Document 00910

ADDENDUM NO.1

Date of Addendum: 1/15/2016
****Enter date by hand when signed for release****

PROJECT NAME: Water Line Replacement in Shepherd Forest II Area

PROJECT NO: WBS No. S-000035-0192-4

BID DATE: February 4, 2016 (Bid date is changed.)

FROM: J. Timothy Lincoln, P.E., City Engineer
City of Houston, Department of Public Works and Engineering
611 Walker Street
Houston, Texas 77002
Attn: *Mumtaz Baig, P.E.*, Project Manager

TO: Prospective Bidders

This Addendum forms a part of the Bidding Documents and will be incorporated into the Contract documents, as applicable. Insofar as the original Project Manual and Drawings are inconsistent, this Addendum governs.

CHANGE IN BID DATE

The Bid Date for this Project has been changed from 2-4-2016 (Date) to 2-18-2016 (Date).
Time of day and place for submittal of bid remains the same

CHANGES TO PROJECT MANUAL

1. Document 00015: Replace existing Document 00015 - List of Drawings in it's entirety with new Document 00015 - List of Drawings, Addendum Number 1.

2. Document 00320: Replace existing Document 00320 – Geotechnical Information in it's entirety with new Document 00320 – Geotechnical Information, Addendum Number 1.

3. Document 00340: Replace existing Document 00340 – Environmental Information in it's entirety with new Document 00340 – Environmental Information, Addendum Number 1.

4. Document 00410A: Replace existing Document 00410A – Bid Form Part A in it's entirety with new Document – Bid Form Part A, Addendum Number 1.

5. Document 00410 B: Replace existing Document 00410B – Bid Form Part B in it's entirety with new Document 410B – Bid Form B, Addendum Number 1.

6. Document 00520: Replace existing Document 00520 – Agreement in it's entirety with new Document 00520 with new Document 00520 – Agreement, Addendum Number 1.

7. Document 01110: Replace existing Document 01110 – Summary of Work in it's entirety with new Document 01110 – Summary of Work, Addendum Number 1.

8. Document 02105: Added Document 02105 – Chemical Sampling and Analysis.

9. Document 02120: Added Document 02120 – Off-Site Transportation and Disposal.

CHANGES TO DRAWINGS

Add drawings for Water Line Replacement along Bellaire Blvd.(WBS Number S-000700-0068-4), COH Drawing Number 54210 (Drawing Sheet Number from 1 thru 59), designed by SES Horizon Consulting Engineers, Inc.

CLARIFICATIONS

CONSTRUCTION COST ESTIMATE: Cost estimate is changed from $3,454,155.00 to $4,664,795.00.

END OF ADDENDUM NO. 1

DATED: Ebi Nassi
For *Ravi Kaleyatodi, P.E., CPM*
Senior Assistant Director
Department of Public Works and Engineering

