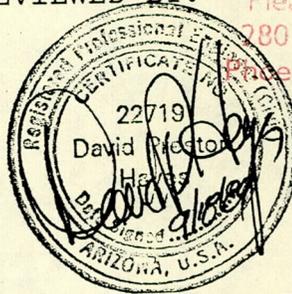


**ATL**  
**TESTING LABORATORIES**

12TH STREET BRIDGE OVER THE ARIZONA CANAL  
DIVERSION CHANNEL  
MARICOPA COUNTY FLOOD CONTROL DISTRICT  
FCD 88-38  
PHOENIX, ARIZONA

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David P. Hayes, P.E.  
Executive Vice President

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REPORT OF  
GEOTECHNICAL INVESTIGATION  
FOR  
PARSONS, BRINCKERHOFF, QUADE & DOUGLAS, INC.

ATL JOB NO. 189038

September 18, 1989

PROJECT

12TH STREET BRIDGE OVER THE ARIZONA CANAL  
DIVERSION CHANNEL  
MARICOPA COUNTY FLOOD CONTROL DISTRICT  
FCD 88-38  
PHOENIX, ARIZONA



**ATL TESTING LABORATORIES**  
GEOTECHNICAL AND MATERIALS CONSULTANTS

September 18, 1989

Parsons, Brinckerhoff, Quade & Douglas, Inc.  
1232 East Broadway  
Suite 120  
Tempe, Arizona 85282

Attention: Mr. Seetha V. Ramaiah, P.E.

Subject: Geotechnical Investigation  
12th Street Bridge  
Maricopa County Flood Control District  
FCD 88-38  
ATL Job No. 189038

Gentlemen:

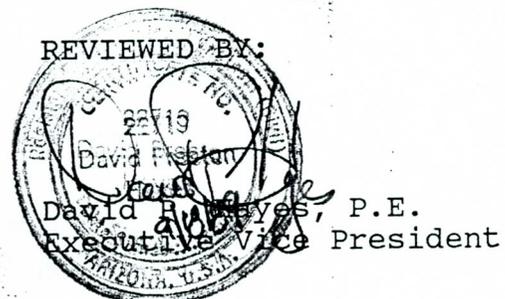
This report presents the results of a geotechnical investigation of the subject site. Presented are the results of our field exploration, laboratory tests, and geotechnical engineering analysis. Our work was done in accordance with ATL Proposal Number P89014.

Plate No. 1 presents the guidelines in the use and interpretation of this report. ATL has appreciated the opportunity to be of service to you on this project and look forward to a continued association on this and future projects. Should any questions arise, please do not hesitate to contact us at your earliest convenience.

Very truly yours,  
ATL TESTING LABORATORIES

  
James D. Rose  
Senior Geotechnical Engineer

JDR/DPH/bs



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REVIEWED BY:



David P. Hayes, P.E.  
Executive Vice President

REPORT OF  
GEOTECHNICAL INVESTIGATION

FOR

PARSONS, BRINCKERHOFF, QUADE & DOUGLAS, INC.

ATL JOB NO. 189038

September 18, 1989

PROJECT

12TH STREET BRIDGE OVER THE ARIZONA CANAL  
DIVERSION CHANNEL  
MARICOPA COUNTY FLOOD CONTROL DISTRICT  
FCD 88-38  
PHOENIX, ARIZONA

1.0 PROJECT DESCRIPTION

The 12th Street Bridge over the Arizona Canal Diversion Channel (ACDC) project for the Maricopa County Flood Control District begins north of the existing 12th Street Bridge. The Maricopa County Flood Control District (FCD) plans to relocate utilities, construct a bridge at 12th Street, make street improvements and install a sanitary sewer siphon.

The proposed bridge will have a forty-five (45) foot clear span with a width equal to the existing bridge crossing the Arizona Canal plus two eight (8) foot wide sidewalks. The proposed bridge structure will be skewed twenty-seven (27) degrees to the right.

Elevation of the existing 12th Street surface at the existing Arizona Canal Bridge is approximately 1241.8 feet. The bottom of the ACDC invert at 12th Street will be approximately at elevation 1212.82.

