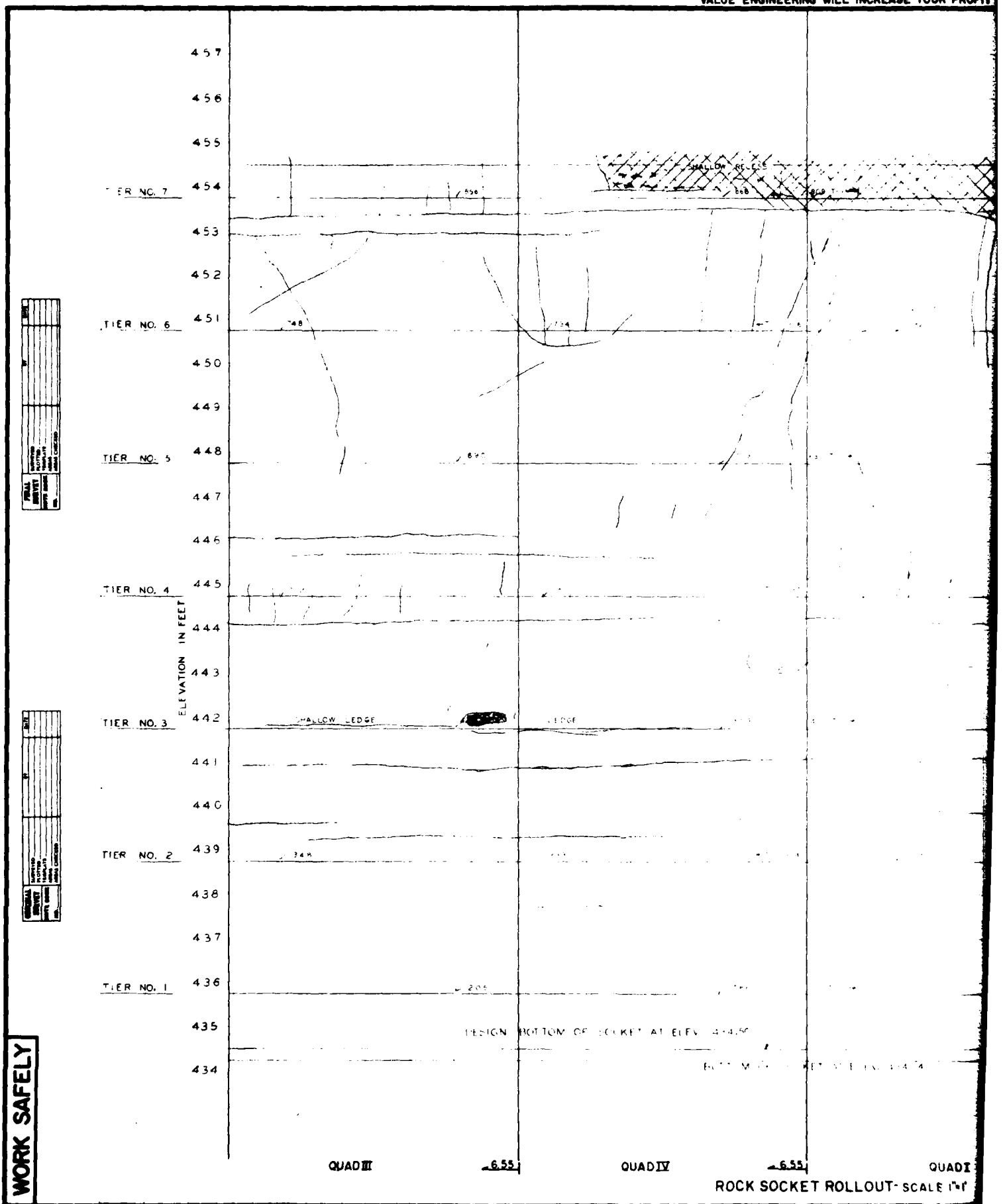
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY. 101, PIER 5, EAST SOCKET

SCALE:	DRAWING NUMBER: 9687-134/3062
SPEC. NO.	
DATE: APRIL 1983	SHEET 29 OF 30

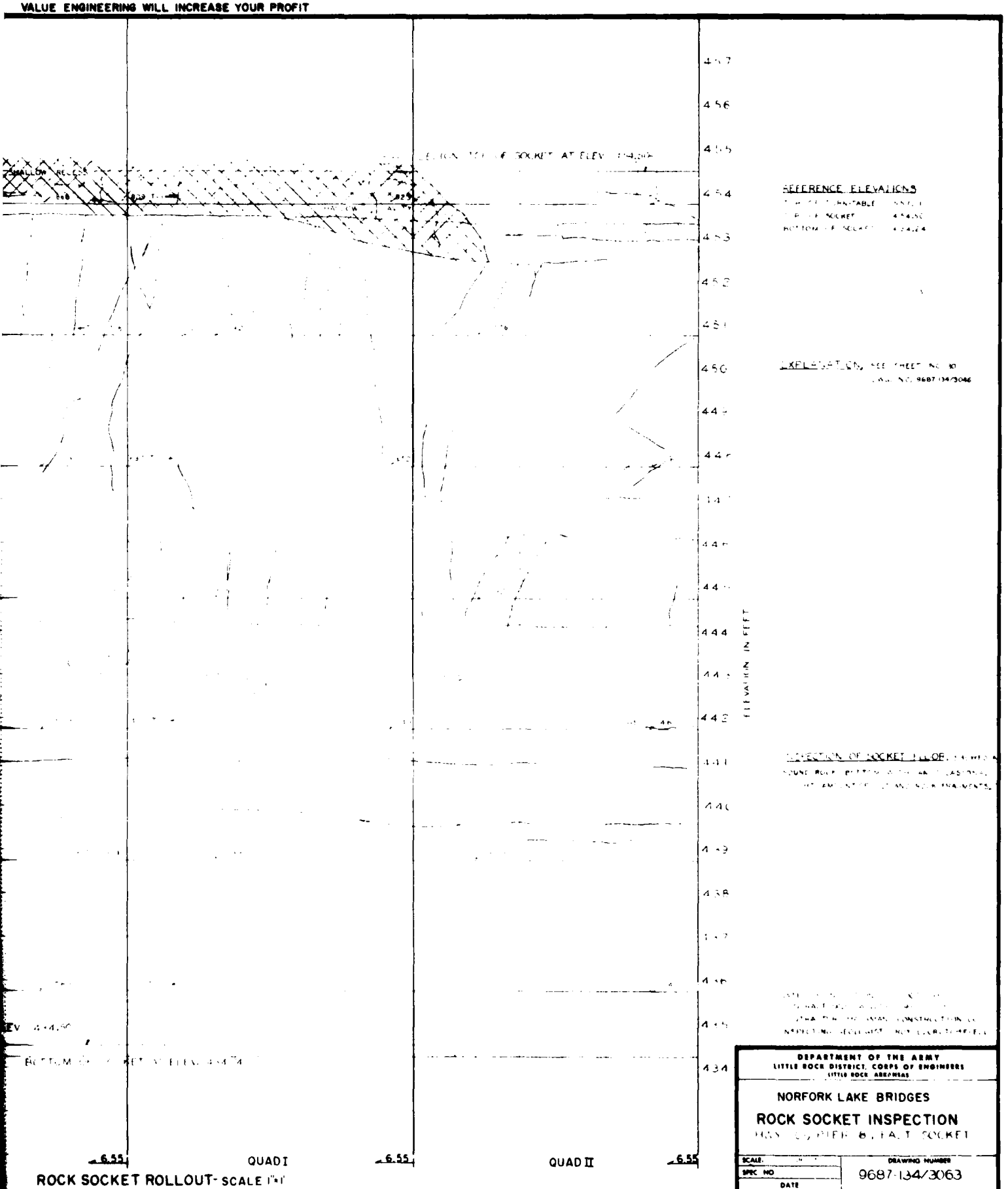
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF FOUNDATION TABLE
TOP OF SOCKET 454.50
BOTTOM OF SOCKET 434.84

