

# U.S. ARMY CORPS OF ENGINEERS

|                                                           |  |                            |  |                                                                    |  |
|-----------------------------------------------------------|--|----------------------------|--|--------------------------------------------------------------------|--|
| BORING NO. <u>91-76</u>                                   |  | DATE: BEGIN <u>3-27-91</u> |  | PAGE <u>1 / 1</u>                                                  |  |
| JOB NO. <u>146448</u>                                     |  | COMPLETE <u>3-27-91</u>    |  | Thin Walled Tube                                                   |  |
| PROJECT <u>BRAY'S Bayou</u>                               |  |                            |  | <input checked="" type="checkbox"/> 3" <input type="checkbox"/> 6" |  |
| LOCATION <u>BRAY'S Bayou South Bank</u>                   |  |                            |  |                                                                    |  |
| ELEVATION OF HOLE _____                                   |  |                            |  |                                                                    |  |
| MANUFACTURER'S DESIGNATION OF DRILL RIG <u>Fairing-36</u> |  |                            |  |                                                                    |  |
| GROUNDWATER: DEPTH <u>7'4"</u> ft., ELEV. _____           |  | ft., at end of Drilling    |  |                                                                    |  |
| WEATHER <u>Cloudy, warm</u>                               |  |                            |  |                                                                    |  |
| DRILLER <u>D. Mitchell</u>                                |  | LOGGER <u>J. Long</u>      |  |                                                                    |  |

| DEPTH, FEET | SAMPLE | SAMPLE NO. | PEN./TORVANE | SPT.-BLOW COUNT | COLOR | MATERIAL TYPE | CONSISTENCY | SECONDARY CONSTITUENTS | STRUCTURAL FEATURES AND COMMENTS |
|-------------|--------|------------|--------------|-----------------|-------|---------------|-------------|------------------------|----------------------------------|
| 0           |        | 1          | 4.25         |                 | Gray  | clay          | hard        |                        | w/ roots                         |
|             |        | 2          | 4.5          |                 | "     | "             | sm.         |                        |                                  |
| 5           |        | 3          | 4.5+         |                 | "     | "             | hard        |                        |                                  |
|             |        | 4          | 4.5          |                 | "     | "             | "           |                        | Small roots                      |
|             |        | 5          | 4.5+         |                 | "     | Clay          | "           |                        | " " w/calc. Nods.                |
| 10          |        | 6          | 4.5+         |                 | "     | "             | hard        |                        |                                  |
|             |        | 7          | 3.0          |                 | "     | "             | very soft   |                        |                                  |
| 15          |        | 8          | 4.0          |                 | "     | "             | "           |                        |                                  |
|             |        | 9          | 3.5          |                 | "     | clay          | very soft   |                        |                                  |
|             |        | 10         | 3.0          |                 | "     | "             | "           |                        | w/calc. Nods.                    |
| 20          |        | 11         | 3.5          |                 | "     | "             | "           |                        |                                  |
|             |        | 12         | 4.5          |                 | "     | "             | hard        |                        | w/calc. Nods.                    |
|             |        | 13         | 4.5          |                 | "     | "             | "           |                        | w/ " "                           |
| 25          |        | 14         | 4.5          |                 | "     | clay          | hard        |                        |                                  |
| 30          |        |            |              |                 |       |               |             |                        | Bottom of 91-76 (22')            |
| 35          |        |            |              |                 |       |               |             |                        |                                  |

Project : Brays and Sims bayou and Fondren Ditch, Houston, Texas  
Contract No.DACW64-91-D-0001 Delivery Order No. 0016