From information supplied by Parsons, Brinckerhoff, Quade & Douglas, Inc. these estimated loads will need to be designed for:

12th Street Bridge Abutments	20 kips/lineal foot along abutments
------------------------------	-------------------------------------

## 2.0 SCOPE OF WORK

The general purpose of this investigation is to present test results and conclusions regarding subsurface soil and groundwater conditions, and to present geotechnical engineering recommendations for the bridge foundations, inverted sewer siphon and pavement sections for roadway improvements.

The specific tasks of this investigation include the following:

- 1) Consider foundation alternatives for the 12th Street Bridge.

- 2) Lateral earth pressures acting on foundations, bridge abutments and wing walls during and after excavation for the ACDC.
- 3) Ease of excavation for on-site soils, safe slope for open cuts at the wingwalls and channel.

### 3.0 FIELD INVESTIGATION

#### 3.1 Location

The site is located immediately north of the Arizona Canal at 12th Street in Phoenix, with the proposed sanitary sewer siphon located approximately 220 feet southeast of the proposed bridge.

#### 3.2 Site Description

The Arizona Canal runs in a northwest direction crossing under 12th Street at the existing bridge. The proposed 12th Street Bridge will be located approximately 110 feet north of the center of the Arizona Canal. The proposed Arizona Canal Diversion Channel (ACDC) will run parallel to the Arizona Canal on the north side.

#### 3.3 Field Testing

At five locations, eight-inch-diameter test borings were drilled with a Mobile B-50 drill rig using 8 inch-diameter

continuous flight auger. Borings were extended to maximum depths of 35 to 57 feet below existing grades.

Standard Penetration Tests (SPT) were performed at selected depths and locations in accordance with ASTM Test Designation D-1586. The SPT sampler was driven with a 140-pound hammer falling thirty inches. ATL's field representative logged the borings and sampled the different soils encountered. The locations of the five borings are shown on the Boring Plan, Plate No. 3. The field information is summarized on the boring logs presented in Appendix A.

#### 4.0 LABORATORY TESTING

Soil samples were returned to our laboratory for further examination. Visual classifications were supplemented by index tests such as sieve analyses and Atterberg Limits on representative samples. Moisture tests were also performed. Results of the sieve analyses, Atterberg Limits, and moisture tests are presented in Appendix B.

#### 5.0 SUMMARY SUBSURFACE CONDITIONS

Boring numbers 1, 2, 3, and 4 revealed that the top ten to fifteen (10-15) feet of the subsurface consisted of a light brown, loose to very dense, silty, clayey sand. Below this layer, dense to very dense, clayey sand and gravel with weak to strong cementation was encountered.

In boring number 5, tan and gray, silty, gravelly sand was encountered from the surface to depth of approximately 25 feet. From approximately 25 to 35 feet of depth, gray and brown silty, sandy gravel was encountered. Both strata typically increase in density with depth. Groundwater was not encountered to the depths explored.

The appended boring logs present a detailed description of the subsurface conditions at each location explored.

## 6.0 DISCUSSIONS & RECOMMENDATIONS

### 6.1 Foundations - 12th Street Bridge

Construction of the bridge with abutments to be supported on drilled piers will be accomplished first, followed by excavation and construction of the ACDC later. Three (3) feet diameter drilled piers are being considered for bridge support.

At the location of the 12th Street Bridge, the proposed ACDC invert elevation is approximately 1212.8 feet. The excavation depth will probably be at least an additional one (1) foot. Therefore, an excavation depth of approximately 26 feet from top of pier cap to bottom of the ACDC is anticipated. The proposed elevation of the bridge deck is approximately 1241.5 feet.

Various foundation alternatives were considered and drilled piers extending below the excavation line for the ACDC were deemed most appropriate for support of the bridge. When the excavation for the ACDC is made, the drilled piers will be subjected to lateral loads from the retained soil. The lateral loads require embedment of the foundation element to a depth offering sufficient lateral support as well as sufficient axial load capacity.

Two conditions were examined for pier embedment as the ACDC excavation is made. The first condition is for no lateral restraint at the pier cap and the second condition is for the pier cap having lateral restraint.