EXPLORATION, SEE SHEET NO. 30
DWG. NO. 9687-134/3046

EXPOSITION OF SOCKET FILLOF
SOUND ROCK BOTTOM
OF EXCAVATION AND ROCK EVALUATION

INSPECTION BY CORPS OF ENGINEERS CONSTRUCTION
INSPECTION DEVELOPMENT NOT EXCEEDED HERE

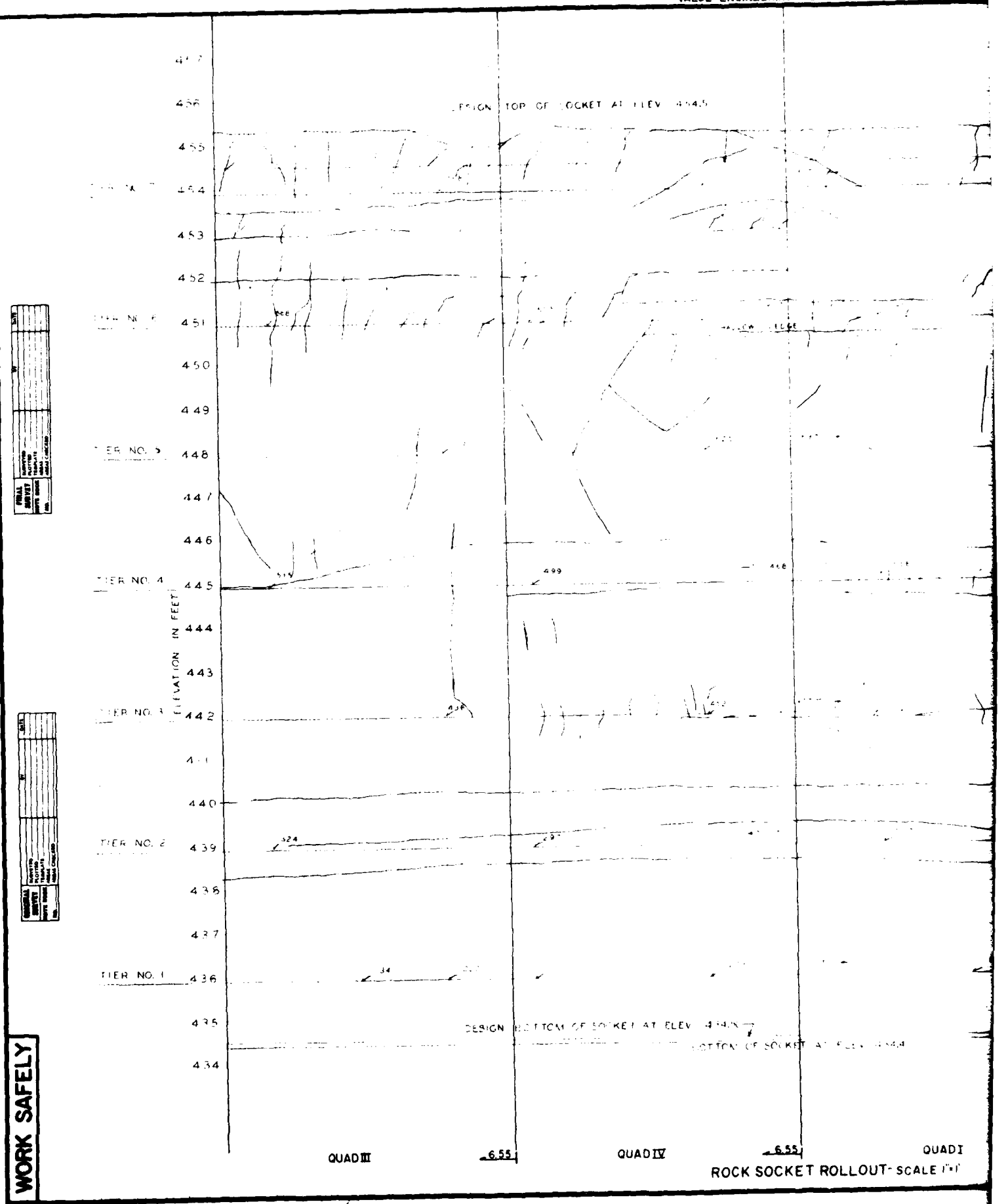
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