SD ACM MB
RK:SD:ACM:MB:sdd

END OF DOCUMENT

Document 00015
LIST OF DRAWINGS

1	COVER SHEET AND VICINITY MAP
2	INDEX OF DRAWINGS AND LEGENDS
3	UTILITY NOTES AND ABBREVIATIONS
4	OVERALL LAYOUT (SHEET 1 OF 4)
5	OVERALL LAYOUT (SHEET 2 OF 4)
6	OVERALL LAYOUT (SHEET 3 OF 4)
7	OVERALL LAYOUT (SHEET 4 OF 4)
8	SURVEY CONTROL MAP (SHEET 1 OF 6)
9	SURVEY CONTROL MAP (SHEET 2 OF 6)
10	SURVEY CONTROL MAP (SHEET 3 OF 6)
11	SURVEY CONTROL MAP (SHEET 4 OF 6)
12	SURVEY CONTROL MAP (SHEET 5 OF 6)
13	SURVEY CONTROL MAP (SHEET 6 OF 6)
14	SURVEY SWINGTIES (SHEET 1 OF 5)
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16	SURVEY SWINGTIES (SHEET 3 OF 5)
17	SURVEY SWINGTIES (SHEET 4 OF 5)
18	SURVEY SWINGTIES (SHEET 5 OF 55+00)
19	W. 30TH ST PLAN & PROFILE (STA 1+00 TO STA 5+00)
20	W. 30TH ST PLAN & PROFILE (STA 5+00 TO STA 10+00)
21	W. 30TH ST PLAN & PROFILE (STA 10+00 TO STA 15+00)
22	W. 30TH ST PLAN & PROFILE (STA 15+00 TO STA 20+00)
23	W. 30TH ST PLAN & PROFILE (STA 20+00 TO STA 24+00)
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25	W. 30TH ST PLAN & PROFILE (STA 29+00 TO STA 33+00)
26	W. 30TH ST PLAN & PROFILE (STA 33+00 TO STA 38+00)
27	W. 30TH ST PLAN & PROFILE (STA 38+00 TO STA 43+00)
28	W. 30TH ST PLAN & PROFILE (STA 43+00 TO STA 47+00)
29	W. 30TH ST PLAN & PROFILE (STA 47+00 TO STA 51+00)
30	W. 30TH ST PLAN & PROFILE (STA 51+00 TO STA 56+00)
31	W. 30TH ST PLAN & PROFILE (STA 56+00 TO STA 60+00)
32	W. 30TH ST PLAN & PROFILE (STA 60+00 TO STA 64+00)
33	W. 30TH ST PLAN & PROFILE (STA 64+00 TO STA 69+00)
34	W. 30TH ST PLAN & PROFILE (STA 69+00 TO STA 74+00)
35	W. 30TH ST PLAN & PROFILE (STA 74+00 TO STA 79+00)
36	W. 30TH ST PLAN & PROFILE (STA 79+00 TO STA END)

37 W. 31ST ST PLAN & PROFILE (STA 1+00 TO STA 5+00)
38 W. 31ST ST PLAN & PROFILE (STA 5+00 TO STA 10+00)
39 W. 31ST ST PLAN & PROFILE (STA 10+00 TO STA 14+00)
40 W. 31ST ST PLAN & PROFILE (STA 14+00 TO STA 19+00)
41 W. 31ST ST PLAN & PROFILE (STA 19+00 TO STA 22+00)
42 W. 31ST ST PLAN & PROFILE (STA 29+00 TO STA 34+00)
43 W. 31ST ST PLAN & PROFILE (STA 34+00 TO STA 39+00)
44 W. 31ST ST PLAN & PROFILE (STA 39+00 TO STA 44+00)
45 W. 31ST ST PLAN & PROFILE (STA 44+00 TO STA END)
46 W. 32ND ST PLAN & PROFILE (STA 1+00 TO STA 5+00)
47 W. 32ND ST PLAN & PROFILE (STA 5+00 TO STA 10+00)
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51 W. 32ND ST PLAN & PROFILE (STA 24+00 TO STA 28+00)
52 W. 32ND ST PLAN & PROFILE (STA 28+00 TO STA END)
53 W. 33RD ST PLAN & PROFILE (STA 1+00 TO STA 5+00)
54 W. 33RD ST PLAN & PROFILE (STA 5+00 TO STA 9+00)
55 W. 33RD ST PLAN & PROFILE (STA 9+00 TO STA 13+00)
56 W. 33RD ST PLAN & PROFILE (STA 13+00 TO STA END)
57 W. 34TH ST PLAN & PROFILE (STA 1+00 TO STA 6+00)
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62 W. 34TH ST PLAN & PROFILE (STA 24+00 TO STA 29+00)
63 W. 34TH ST PLAN & PROFILE (STA 29+00 TO STA 34+00)
64 W. 34TH ST PLAN & PROFILE (STA 34+00 TO STA END)
65 STONECREST DR. PLAN & PROFILE (STA 1+00 TO STA 5+00)
66 STONECREST DR. PLAN & PROFILE (STA 5+00 TO STA 9+00)
67 STONECREST DR. PLAN & PROFILE (STA 9+00 TO STA 13+00)
68 STONECREST DR. PLAN & PROFILE (STA 13+00 TO STA 18+00)
69 STONECREST DR. PLAN & PROFILE (STA 18+00 TO STA 23+00)
70 STONECREST DR. PLAN & PROFILE (STA 23+00 TO STA 27+50)
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73 ALBA RD. PLAN & PROFILE (STA 1+00 TO STA 6+00)
74 ALBA RD. PLAN & PROFILE (STA 6+00 TO STA 11+00)
75 ALBA RD. PLAN & PROFILE (STA 11+00 TO STA 14+50)
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77 ALBA RD. PLAN & PROFILE (STA 19+50 TO STA END)
78 DUNSMERE RD. PLAN & PROFILE (STA 1+00 TO STA 3+50)
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84 RANDALL ST. PLAN & PROFILE (STA 10+00 TO STA END)
85 LAWRENCE ST. PLAN & PROFILE (STA 1+00 TO STA 5+00)
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131	TREE PROTECTION PLAN (SHEET 18 OF 24)
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142	PAVEMENT DETAILS (SHEET 3 OF 3)
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LIST OF DRAWINGS-WLR along Bellaire Blvd.