# SUMMARY OF LABORATORY TEST RESULTS

Boring No. 91-76

| S # | Depth<br>(ft) | PP<br>(tsf) | SPT<br>Blows<br>per<br>Foot | Visual<br>Classification                                                                   | U S C | M c<br>(%) | Dry<br>Unit<br>Wt<br>(pcf) | Wet<br>Unit<br>Wt<br>(pcf) | LL<br>(%) | P L<br>(%) | Mechanical Analysis<br>% Passing |      |      |      |      | Torvane<br>Shear<br>Strength<br>(tsf) | q u<br>(tsf) |
|-----|---------------|-------------|-----------------------------|--------------------------------------------------------------------------------------------|-------|------------|----------------------------|----------------------------|-----------|------------|----------------------------------|------|------|------|------|---------------------------------------|--------------|
|     |               |             |                             |                                                                                            |       |            |                            |                            |           |            | #4                               | #10  | #40  | #100 | #200 |                                       |              |
| 1   | 0-2           | 4.00        |                             | Dark gray, clay, very stiff, w/ roots                                                      | CH    | 27.8       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 2   | 2-4           | 2.50        |                             | Dark gray, clay, very stiff                                                                | CH    | 32.9       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 3   | 4-6           | 4.5+        |                             | Dark gray, clay, hard, w/ ferrous nodules, slick-<br>ensided                               | CH    | 28.1       | 94.0                       | 120.4                      | 97        | 32         | 100.0                            | 99.6 | 98.8 |      | 87.3 |                                       | 3.36         |
| 4   | 6-8           | 4.5+        |                             | Gray & yellowish brown, clay, hard, w/ ferrous<br>nodules & blocky structure, slickensided | CH    | 30.2       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 5   | 8-10          | 4.5+        |                             | Gray & yellowish brown, clay, hard, w/ ferrous &<br>calcareous nodules , blocky structure. | CH    | 31.7       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 6   | 10-12         | 3.50        |                             | Red & gray, clay, very stiff, w/ calcareous &<br>ferrous nodules, slickensided             | CH    | 30.3       |                            |                            | 76        | 28         |                                  |      |      |      |      |                                       |              |
| 7   | 12-14         | 3.50        |                             | Red & gray, clay, very stiff, w/ calcareous &<br>ferrous nodules, slickensided             | CH    | 31.1       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 8   | 14-16         | 3.00        |                             | Gray & yellowish brown, clay, very stiff, w/ cal-<br>careous nodules, slickensided         | CH    | 22.6       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 9   | 16-18         | 3.00        |                             | Gray & yellowish brown, clay, very stiff, w/ cal-<br>careous nodules                       | CH    | 21.9       |                            |                            | 62        | 23         |                                  |      |      |      |      |                                       |              |
| 10  | 18-20         | 3.00        |                             | Gray & yellowish brown, clay, very stiff, slicken-<br>sided                                | CH    | 22.8       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 11  | 20-22         | 3.25        |                             | Gray & yellowish brown, clay, very stiff, w/ cal-<br>careous nodules                       | CH    | 22.3       | 105.6                      | 129.2                      | 66        | 24         | 99.7                             | 99.3 | 99.0 |      | 89.6 |                                       | 2.50         |
| 12  | 22-24         | 3.00        |                             | Gray & yellowish brown, clay, very stiff, w/ cal-<br>careous & ferrous nodules             | CH    | 22.6       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 13  | 24-26         | 3.00        |                             | Gray & brown, clay, very stiff, w/ calcareous<br>& ferrous nodules                         | CH    | 22.6       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
| 14  | 26-28         | 3.00        |                             | Gray & brown, clay, very stiff, w/ calcareous<br>& ferrous nodules, slickensided           | CH    | 27.3       |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
|     |               |             |                             |                                                                                            |       |            |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
|     |               |             |                             |                                                                                            |       |            |                            |                            |           |            |                                  |      |      |      |      |                                       |              |
|     |               |             |                             |                                                                                            |       |            |                            |                            |           |            |                                  |      |      |      |      |                                       |              |

S # : Sample Number, P P : Pocket Penetrometer Reading, U S C : Unified Soil Classification, M c : Moisture Content  
q u : Unconfined Compressive Strength, W O H : Weight of hammer, W O P : Weight of pipe