PIER 6, EAST SOCKET

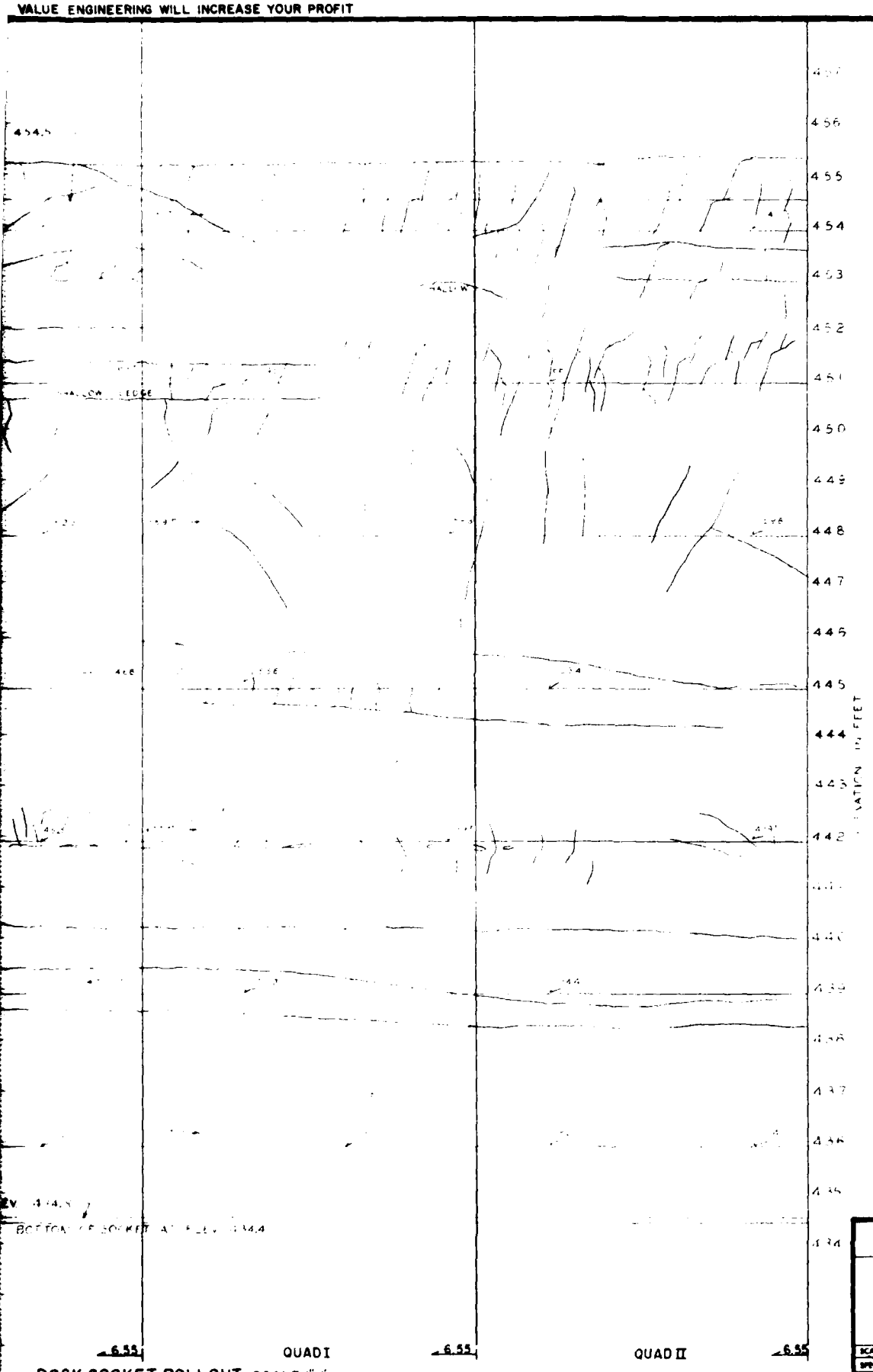
SCALE:	DRAWING NUMBER
SPEC NO	9687-134/3063
DATE APRIL 1983	SHEET 47 OF 52



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURBINE TAILPIECE ELEV 459.0
TOP OF SOCKET ELEV 454.50
BOTTOM OF SOCKET ELEV 434.40

EXPLANATION SEE SHEET NO. 2
CWS NO. 9687-134-3046

INSPECTION OF SOCKET FOR HEAVY CLEAN, SOUND ROCK BOTTOM

DATE OF INSPECTION: 31 OCT & 2 NOV 83
CONTRACT NO.: DACW03-79-C-0055
CONTRACTOR: MASSMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

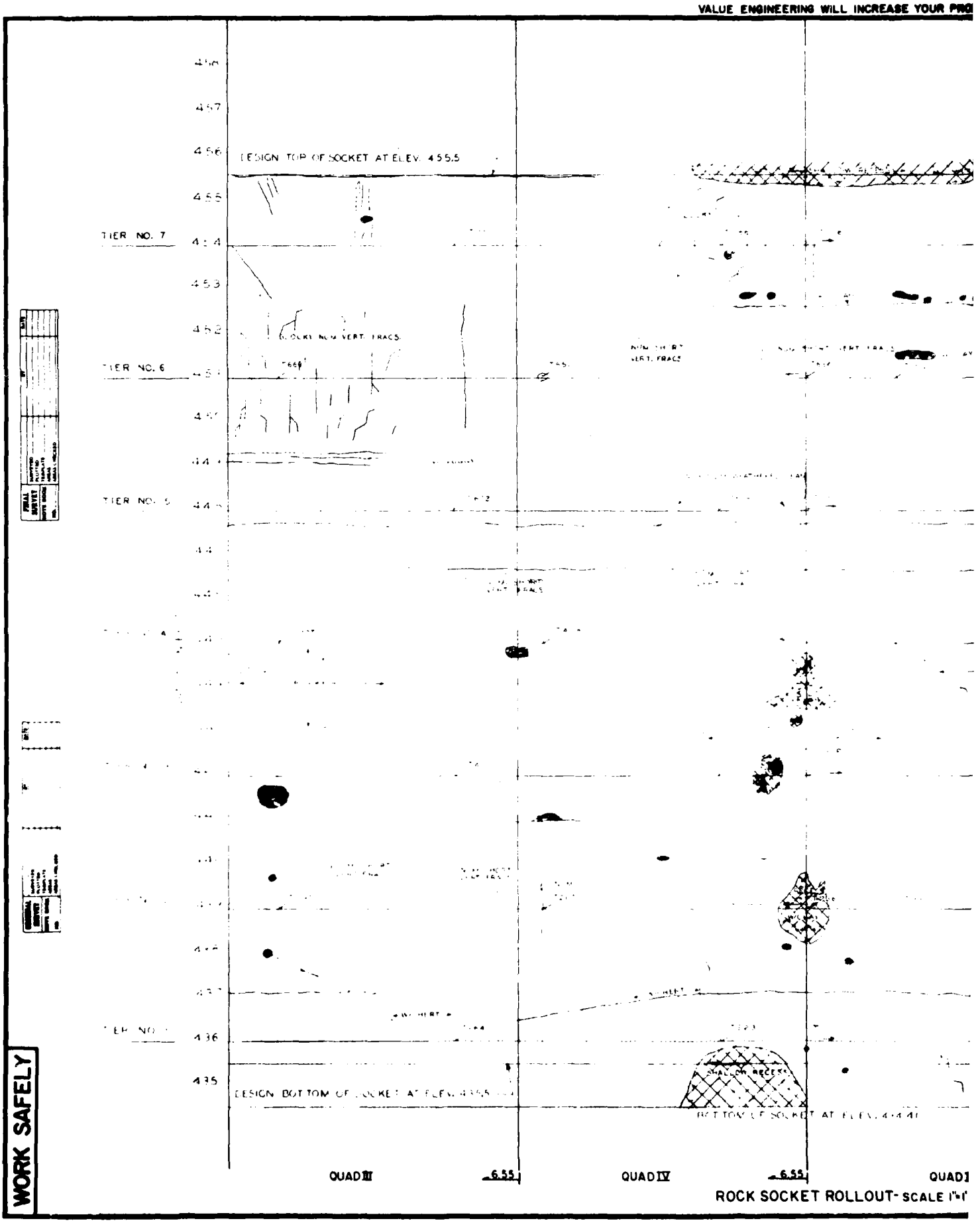
NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