1	COVER SHEET AND VICINITY MAP
2	INDEX OF DRAWINGS AND LEGENDS
3	UTILITY NOTES
4	CONSTRUCTION AND TOPO LEGEND
5	OVERALL PROJECT LAYOUT
6-7	SURVEY CONTROL MAP
8-9	SURVEY CONTROL POIT SWING TIES
10	C.H.H MONUMENT SWING TIES

11 FROM STA. 1+00 TO STA.5+40 (PLAN)
12 FROM STA. 1+00 TO STA.5+40 (PROFILE)
13 FROM STA. 5+40 TO STA.10+00 (PLAN)
14 FROM STA. 5+40 TO STA.10+00 (PROFILE)
15 FROM STA. 10+00 TO STA.14+20 (PLAN)
16 FROM STA. 10+00 TO STA.14+20 (PROFILE)
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25 FROM STA. 31+80 TO STA.36+20 (PLAN)
26 FROM STA. 31+80 TO STA.36+20 (PROFILE)
27 FROM STA. 36+20 TO STA.40+60 (PLAN)
28 FROM STA. 36+20 TO STA.40+60 (PROFILE)
29 FROM STA. 40+60 TO STA.45+00 (PLAN)
30 FROM STA. 40+60 TO STA.45+00 (PROFILE)
31 FROM STA. 45+00 TO STA.47+00 (PLAN)
32 FROM STA. 45+00 TO STA.47+00 (PROFILE)

STELLA LINK @ BELLAIRE BLVD.
33 FROM STA. 1+00 TO STA.4+00

AUDEN BLVD. @BELLARE BLVD.

34 FROM STA. 1+00 TO STA.4+00

EDLOE STREET @ BELLARE BLVD.

35 FROM STA. 1+00 TO STA.4+00

END OF DOCUMENT

Document 00320

GEOTECHNICAL INFORMATION

1. DOCUMENT INCLUDES

   A. Soils investigation reports.
   B. Bidder's responsibilities.

2. RELATED DOCUMENTS

   A. Document 00340 – Environmental Information
   B. Section 02260 - Trench Safety Systems

3. SITE INVESTIGATION REPORTS

   A. In the design and preparation of Contract documents for this Project, the City and Design Consultant have used information in geotechnical reports for the investigation and analysis of soils and subsurface conditions at the Project site.

   B. An electronic copy of the report for this project is included in a CD-Rom affixed to the inside front cover of the project manual.

   C. Neither the City nor Design Consultant is responsible for accuracy or completeness of any information or data.

4. GEOTECHNICAL REPORTS

   A. Report No.: G13-196 Prepared by (Firm Name): Associated Testing Laboratories, Inc.. Title: Final Report Geotechnical Investigation, Water Line Replacement in Shepherd Forest II Area; WBS No. S-000035-0192-4. Report Date: December 18, 2013 No. of Pages: 158 pages including attachments & contents pages.

   Report No.: 06.13.284 Prepared by (Firm Name): 1.Tolunay-Wong Engineers, Inc.(For Bellaire). Title: Geotechnical Study Bellaire Boulevard Project City of Southside Place, Texas; WBS No. S-000700-A017-4. Report Date: September 19, 2006 No. of Pages: 121 pages including attachments & contents pages.

5. BIDDER RESPONSIBILITIES

A. Bidder shall take full responsibility for interpretation and use of information contained in above listed reports for its bidding and construction purposes.