JOB NO. 14G487

DATE 7/02/91

PROJECT BRAYS BAYOU, SIMS BAYOU AND FONDERN DITCH

BORING NO. 91-76

SAMPLE NO. 3

DEPTH 4-6 ft

SPECIMEN NO. 1

## CLASSIFICATION

Dark gray, clay, hard, w/ ferrous nodules, slickensided

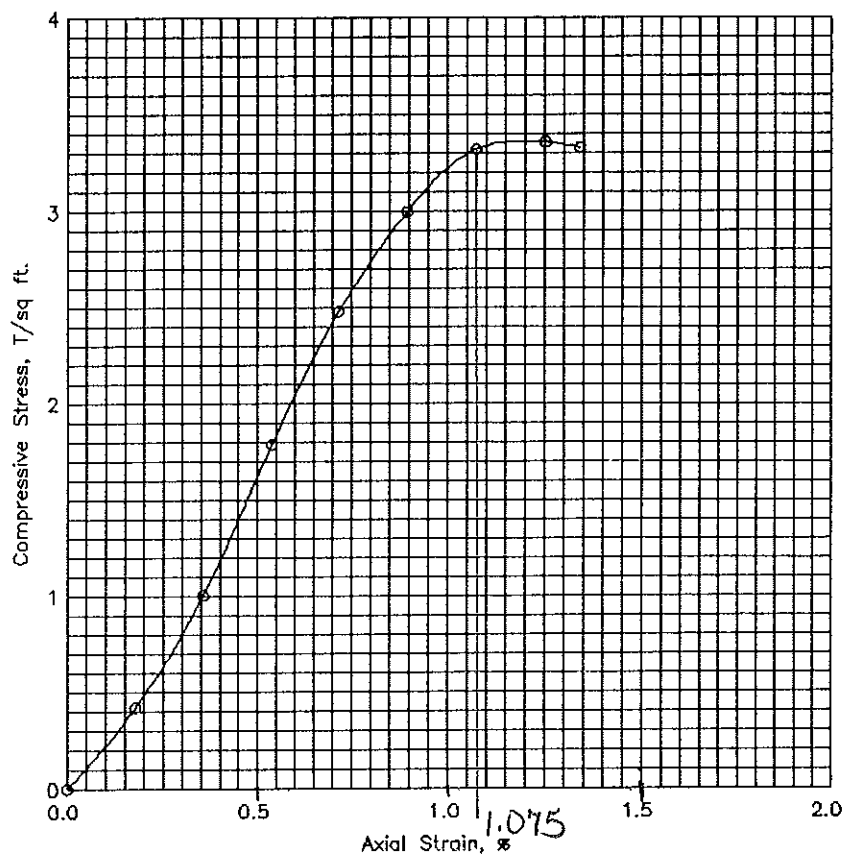
|                            |            |                  |               |
|----------------------------|------------|------------------|---------------|
| Tare No.                   | P-17       | Height           | 5.595 in.     |
| Tare plus Wet Specimen     | 751.21 gm  | Average Diameter | 2.830 in.     |
| Tare plus Dry Specimen     | 595.75 gm  | Initial Area     | 6.290 sq in.  |
| Water Weight               | 155.46 gm  | Volume           | 35.194 cu in. |
| Tare Weight                | 42.78 gm   | Volume of Solids | cu in.        |
| Wet Specimen               | 1112.10 gm | Void Ratio       |               |
| Dry Specimen               | 868.06 gm  | Saturation       | %             |
| Water Content              | 28.11 %    | Dry Density      | 94.0 lb/cu ft |
| Specific Gravity of Solids |            |                  |               |
| LL = 97                    | PL = 32    | PI = 65          |               |

Proving Ring No. 10170

Proving Ring Constant, K = .766 lbs/div.