POWER CHANNEL AFT SOCKET

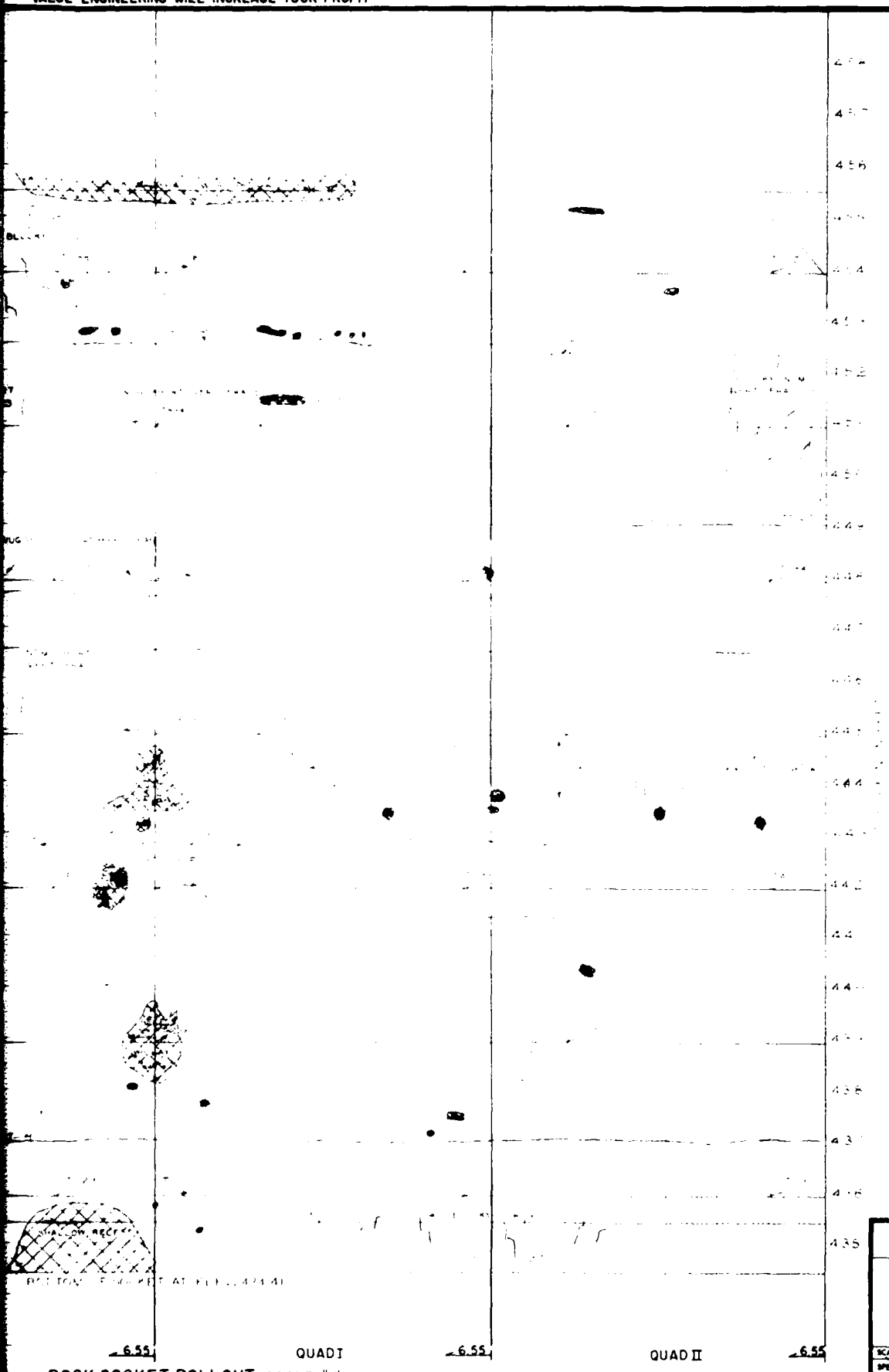
SCALE: 1" = 1'	DRAWING NUMBER 9687-134/3064
SPEC NO	
DATE APRIL 1983	SHEET 48 OF 52