#### Condition I - No Lateral Restraint

An active soil pressure using an internal angle of friction of 35 degrees, a soil unit weight of 115 pcf and analysis techniques of NAVFAC DM 7.2 were used to estimate lateral deflection of the drilled piers. For a 3 feet diameter drilled pier with no lateral restraint at the pier cap, total lateral deflection at the excavation line due to the combined effect of lateral load and bending moment will range from 1.6 inches at 14 feet embedment depth to 0.9 inches at 28 feet embedment depth. These lateral deflections appear excessive, and therefore, we recommend that lateral restraint be provided. Restraint may be provided by the deck slab or by constructing

tie-backs. Tie-backs do not appear economically feasible when compared with using the already planned deck slab.

Condition II - Lateral Restraint

A drilled pier laterally restrained at the top will require sufficient embedment depth to withstand the lateral forces generated by the retained soil. At the embedded zone of the drilled pier, the passive resistance of the very dense clayey sand and gravel is 575 pcf based upon an internal friction angle of 40 degrees and a soil unit weight of 125 pcf. A minimum embedment depth of 14 feet is required to resist the lateral force on the drilled pier, using a factor of safety of 3.

In conformance with the Scope of Work, drilled piers having end bearing capacity only are considered. The following table gives load capacities for 3 feet diameter drilled piers at varying embedment depths plus estimated values for modulus of subgrade reaction.

TABLE 1

<u>DIAMETER (FT.)</u>	<u>DEPTH BELOW EXCAVATION LINE (FT.)</u>	<u>TIP ELEVATION (FT.)</u>	<u>ALLOWABLE LOAD (KIPS)</u>	<u>*ESTIMATED MODULUS OF SUBGRADE REACTION (KCF)</u>
3	5	1207	55	225
3	10	1202	174	300

TABLE 1 - CONTINUED

<u>DIAMETER (FT.)</u>	<u>DEPTH BELOW EXCAVATION LINE (FT.)</u>	<u>TIP ELEVATION (FT.)</u>	<u>ALLOWABLE LOAD (KIPS)</u>	<u>*ESTIMATED MODULUS OF SUBGRADE REACTION (KCF)</u>
3	14	1198	408	700
3	20	1192	583	700

Expected settlements will be less than one-half inch.

\* Estimated Modulus of Subgrade Reaction, Table 9-1, Foundation Analysis and Design, 2nd Edition, Bowles.

A minimum spacing of 3 drilled pier diameters on center between piers is recommended for the above listed allowable loads. In order to found drilled pier tips at a uniformly very dense zone, 14 feet embedment to elevation 1198 is recommended.

After excavation for the ACDC, the soil between piers is anticipated to "bridge" since the soil is moderately cemented and dense. Some sloughing of soil may occur in the upper 10 feet due to vibration from passing traffic. To prevent sloughing, ATL recommends the use of a slurry wall placed between piers to 10 feet depth before installation of the pier cap. Another technique to prevent sloughing would be to tie wire mesh between piers and apply shotcrete to the mesh across the cut face between piers.

Cutoff walls have been proposed for use at the corners of the bridge abutments. In order to provide vertical and lateral support for the proposed cutoff walls, ATL recommends using a drilled pier under each cutoff wall. The drilled piers should be the same diameter and length as those supporting the adjacent abutment.

The drilled piers should be spaced no greater distance from the end piers under the abutments than the selected pier spacing in order to maintain "bridging" of the soil.

## 6.2 Inverted Siphon

Excavation for the inverted siphon will be moderately difficult and may require special excavation equipment. Excavation, backfilling and compaction shall be in accordance with Section 601 of the Uniform Standards Specifications for Public Works Construction by the Maricopa Association of Governments (MAG) and applicable City of Phoenix supplements.

Open cut slopes of 1:1 (H:V) are recommended for the top ten (10) feet at the inverted siphon location with cut slopes of 3/4:1 recommended from depths of ten (10) to thirty (30) feet.

Sheeting and shoring requirements of OSHA should be observed during construction of the siphon.