B. Bidder may perform additional soils investigations as Bidder deems appropriate.

END OF DOCUMENT

Document 00340

ENVIRONMENTAL INFORMATION

1.0 DOCUMENT INCLUDES

A. Environmental Site Assessment, if applicable.

B. Asbestos and Lead Surveys, if applicable.

C. Bidder's responsibilities.

2.0 RELATED DOCUMENTS

A. Document 00320 - Geotechnical Information

3.0 SITE INVESTIGATION REPORTS

A. In the design and preparation of Contract documents for this Project, the City and Design Consultant have used information in environmental site assessment reports for the investigation and analysis of soils and subsurface conditions at the Project site.

B. In the design and preparation of Contract documents for this Project, the City and Design Consultant have relied upon information in surveys taken for Asbestos-containing Materials (ACMs) and lead at the Project site.

C. An electronic copy of each report for this project is included in a CD-Rom affixed to the inside front cover of the project manual.

D. Neither the City nor Design Consultant is responsible for accuracy or completeness of any information or data.

4.0 REPORTS

A. Environmental Assessment Surveys

1. Report No.: 13268012, Prepared by Othon, Inc. ; Title: Phase I Environmental Site Assessment, Water Line Replacement in Shepherd Forest II Area, Report Date: June, 2013, consisting of 1413 pages.

2. No.: E13-112, Prepared by Associated Testing Laboratories, Inc. ; Title: Phase II Environmental Site Assessment, Water Line Replacement in Shepherd Forest II Area, Report Date: September, 2013, consisting of 57 pages

3. Report No.: 06.12.005, Prepared by 1. Tolunay-Wong Engineers, Inc. (For Bellaire); Title: Phase I Environmental Site Assessment of College Avenue Project from University Boulevard to Bellaire Boulevard City of West University Harris County, Texas, Report Date: September 2006, consisting of 87 pages.
   Environmental Site Assessment Report(s) is available to Bidders: (List information. Use back of page if necessary.)

4. Report No.:TWEI Project Number 07.12.018, Prepared by 1. Tolunay-Wong Engineers, Inc.(For Bellaire) ; Title: Phase II Environmental Site Assessment of Bellaire Boulevard Project City of Southside Place Harris County, Texas, Report Date: July 2007, consisting of 112 pages.

5.0 BIDDER RESPONSIBILITIES

A. Bidder shall take full responsibility for interpretation and use of information contained in above listed reports for bidding and construction purposes.

B. Bidder may perform additional investigations as Bidder deems appropriate.

END OF DOCUMENT

Document 00410A

BID FORM – PART A

To: **The Honorable Mayor and City Council of the City of Houston**
City Hall Annex
900 Bagby Street
Houston, Texas 77002

Project: Water Line Replacement in Shepherd Forest II Area
Project Nos.: WBS No. S-000035-0192-4
Bidder: Water Line Replacement Along Bellaire Blvd.
WBS No. S-000700-0068-4

(Print or type full name of proprietorship, partnership, corporation, or joint venture.)

1.0 OFFER

A. Total Bid Price: Having examined the Project location and all matters referred to in Bid Documents for the Project, we, the undersigned, offer to enter into a Contract to perform the Work for the Total Bid Price shown on the signature page of this Document

B. Security Deposit: Included with the Bid is a Security Deposit in the amount of 10 percent of the Total Bid Price subject to terms described in Document 00200– Instructions to Bidders.

C. Period for Bid Acceptance: This offer is open to acceptance and is irrevocable for 90 days from Bid Date. That period may be extended by mutual written agreement of the City and Bidder.

D. Addenda: All Addenda have been received. Modifications to Bid Documents have been considered and all related costs are included in the Total Bid Price.