VALUE ENGINEERING WILL INCREASE YOUR PRO



WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

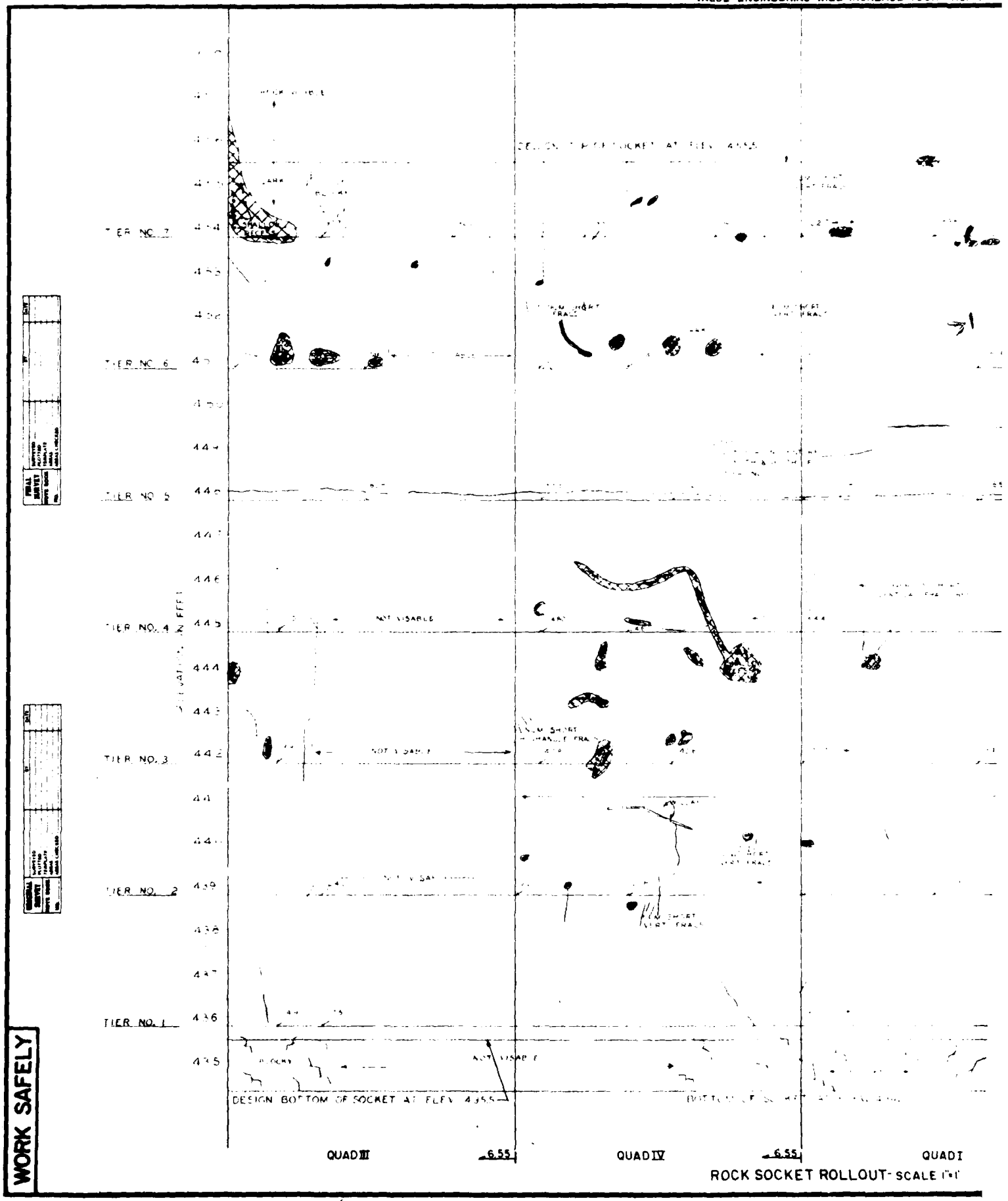
INSPECTION OF SOCKET FLOOR

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION
HWY 101, PIER 3, EAST SOCKET

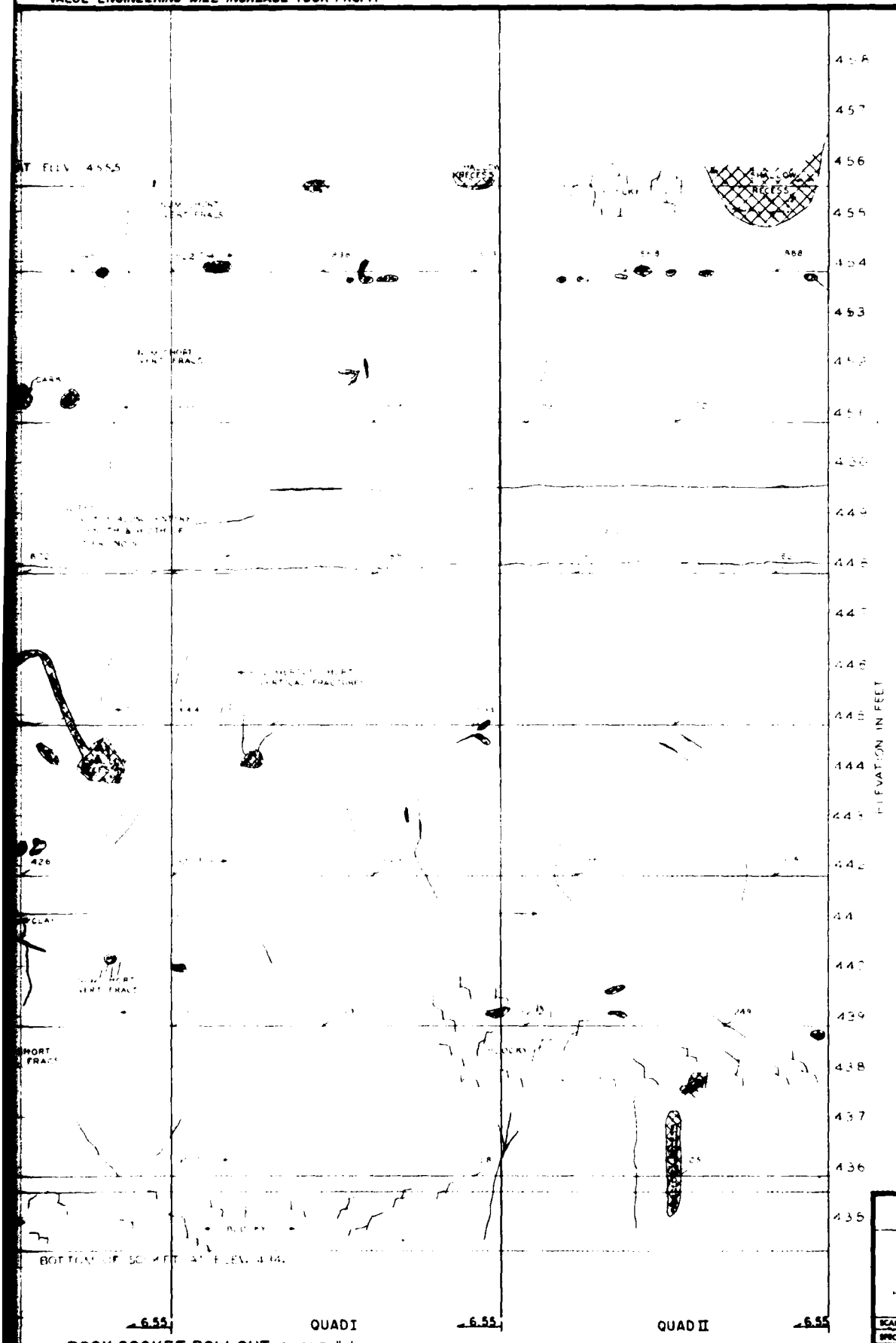
SCALE:	DRAWING NUMBER
SPEC NO	9687-134/3067
DATE APRIL 1983	SHEET 49 OF 54