| Elapsed Time min. | Dial Reading 0.001" | Cumulative Change in. | Proving Ring Dial Reading | Axial Load lb | Axial Strain | Area Corr. sq in. | Compr. Stress tsf |
|-------------------|---------------------|-----------------------|---------------------------|---------------|--------------|-------------------|-------------------|
| .0                | 0.                  | .000                  | .0                        | .0            | .000         | 6.29              | .000              |
| .3                | 10.                 | .010                  | 48.0                      | 36.8          | .002         | 6.30              | .420              |
| .5                | 20.                 | .020                  | 115.0                     | 88.1          | .004         | 6.31              | 1.005             |
| .8                | 30.                 | .030                  | 205.0                     | 157.0         | .005         | 6.32              | 1.788             |
| 1.1               | 40.                 | .040                  | 285.0                     | 218.3         | .007         | 6.34              | 2.481             |
| 1.4               | 50.                 | .050                  | 345.0                     | 264.3         | .009         | 6.35              | 2.998             |
| 1.6               | 60.                 | .060                  | 383.0                     | 293.4         | .011         | 6.36              | 3.322             |
| 1.6               | 70.                 | .070                  | 388.0                     | 297.2         | .013         | 6.37              | 3.359             |
| 1.7               | 75.                 | .075                  | 385.0                     | 294.9         | .013         | 6.38              | 3.330             |

## Failure Sketches



- ☐ Controlled stress
- ☒ Controlled strain

|                                                                        |                       |                                                   |        |              |    |
|------------------------------------------------------------------------|-----------------------|---------------------------------------------------|--------|--------------|----|
| Test No.                                                               |                       | 1                                                 |        |              |    |
| Type of Specimen                                                       |                       | Undisturbed                                       |        |              |    |
| Initial                                                                | Water content         | $w_0$                                             | 28.1 % | %            | %  |
|                                                                        | Void ratio            | $e_0$                                             |        |              |    |
|                                                                        | Saturation            | $S_0$                                             | %      | %            | %  |
|                                                                        | Dry density, lb/cu ft | $\gamma_d$                                        | 94.0   |              |    |
| Time to failure, min                                                   |                       | $t_f$                                             | 1.65   |              |    |
| Unconfined compressive strength, T/sq ft                               |                       | $q_u$                                             | 3.36   |              |    |
| Undrained shear strength, T/sq ft                                      |                       | $S_u$                                             | 1.68   |              |    |
| Sensitivity ratio                                                      |                       | $S_t$                                             |        |              |    |
| Initial specimen diameter, in.                                         |                       | $D_0$                                             | 2.830  |              |    |
| Initial specimen height, in.                                           |                       | $H_0$                                             | 5.595  |              |    |
| Classification Dark gray, clay, hard, w/ ferrous nodules, slickensided |                       |                                                   |        |              |    |
| LL                                                                     | 97                    | PL                                                | 32     | PI           | 65 |
| Remarks                                                                |                       | G.                                                |        |              |    |
|                                                                        |                       | Project BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH |        |              |    |
|                                                                        |                       | Area Houston, Texas                               |        |              |    |
|                                                                        |                       | Boring No. 91-76                                  |        | Sample No. 3 |    |
|                                                                        |                       | Depth 4-6 ft                                      |        | Date 7/02/91 |    |
|                                                                        |                       | El                                                |        |              |    |
| UNCONFINED COMPRESSION TEST REPORT                                     |                       |                                                   |        |              |    |