E. Bid Supplements: The following documents are attached:

[X] Security Deposit *(as defined in Document 00200– Instructions to Bidders)*
[X] Document 00450 - Bidder's Statement of MWBE/PDBE/DBE/SBE Status
[X] Document 00452 - Contractor's Submission List - Fair Campaign Ordinance Form A
[X] Document 00453 – Bidder's Statement of Residency *(not required for AIP funded project)*
[X] Document 00454 - Affidavit of Non-interest
[X] Document 00455 - Affidavit of Ownership or Control
[ ] Document 00456 - Bidder's Certificate of Compliance with Buy American Program *(required for AIP funded project)*
[X] Document 00457 – Conflicts of Interest Questionnaire (CIQ)
[ ] Document 00458 - Bidder's Certificate Regarding Foreign Trade Restriction *(required for AIP funded project)*
[ ] Document 00459 - Contractor's Statement Regarding Previous Contracts Subject to EEO *(required for AIP funded project)*
[X] Document 00470 – Pay or Play Acknowledgement Form (POP 1-A)
[ ] Others as listed: _____

2.0 CONTRACT TIME

If offer is accepted, Contractor shall achieve Date of Substantial Completionwithin 410 days after Date of Commencement of the Work, subject to adjustments of Contract Time as provided in the Contract.

Document 00410B

BID FORM – PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND PROCESS (PRINT OR TYPE NUMERICAL AMOUNTS):

A. STIPULATED PRICE: $0.00 (N/A)

(Total Bid Price; minus Base Unit Prices, Extra Unit Prices, Cash Allowances and All Alternates, if any)

B. BASE UNIT PRICE TABLE: For Water Line Replacement in Shepherd Forest II Area

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	01502	Mobilization	LS	1	$131,000.00(1)	$131,000.00(1)
2	01555	Flagmen	LS	1	$41,000.00(2)	$39,000.00(2)
3	01555	Traffic control and regulation	LS	1	$47,000.00(2)	$45,000.00(2)
4	01562	Tree and plant protection	LS	1	$25,000.00(2)	$25,000.00(2)
5	01570	Filter fabric barrier	LF	11,500		
6	01570	Reinforced filter fabric barrier	LF	3,500		
7	01570	Bagged gravel barrier	LF	600		
8	01570	Inlet protection barrier	LF	400		
9	01740	Site restoration	LF	32,583	$5.00(2)	$162,915.00(2)
10	02221	Removing and disposing of Asphaltic surfacing (all thickness, including base & subgrade, w/ or w/o curb, all depths)	SY	570		
11	02221	Removing and disposing of Concrete pavements (all thickness, w/ or w/o Asphalt, including base & subgrade, w/ or w/o curb, all depths)	SY	200		

Bidder's Initials [ ]

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
12	DWG	Flexible Joint at Fault Zone	EA	7		
13	02511	4-inch diameter water line by trenchless construction	LF	17		
14	02511	4-inch diameter DIP water line by trenchless construction with restrained joints	LF	21		
15	02511	6-inch diameter water line by trenchless construction	LF	124		
16	02511	6-inch diameter water line by trenchless construction with restrained joints	LF	155		
17	02511	8-inch diameter water line by trenchless construction	LF	23,896		
18	02511	8-inch diameter water line by trenchless construction with restrained joints	LF	94		
19	02511	8-inch diameter DIP water line by trenchless construction with restrained joints	LF	2,822		
20	02511	8-inch diameter DIP water line by trenchless construction with restrained joints in 16-inch casing	LF	100		
21	02511	12-inch diameter water line by trenchless construction	LF	4,152		
22	02511	12-inch diameter DIP water line by trenchless construction with restrained joints	LF	1,033		
23	02511	12-inch diameter DIP water line by trenchless construction with restrained joints in 20-inch casing	LF	169		
24	02512	3/4-inch thru 1-inch diameter water taps and copper service lines with meter box, short side	EA	312		
25	02512	3/4-inch thru 1-inch diameter water taps and copper service lines with meter box, long side	EA	311		
26	02512	3/4-inch thru 1-inch diameter water taps and copper service lines with meter box, extra long side	EA	2		
27	02512	1-1/2-inch thru 2-inch diameter water taps and service lines with meter box, long side	EA	1		
28	02513	2-inch diameter standard connection	EA	1		
29	02513	3-inch diameter wet connection	EA	1		
30	02513	4-inch diameter wet connection	EA	1		
31	02513	6-inch diameter wet connection	EA	8		
32	02513	8-inch diameter wet connection	EA	9		

Bidder's Initials [ ]