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE

EXPLANATION SEE SHEET NO 30
W.O. NO. 9687-134/3046

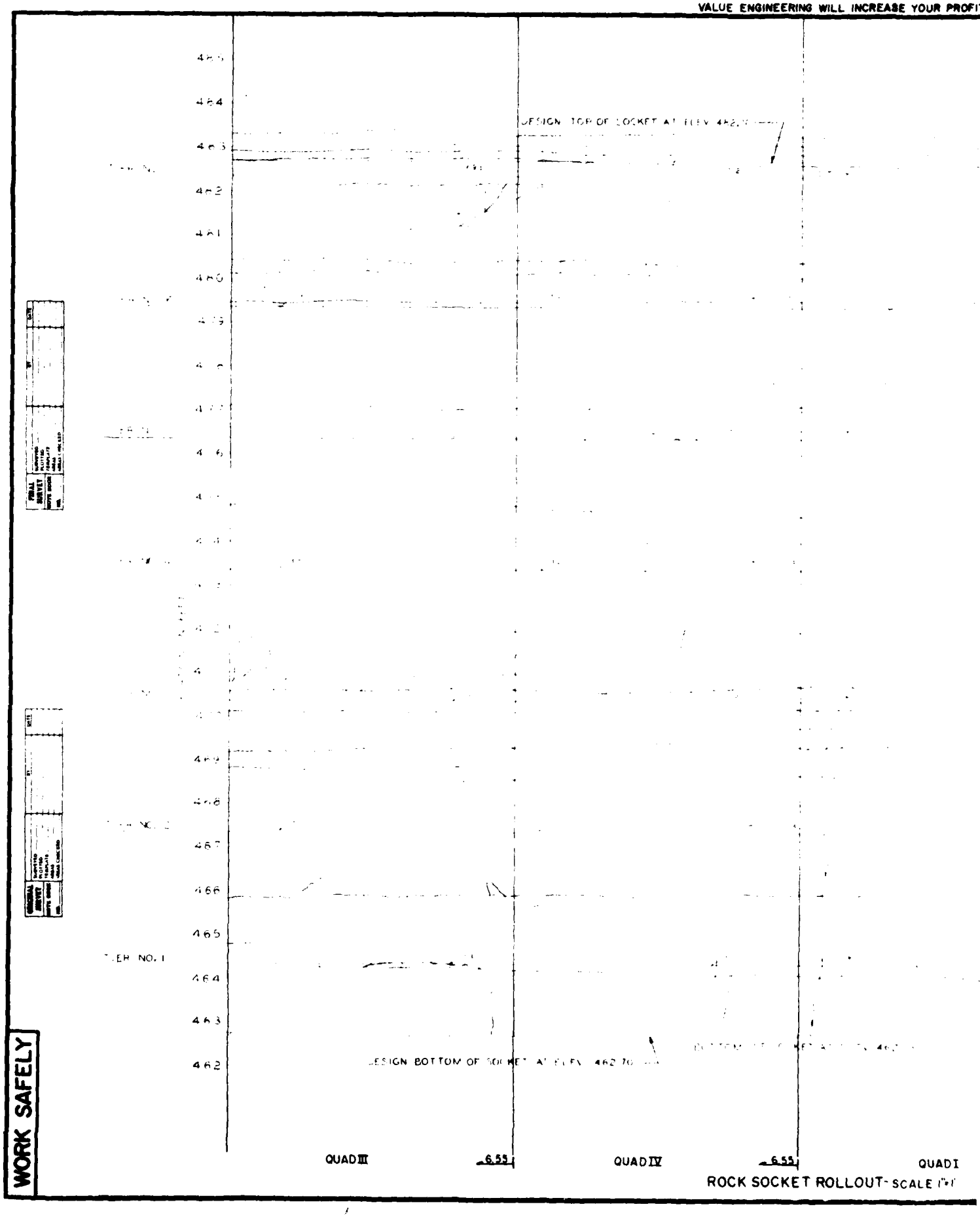
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 9, WEST SOCKET

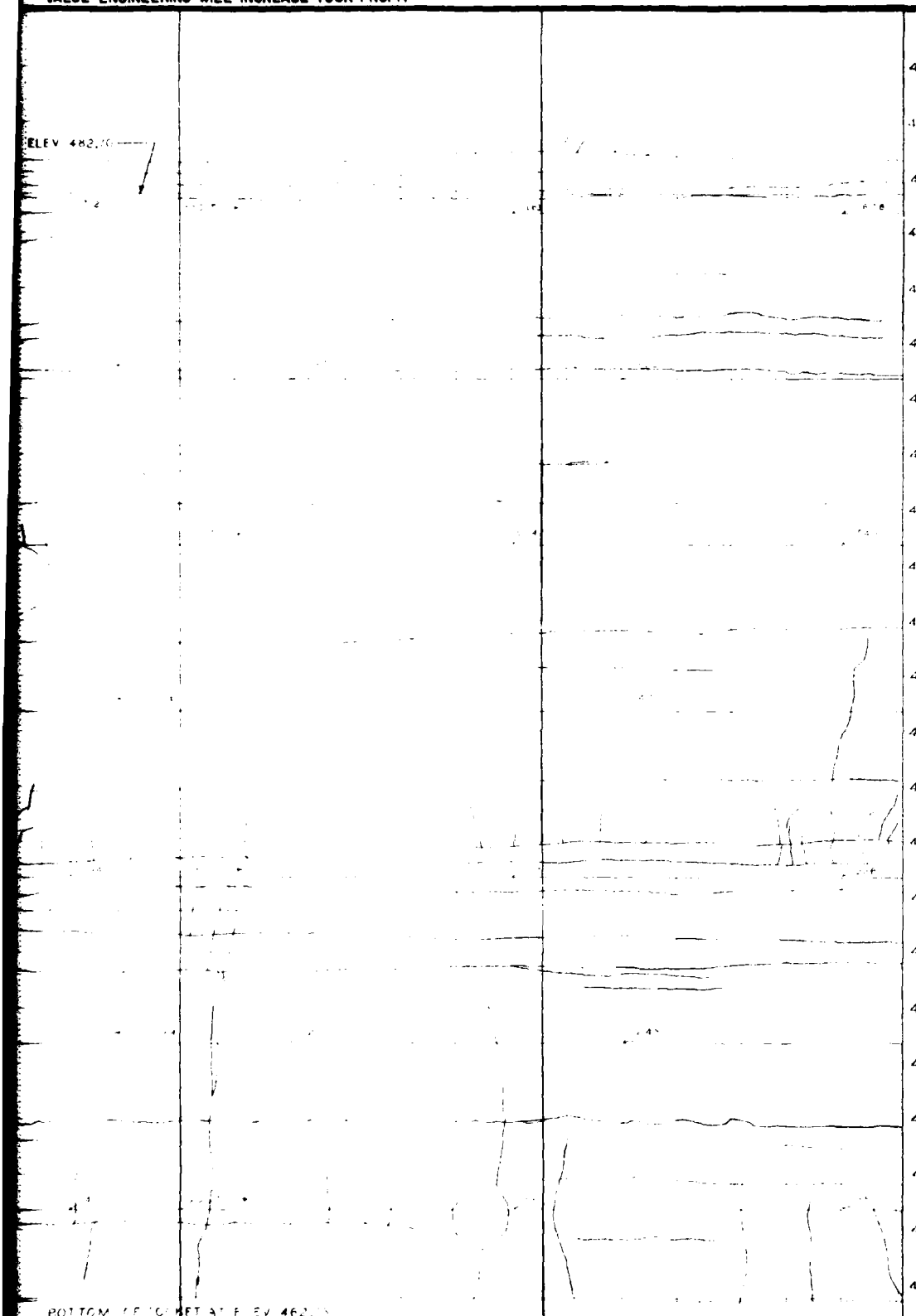
SCALE	DRAWING NUMBER
SPEC NO	9687-134/3066
DATE APRIL 1983	SHEET 30 OF 52