JOB NO. 14G487

DATE 7/02/91

PROJECT BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH

BORING NO. 91-76

SAMPLE NO. 11

DEPTH 20-22 ft

SPECIMEN NO. 1

## CLASSIFICATION

Gray &amp; yellowish brown, clay, very stiff, w/ calcareous nodules

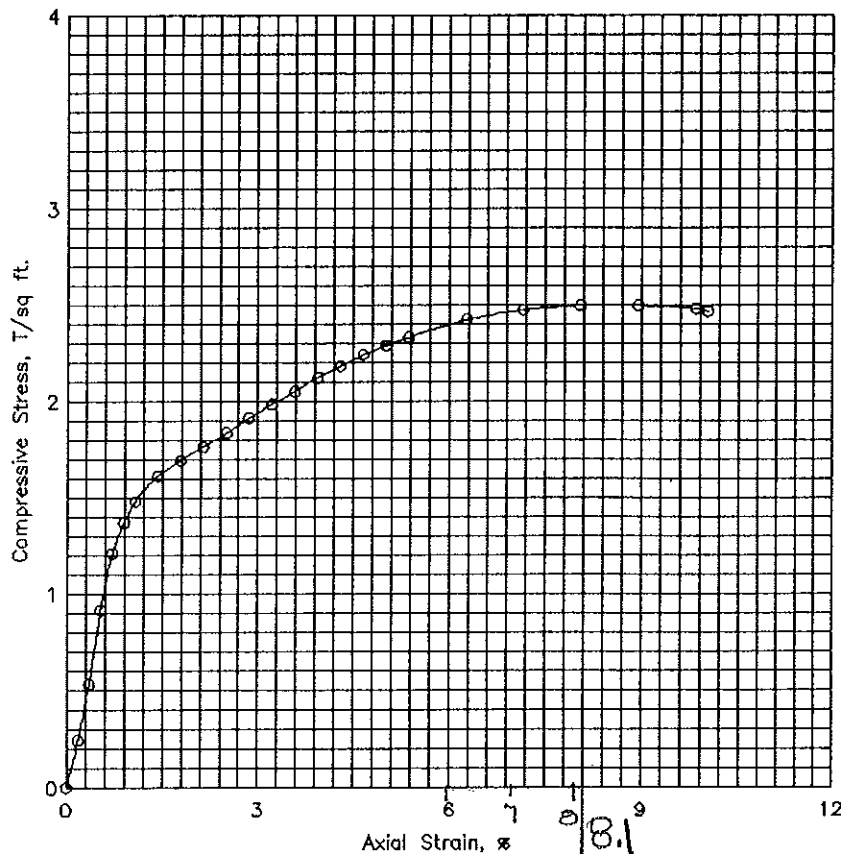
|                            |            |                  |                |
|----------------------------|------------|------------------|----------------|
| Tare No.                   | P-2        | Height           | 5.595 in.      |
| Tare plus Wet Specimen     | 782.00 gm  | Average Diameter | 2.830 in.      |
| Tare plus Dry Specimen     | 647.50 gm  | Initial Area     | 6.290 sq in.   |
| Water Weight               | 134.50 gm  | Volume           | 35.194 cu in.  |
| Tare Weight                | 43.03 gm   | Volume of Solids | cu in.         |
| Wet Specimen               | 1193.08 gm | Void Ratio       |                |
| Dry Specimen               | 975.93 gm  | Saturation       | %              |
| Water Content              | 22.25 %    | Dry Density      | 105.6 lb/cu ft |
| Specific Gravity of Solids |            |                  |                |
| LL = 66                    | PL = 24    | PI = 42          |                |

Proving Ring No. 10170

Proving Ring Constant, K = .766 lbs/div.