### 6.3 Lateral Earth Pressures

The lateral earth pressures behind bridge abutments and wingwalls from surface to 10 feet of depth, can be approximated by the following equivalent fluid pressure (EFP) for the native soils:

<u>Type of Earth Pressure</u>	<u>EFP Value (pcf)</u>
Active	31
Passive	424
At-Rest	49

An internal friction angle of 35 degrees and a soil unit weight of 115 pcf are used in the above determinations.

### 6.4 Pavement Sections

On either side of the approach slabs to the new bridge, we anticipate that a short transition section of asphaltic concrete and aggregate base course will be required. Normally, we would recommend that the existing pavement section be matched. Unfortunately, the City of Phoenix does not know the section thickness for this portion of 12th Street. Therefore, we recommend, as a minimum, the following section developed from City of Phoenix Standard Detail P-1103:

- 4 inches Asphaltic Concrete
- 6 inches of Aggregate Base Course
- 6 inches of Type B Select Material

## 6 inches of Type B Select Material

The asphaltic concrete should conform to MAG Section 710 for a C-3/4 mix. The aggregate base course should conform to MAG Section 702 and the select to MAG Section 702 for Type B material.

Approach slabs should be constructed of portland cement concrete pavement (PCCP). The pavement section should consist of a minimum of 12.0 inches of PCCP as per ADOT Standard Detail B-19.11. The PCCP shall have a minimum compressive strength of 3000 psi at 28 days.

### 6.5 General Construction Recommendations

Installation of the bridge foundations, wingwalls, and channel earthwork should be performed in accordance with Maricopa Association of Government Uniform Standard Specifications for Public Works Construction, Section 601 and applicable City of Phoenix supplements.

Backfill material consisting of native soil behind bridge abutments shall be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D-698. The moisture content shall be at optimum moisture content  $\pm$  2 percent.

Open cut slopes of 1:1 (H:V) are recommended for the top ten (10) feet at the wingwalls excavations with cut slopes of

3/4:1 recommended from depths of ten (10) to thirty (30) feet.

Soluble sulfates in the soil were found to be 68 ppm which is considerable less than the threshold amount of 1000 ppm allowing the use of Type I cement in all concrete in direct contact with the soil.

#### 7.0 ADDITIONAL SERVICES

It is recommended that ATL Testing Laboratories be retained to provide geotechnical services during construction. This is to observe compliance with design concepts, specifications or recommendations, and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

## Guidelines in the Use and Interpretation of This Geotechnical Report

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Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The geotechnical report was prepared for the use of the Owner in the design of the subject facility and should be made available to potential contractors and/or the Contractor for information on factual data only. This report should not be used for contractual purposes as a warranty of interpreted subsurface conditions such as those indicated by the interpretive boring and test pit logs, cross sections, or discussion of subsurface conditions contained herein.

The analyses, conclusions and recommendations contained in the report are based on site conditions as they presently exist and assume that the exploratory borings, test pits, and/or probes are representative of the subsurface conditions of the site. If, during construction, subsurface conditions are found which are significantly different from those observed in the exploratory borings and test pits, or assumed to exist in the excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