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF BEDDABLE 483.38

TOP OF SOCKET 482.

SHEET NO. 30

DWG. NO. 9687 134/3046

INSPECTION OF SOCKET FLOOR, SHOWED A COVERING OF OVERBURDEN ... ON THE ... INSPECTION, AFTER INNER CONCRETE FORMS WERE SEALED, INSPECTION SHOWED A SOUND ROCK BOTTOM WITH A THIN SCATTERING OF ... RESIDUAL ROCK FRAGMENTS.

DATE OF INSPECTION ...

CONTRACT ... A.W.E. ... 755

CONTRACTOR KINSMAN CONSTRUCTION CO.

INSPECTING GEOLOGIST ... L. CRUTCHFIELD

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER ..., EAST SOCKET

SCALE

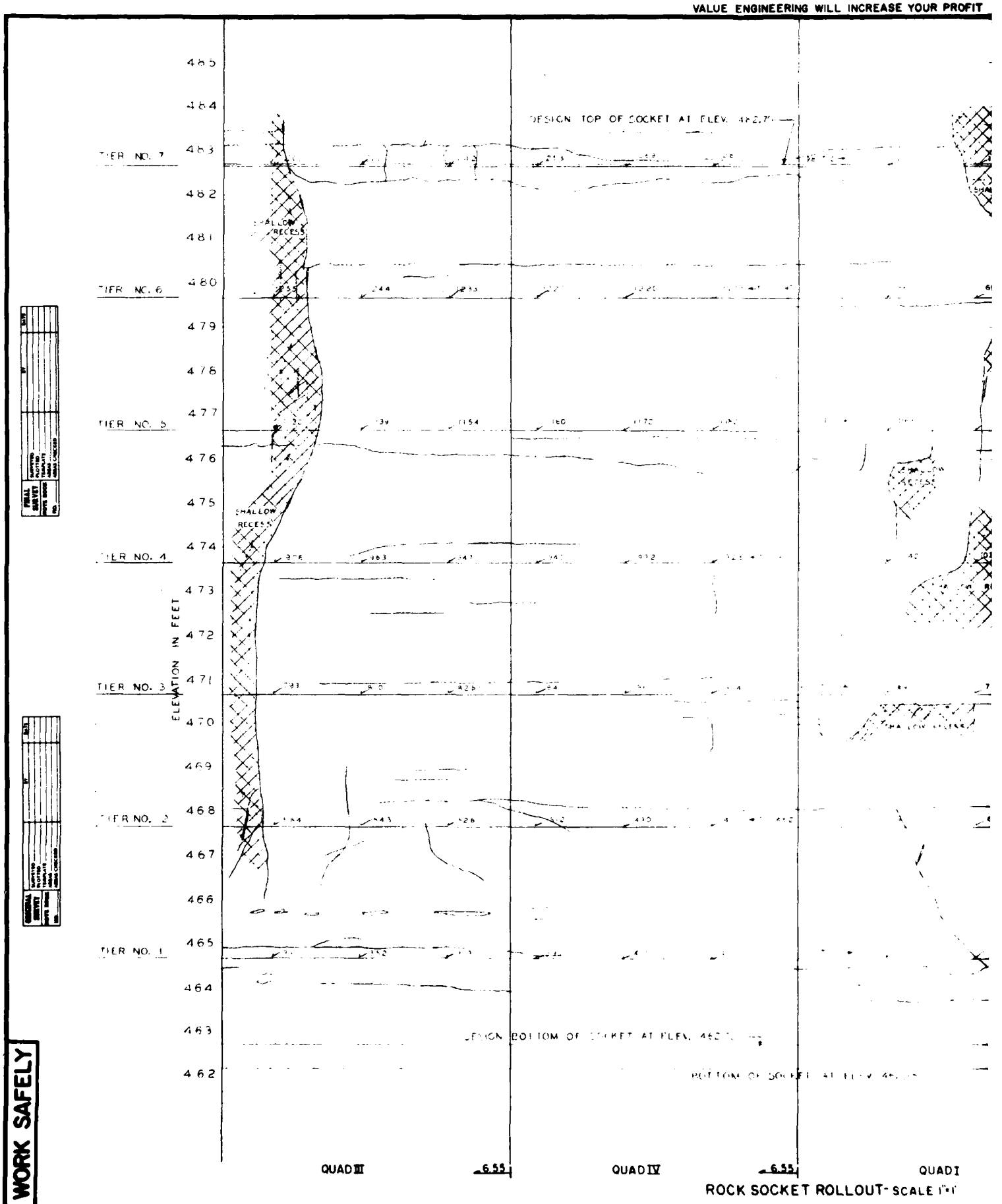
SPEC NO

DATE
APRIL 1981

DRAWING NUMBER
9687 134/3067

SHEET 3 OF 34

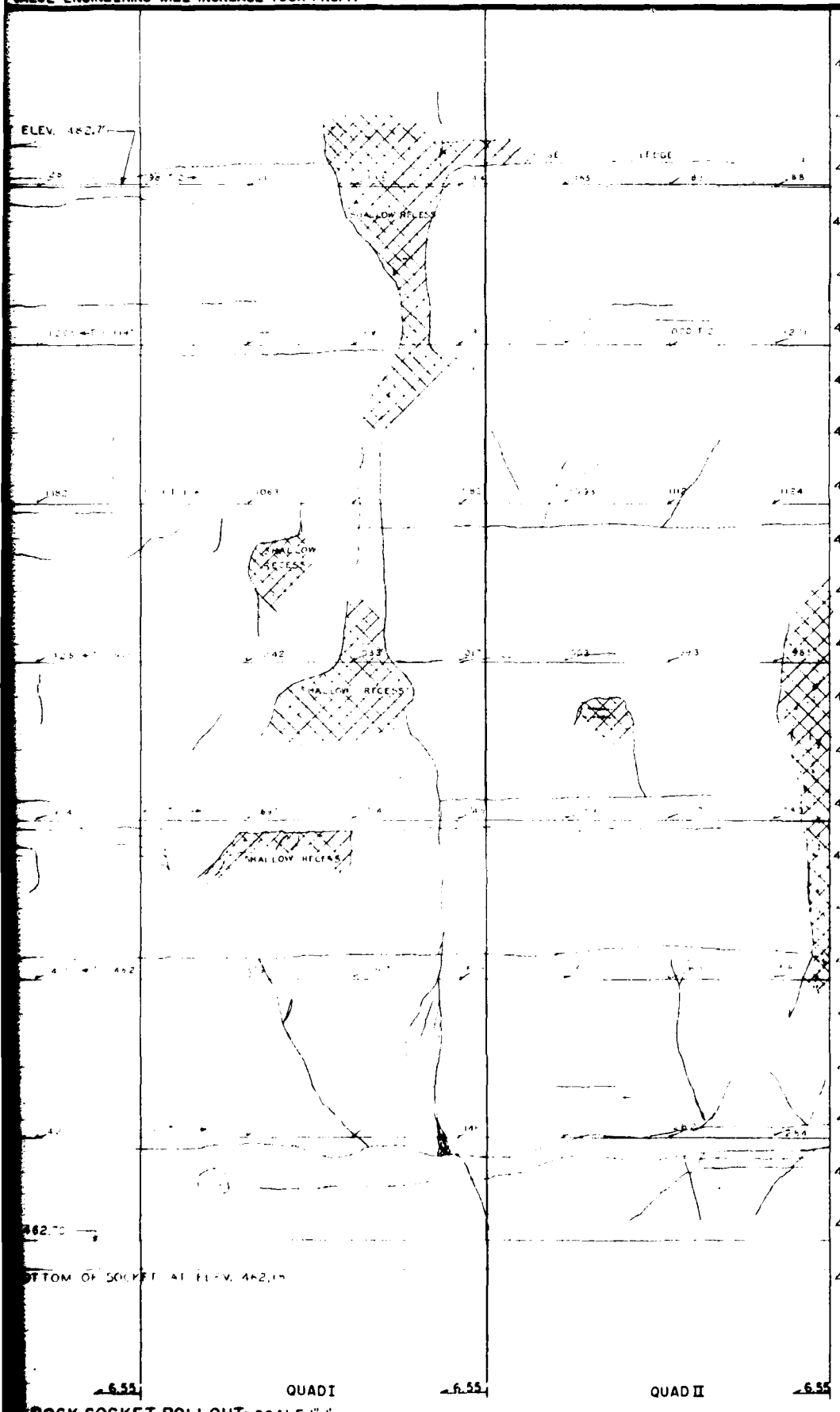
VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

WORK SAFELY

VALUE ENGINEERING WILL INCREASE YOUR PROFIT



ROCK SOCKET ROLLOUT- SCALE 1"=1'

REFERENCE ELEVATIONS

TOP OF TURN-TABLE	482.8
TOP OF SOCKET	482.70
BOTTOM OF SOCKET	462.15

EXPLANATION, SEE SHEET NO. 50
DWG. NO. 9687-134/3046

DEPTH OF INSPECTION
CONTRACT NO.: DACW03-79-C-0055
CONTRACTOR: DICKMAN CONSTRUCTION CO.
INSPECTING GEOLOGIST: ROY L. HUTCHFIELD

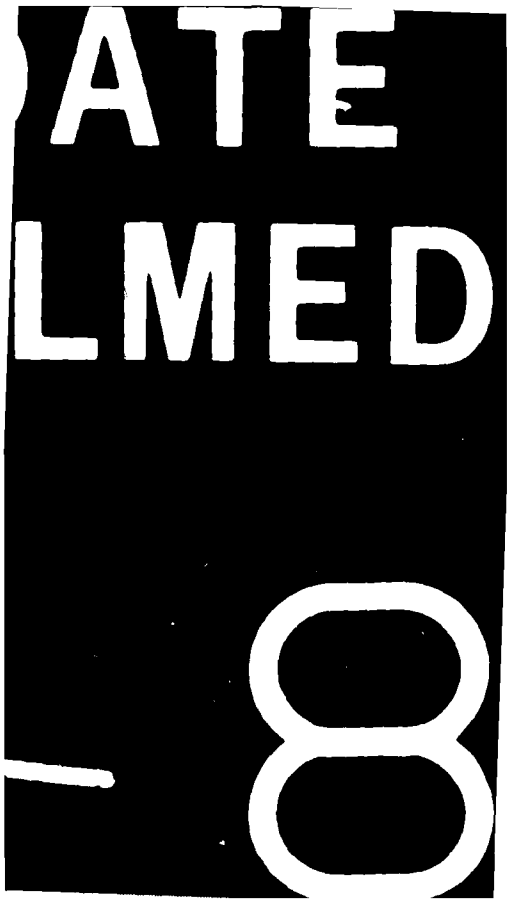
DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS

NORFORK LAKE BRIDGES

ROCK SOCKET INSPECTION

HWY 101, PIER 1C, WEST SOCKET

SCALE	DRAWING NUMBER
SPEC NO	9687-134/3068
DATE APRIL 1983	SHEET 52 OF 52


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8