| Elapsed<br>Time<br>min. | Dial<br>Reading<br>0.001" | Cumulative<br>Change<br>in. | Proving Ring<br>Dial Reading | Axial<br>Load<br>lb | Axial<br>Strain | Area<br>Corr.<br>sq in. | Compr.<br>Stress<br>tsf |
|-------------------------|---------------------------|-----------------------------|------------------------------|---------------------|-----------------|-------------------------|-------------------------|
| .0                      | 0.                        | .000                        | .0                           | .0                  | .000            | 6.29                    | .000                    |
| .3                      | 10.                       | .010                        | 28.0                         | 21.4                | .002            | 6.30                    | .245                    |
| .4                      | 20.                       | .020                        | 61.0                         | 46.7                | .004            | 6.31                    | .533                    |
| .7                      | 30.                       | .030                        | 105.0                        | 80.4                | .005            | 6.32                    | .916                    |
| .9                      | 40.                       | .040                        | 139.0                        | 106.5               | .007            | 6.34                    | 1.210                   |
| 1.1                     | 50.                       | .050                        | 158.0                        | 121.0               | .009            | 6.35                    | 1.373                   |
| 1.3                     | 60.                       | .060                        | 171.0                        | 131.0               | .011            | 6.36                    | 1.483                   |
| 1.6                     | 80.                       | .080                        | 187.0                        | 143.2               | .014            | 6.38                    | 1.616                   |
| 1.9                     | 100.                      | .100                        | 197.0                        | 150.9               | .018            | 6.40                    | 1.696                   |
| 2.3                     | 120.                      | .120                        | 206.0                        | 157.8               | .021            | 6.43                    | 1.767                   |
| 2.6                     | 140.                      | .140                        | 215.0                        | 164.7               | .025            | 6.45                    | 1.838                   |
| 3.0                     | 160.                      | .160                        | 225.0                        | 172.3               | .029            | 6.48                    | 1.916                   |
| 3.3                     | 180.                      | .180                        | 234.0                        | 179.2               | .032            | 6.50                    | 1.986                   |
| 3.7                     | 200.                      | .200                        | 243.0                        | 186.1               | .036            | 6.52                    | 2.054                   |
| 4.0                     | 220.                      | .220                        | 252.0                        | 193.0               | .039            | 6.55                    | 2.123                   |
| 4.3                     | 240.                      | .240                        | 260.0                        | 199.2               | .043            | 6.57                    | 2.182                   |
| 4.7                     | 260.                      | .260                        | 268.0                        | 205.3               | .046            | 6.60                    | 2.241                   |
| 5.0                     | 280.                      | .280                        | 275.0                        | 210.6               | .050            | 6.62                    | 2.291                   |
| 5.3                     | 300.                      | .300                        | 281.0                        | 215.2               | .054            | 6.65                    | 2.332                   |
| 6.1                     | 350.                      | .350                        | 295.0                        | 226.0               | .063            | 6.71                    | 2.425                   |
| 7.0                     | 400.                      | .400                        | 304.0                        | 232.9               | .071            | 6.77                    | 2.475                   |
| 7.8                     | 450.                      | .450                        | 310.0                        | 237.5               | .080            | 6.84                    | 2.499                   |
| 8.6                     | 500.                      | .500                        | 313.0                        | 239.8               | .089            | 6.91                    | 2.499                   |
| 9.4                     | 550.                      | .550                        | 314.0                        | 240.5               | .098            | 6.98                    | 2.482                   |
| 9.6                     | 560.                      | .560                        | 313.0                        | 239.8               | .100            | 6.99                    | 2.470                   |

## Failure Sketches



☐ Controlled stress  
☒ Controlled strain

|                                                                                |                       |                                                   |        |               |    |
|--------------------------------------------------------------------------------|-----------------------|---------------------------------------------------|--------|---------------|----|
| Test No.                                                                       |                       | 1                                                 |        |               |    |
| Type of Specimen                                                               |                       | Undisturbed                                       |        |               |    |
| Initial                                                                        | Water content         | $w_0$                                             | 22.3 % | %             | %  |
|                                                                                | Void ratio            | $e_0$                                             |        |               |    |
|                                                                                | Saturation            | $S_0$                                             | %      | %             | %  |
|                                                                                | Dry density, lb/cu ft | $\gamma_d$                                        | 105.6  |               |    |
| Time to failure, min                                                           |                       | $t_f$                                             | 7.80   |               |    |
| Unconfined compressive strength, T/sq ft                                       |                       | $q_u$                                             | 2.50   |               |    |
| Undrained shear strength, T/sq ft                                              |                       | $S_u$                                             | 1.25   |               |    |
| Sensitivity ratio                                                              |                       | $S_t$                                             |        |               |    |
| Initial specimen diameter, in.                                                 |                       | $D_0$                                             | 2.830  |               |    |
| Initial specimen height, in.                                                   |                       | $H_0$                                             | 5.595  |               |    |
| Classification Gray & yellowish brown, clay, very stiff, w/ calcareous nodules |                       |                                                   |        |               |    |
| LL                                                                             | 66                    | PL                                                | 24     | PI            | 42 |
|                                                                                |                       |                                                   |        | $G_s$         |    |
| Remarks                                                                        |                       | Project BRAYS BAYOU, SIMS BAYOU AND FONDREN DITCH |        |               |    |
|                                                                                |                       | Area Houston, Texas                               |        |               |    |
|                                                                                |                       | Boring No. 91-76                                  |        | Sample No. 11 |    |
|                                                                                |                       | Depth 20-22 ft                                    |        | Date 7/02/91  |    |
|                                                                                |                       | UNCONFINED COMPRESSION TEST REPORT                |        |               |    |