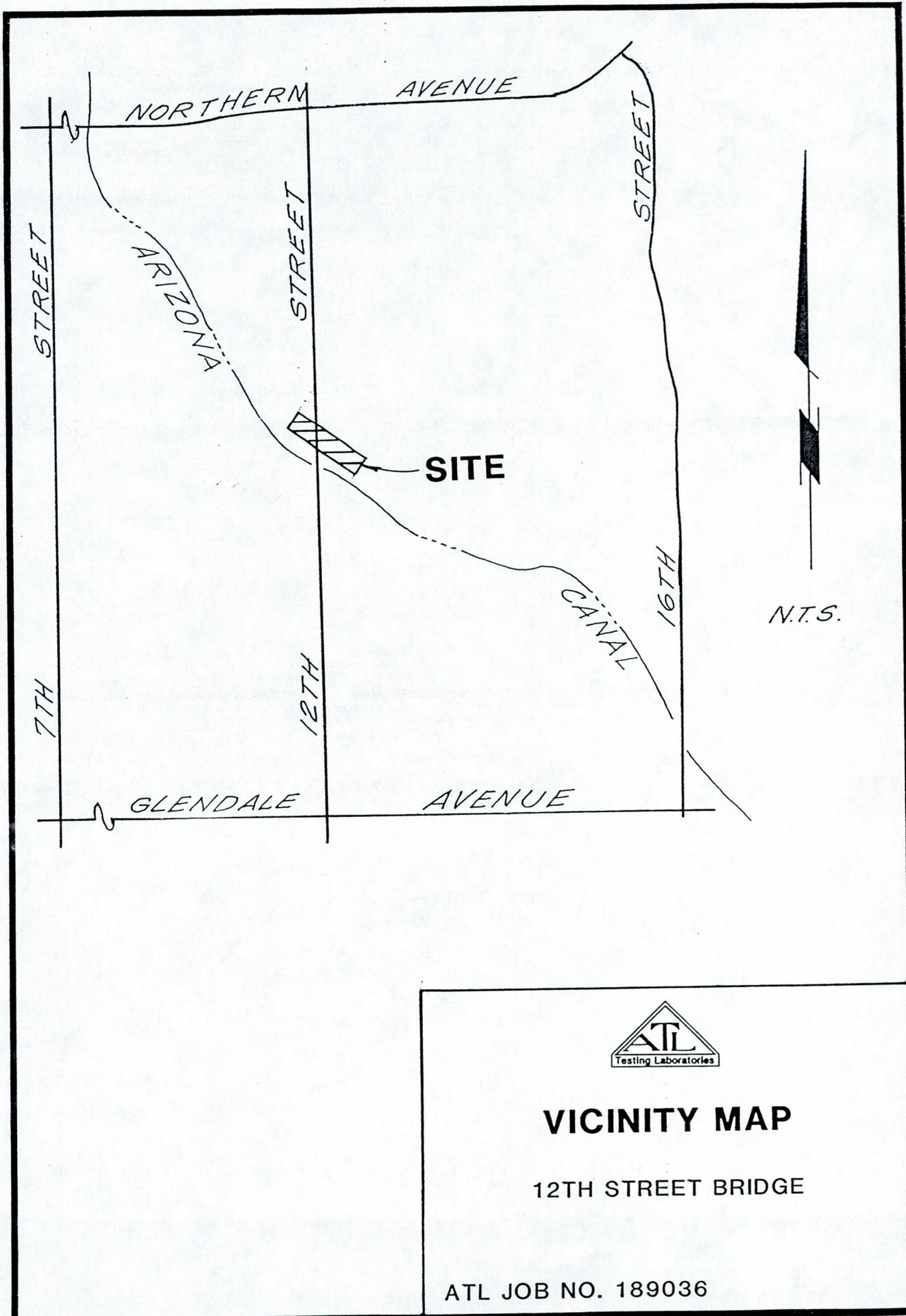
The Summary Boring Logs are our opinion of the subsurface conditions revealed by periodic sampling of the ground as the borings progressed. The soil descriptions and interfaces between strata are interpretive and actual changes may be gradual.

The boring logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations.

Groundwater levels often vary seasonally. Groundwater levels reported on the boring logs or in the body of the report are factual data only for the dates shown.

Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples, borings or test pits. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. It is recommended that the Owner consider providing a contingency fund to accommodate such potential extra costs.

This firm cannot be responsible for any deviation from the intent of this report including, but not restricted to, any changes to the scheduled time of construction, the nature of the project or the specific construction methods or means indicated in this report; nor can our firm be responsible for any construction activity on sites other than the specific site referred to in this report.



## VICINITY MAP

12TH STREET BRIDGE

ATL JOB NO. 189036



A P P E N D I X    A



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 1  
 LOCATION OF BORING:  
 STA. 12+46.31' LEFT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-15-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: JIM COWELL  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
		LIGHT BROWN SILTY SAND AND GRAVEL. (SM). SLIGHTLY MOIST					
	5	TAN GRAVEL AND SAND WITH SOME SILT. (GW). DRY TO SLIGHTLY MOIST		19		0.4	
	10	LIGHT BROWN SILTY SAND WITH GRAVEL. (SM). SLIGHTLY MOIST. WEAK CEMENTATION		41			15.3
	15			23			
	20	TAN CLAYEY SAND WITH SOME GRAVEL. (SC). DRY TO VERY MOIST. STRONG CEMENTATION		100+			
25	MEDIUM CEMENTATION AT 25 FEET		78				
BORING STOPPED AT 57.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
	DEPTH	HOUR	RATE				
	NONE						

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 1 (CONT)  
 LOCATION OF BORING:  
 STA. 12+46. 31' LEFT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-15-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: JIM COWELL  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
		CONTINUED FROM PREVIOUS PAGE					
		STRONG CEMENTATION AT 28 TO 48 FEET					
	30			100+			
	35			58			
	40			100+			
	45			100+			
	50			100+		29.6	
BORING STOPPED AT 57.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 1 (CONT)  
 LOCATION OF BORING:  
 STA. 12+46.31' LEFT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-15-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: JIM COWELL  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	55	CONTINUED FROM PREVIOUS PAGE					
		STRONG CEMENTATION FROM 48 TO 57 FEET DEPTH		132			
	60						
	65						
	70						
	75						
BORING STOPPED AT 57.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 2  
 LOCATION OF BORING:  
 STA. 11+80. 64' LEFT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-23-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: MARK REISIG  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
		BROWN SILTY SAND AND GRAVEL. (SM). SLIGHTLY MOIST					
	5	LIGHT BROWN SILTY SAND AND GRAVEL. (SM). SLIGHTLY MOIST. WEAK CEMENTATION		24			
	10	LIGHT BROWN CLAYEY SAND WITH SOME GRAVEL. (SC). SLIGHTLY MOIST. WEAK CEMENTATION		40			
	15	NOTE: 5 GALLONS OF WATER ADDED AT EACH SPT DRIVE		32			
	20	LIGHT BROWN CLAYEY SAND AND GRAVEL. (SC). SLIGHTLY MOIST. MEDIUM CEMENTATION		66			
	25			90			
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 2 (CONT)  
 LOCATION OF BORING:  
 STA. 11+80.64' LEFT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-23-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: MARK REISIG  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	30	CONTINUED FROM PREVIOUS PAGE		23			
	35	NOTE: LESS GRAVEL CONTENT FROM 28 FT TO 35 FT		31			
	40	DRILLING VERY DIFFICULT DUE TO STRONG CEMENTATION FROM 41 FEET TO END OF BORING		100+			
	45			100+			
	50			100+			
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 2 (CONT)

LOCATION OF BORING:

STA. 11+80.64' LEFT

DATE OF BORING: 6-23-89

ELEVATION OF BORING: 1241 FT

DRILLING EQUIPMENT: MOBILE B-50  
DRILL RIG WITH 8 INCH OUTSIDE  
DIAMETER CONTINUOUS FLIGHT  
AUGER

DRILLER: TOM KULIK  
FIELD ENGINEER: MARK REISIG  
REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	55	CONTINUED FROM PREVIOUS PAGE		100+			
		NOTE: LESS GRAVEL CONTENT FROM 28 TO 35 FEET DEPTH					
	60						
	65						
	70						
	75						
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 3  
 LOCATION OF BORING:  
 STA. 10+87.50' RIGHT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-23-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: MARK REISIG  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	0 - 5	BROWN SILTY SAND AND GRAVEL. (SM). SLIGHTLY MOIST  NOTE: 5 GALLONS OF WATER ADDED AT EACH SPT DRIVE		10			
	5 - 10	LIGHT BROWN CLAYEY SAND AND GRAVEL. (SC). SLIGHTLY MOIST. WEAK CEMENTATION		43			
	10 - 20	LIGHT BROWN CLAYEY SAND WITH SOME GRAVEL. (SC). SLIGHTLY MOIST. MEDIUM CEMENTATION		26			
	20 - 25			130		24.4	
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 3 (CONT)  
 LOCATION OF BORING:  
 STA. 10+87.50' RIGHT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-23-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: TOM KULIK  
 FIELD ENGINEER: MARK REISIG  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	30	CONTINUED FROM PREVIOUS PAGE		100+			
	35	BROWN CLAYEY GRAVEL AND SOME SAND. (GC). SLIGHTLY MOIST. WEAK CEMENTATION		100+		12.0	
	40			100+			
	45			100+		13.9	
	50			100+			
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 3 (CONT)

LOCATION OF BORING:

STA. 10+67.50' RIGHT

DATE OF BORING: 6-23-89

ELEVATION OF BORING: 1241 FT

DRILLING EQUIPMENT: MOBILE B-50  
DRILL RIG WITH 8 INCH OUTSIDE  
DIAMETER CONTINUOUS FLIGHT  
AUGER

DRILLER: TOM KULIK

FIELD ENGINEER: MARK REISIG

REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
CONTINUED FROM PREVIOUS PAGE							
	55			120			
	60						
	65						
	70						
	75						
BORING STOPPED AT 56.5 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 4

LOCATION OF BORING:

STA. 11+96.57' RIG

DATE OF BORING: 6-15-89

ELEVATION OF BORING: 1241 FT

DRILLING EQUIPMENT: MOBILE B-50  
DRILL RIG WITH 8 INCH OUTSIDE  
DIAMETER CONTINUOUS FLIGHT  
AUGER

DRILLER: GARVIN SCAGGS

FIELD ENGINEER: STEVE ANASTOS

REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	5	GRAY GRAVEL AND COBBLES WITH SILT SAND. (GM). SLIGHTLY MOIST  NOTE: WATER ADDED AT EACH SPT DRIVE		24			
	10	GRAY SILTY CLAYEY SAND AND GRAVEL. (SM). SLIGHTLY MOIST		45			
	15	GRAY BROWN GRAVEL WITH SOME SILT AND SAND. (GM). SLIGHTLY MOIST		120			
	20	GRAY BROWN GRAVEL AND CLAYEY SAND. (GC). SLIGHTLY MOIST		100+			
	25	GRAY BROWN GRAVEL AND CLAYEY SAND. (GC). SLIGHTLY MOIST		100+			
BORING STOPPED AT 49.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 4 (CONT)  
 LOCATION OF BORING:  
 STA/ 11+96. 57' RIGHT

DRILLING EQUIPMENT: MOBILE B-50  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-16-89  
 ELEVATION OF BORING: 1241 FT

DRILLER: GARVIN SCAGGS  
 FIELD ENGINEER: STEVE ANASTOS  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
		CONTINUED FROM PREVIOUS PAGE					
	30			100+			
	35	BROWN CLAYEY SAND WITH SOME GRAVEL. (SC). SLIGHTLY MOIST		89		18.5	
	40	GRAY GRAVEL (HIGHLY FRACTURED) WITH CLAYEY SAND. (GC). SLIGHTLY MOIST					
	45			100+			
		NOTE: EXTREMELY HARD DRILLING AT 48 FEET. AUGER REFUSAL AT 49 FEET					
	50						
BORING STOPPED AT 49.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 5  
 LOCATION OF BORING:  
 STA. 10+92. 293' RIGHT

DRILLING EQUIPMENT: MOBILE B-56  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-15-89  
 ELEVATION OF BORING: 1240 FT

DRILLER: GARVIN SCAGGS  
 FIELD ENGINEER: STEVE ANASTOS  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
[Hatched Pattern]	0	TAN SILTY FINE SAND WITH GRAVEL. (SM). SLIGHTLY MOIST					
	5	NOTE: WATER ADDED AT EACH SPT DRIVE		31			
	10	GRAY BROWN SILTY SAND WITH SOME GRAVEL. (SM). SLIGHTLY MOIST		40			
	15			100+		5.0	
	20			100+			
	25			100+			
BORING STOPPED AT 35.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY



# 12TH STREET BRIDGE

ATL JOB NUMBER: 189038

BORING NUMBER: 5 (CONT)  
 LOCATION OF BORING:  
 STA. 10+92. 293' RIGHT

DRILLING EQUIPMENT: MOBILE B-56  
 DRILL RIG WITH 8 INCH OUTSIDE  
 DIAMETER CONTINUOUS FLIGHT  
 AUGER

DATE OF BORING: 6-15-89  
 ELEVATION OF BORING: 1240 FT

DRILLER: GARVIN SCAGGS  
 FIELD ENGINEER: STEVE ANASTOS  
 REVIEWED BY: ERIC STANFORD

GRAPHICAL LOG	DEPTH (feet)	SOIL DESCRIPTION	BULLNOSE	SPT NO.	RING NO.	WATER CONTENT %	DRY DENSITY (PCF)
	30	GRAY BROWN FINE SANDY SILTY GRAVEL. (GM). SLIGHTLY MOIST		51			
	35	NOTE: INCREASE IN AMOUNT OF GRAVEL 25 FEET TO 35 FEET		100+			
	40						
	45						
	50						
BORING STOPPED AT 35.0 FEET BELOW EXISTING GRADES		GROUNDWATER					
		DEPTH	HOUR	RATE			
		NONE					

THE ABOVE DATA FOR DESIGN PURPOSES ONLY

A P P E N D I X   B

DATE: August 7, 1989  
CLIENT: Parsons, Brinckerhoff, Quade, & Douglas, Inc.  
PROJECT: 12th Street Bridge - ACDC  
ATL JOB NO.: 189038

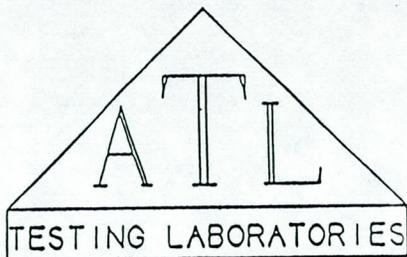
SOLUBLE SULFATES

<u>BORING NO.</u>	<u>DEPTH (FT.)</u>	<u>SOLUBLE SULFATE (ppm)</u>
1	19 - 30	68



PROJECT: 12th Street Bridge DATE: 7-20-89  
 LOCATION: Phoenix, Arizona  
 MATERIAL: Subsurface Soil DATE OF SAMPLE: 7-11-89  
 REQUESTED BY: ATL/E. Stanford ATL Job No: 189038

LOG	DEPTH (ft.)	MOISTURE	USCS	LL	PI	SIEVE ANALYSIS - PERCENT PASSING														
						200	100	50	40	30	16	10	8	4	1/4	3/8	1/2	3/4	1	1 1/2
1	3-7.5	0.4	GW		NP	10	12	14	16	18	21	25	26	34	38	46	53	63	70	81
1	7.5-19	15.3	SM		NP	40	47	54	56	60	66	72	74	84	88	94	97	99	100	
1	40-55	29.6	SC	30	10	44	50	57	62	66	77	85	87	96	98	99	100			
2	8-17	10.9	SC	27	9	34	40	44	46	49	55	60	62	70	76	84	90	95	98	100
2	37-47	25.6	SC	32	11	35	40	46	49	52	60	66	68	76	80	87	93	96	97	100
3	18-28	24.3	SC	32	11	35	40	45	48	51	58	64	66	76	81	88	93	98	100	
3	33-43	12.0	GC	31	12	17	20	23	24	26	30	34	36	44	49	58	63	69	72	94
3	43-53	13.9	GC	39	16	27	31	35	37	40	47	52	54	63	69	78	85	93	95	100
4	15-24	9.7	GM		NP	17	20	23	25	27	32	37	39	49	56	69	78	90	94	100
4	34-38	18.5	SC	35	15	43	49	54	57	61	69	76	78	85	88	92	94	96	99	100



PROJECT: 12th Street Bridge DATE: 7-20-89

LOCATION: Phoenix, Arizona

MATERIAL: Subsurface Soil DATE OF SAMPLE: 7-11-89

REQUESTED BY: ATL/E. Stanford

LOG	DEPTH (ft.)	MOISTURE	USCS	LL	PI	SIEVE ANALYSIS-PERCENT PASSING														
						200	100	50	40	30	16	10	8	4	1/4	3/8	1/2	3/4	1	1 1/2
5	11-25	5.0	SM		NP	24	29	32	35	37	44	50	53	67	75	86	91	97	97	100