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
33	02513	12-inch diameter wet connection	EA	1		
34	02516	Cut, plug, and abandon existing 2-inch diameter water line	EA	4		
35	02516	Cut, plug, and abandon existing 3-inch diameter water line	EA	1		
36	02516	Cut, plug, and abandon existing 4-inch diameter water line	EA	1		
37	02516	Cut, plug, and abandon existing 6-inch diameter water line	EA	14		
38	02516	Cut, plug, and abandon existing 8-inch diameter water line	EA	16		
39	02516	Cut, plug, and abandon existing 12-inch diameter water line	EA	1		
40	02520	Fire hydrant assembly, all depths, including 6-inch diameter gate valve and box	EA	65		
41	02520	6-inch diameter fire hydrant branch by open-cut	LF	650		
42	02520	Remove and salvage existing fire hydrant	EA	45		
43	02525	6-inch by 6-inch diameter tapping sleeve and valve with box	EA	1		
44	02525	8-inch by 8-inch diameter tapping sleeve and valve with box	EA	1		
45	02525	12-inch by 8-inch diameter tapping sleeve and valve with box	EA	2		
46	02525	16-inch by 8-inch diameter tapping sleeve and valve with box	EA	4		
47	02525	24-inch by 12-inch diameter tapping sleeve and valve with box	EA	1		
48	02741	Hot-Mix Asphaltic Pavement (all thickness, including surfacing, base & subgrade)	SY	570		
49	02751	Concrete pavement (all thickness, including reinforcement, Asphaltic surfacing, base & subgrade)	SY	200		
TOTAL BASE UNIT PRICES: For Water Line Replacement in Shepherd Forest II Area						$_____

Bidder's Initials [ ]

B1. BASE UNIT PRICE TABLE: FOR WATER LINE REPLACEMENT ALONG BELLAIRE BLVD.: S-000700-0068-4

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
50	01502	Mobilization	LS	1	$40,000.00(1)	$40,000.00(1)
51	01555	Flagmen	LS	1		
					$13,000.00(2)	$13,000.00(2)
52	01555	Traffic Control and Regulation	LS	1		
					$14,000.00(2)	$14,000.00(2)
53	01562	Tree and Plant Protection	LS	1		
					$800.00(2)	$800.00(2)
54	01570	Inlet Protection Barrier	LF	27		
55	01570	Filter Fabric Fence	LF	3,815		
56	01555	Site Restoration	LF	6,256		
					$5.00(2)	$31,280.00(2)
57	02105	Preparatory Work related to site remediation and excavation in PPCA Area	LS	1		
					$15,000.00(2)	$15,000.00(2)
58	02120	Transportation and disposal of Class I/II soil in PPCA Area	CY	300		
59	02120	Transportation and disposal of contaminated ground water in PPCA area	GAL	2,000		
60	02221	Removing and disposing of Concrete pavements (all thickness, w/ or w/o Asphalt, including base & subgrade, w/ or w/o curb, all depths)	SY	325		
61	02511	8-inch diameter water line by trenchless construction	LF	50		
62	02511	8-inch diameter water line by trenchless construction with restrained joints in PPCA	LF	1,564		
63	02511	12-inch diameter DIP water line by trenchless construction in PPCA	LF	65		
64	02511	12-inch diameter DIP water line by trenchless construction with restrained joints in PPCA	LF	93		

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
65	02511	16-inch diameter DIP water line by trenchless construction	LF	832		
66	02511	16-inch diameter DIP water line by trenchless construction with restrained joints in PPCA	LF	3,655		
67	02512	3/4-inch thru 1-inch diameter water taps and copper service lines with meter box, short side in PPCA	EA	11		
68	02512	3/4-inch thru 1-inch diameter water taps and copper service lines with meter box, long side in PPCA	EA	5		
69	02513	8-inch diameter wet connection	EA	1		
70	02513	8-inch diameter wet connection in PPCA	EA	2		
71	02513	12-inch diameter wet connection	EA	1		
72	02513	12-inch wet connection in PPCA	EA	1		
73	02516	Cut, plug and abandon existing 3-inch diameter water line in PPCA	EA	1		
74	02516	Cut, plug and abandon existing 8-inch diameter water line	EA	1		
75	02516	Cut, plug and abandon existing 8-inch diameter water line in PPCA	EA	1		
76	02516	Cut, plug and abandon existing 12-inch water line	EA	1		
77	02516	Cut, Plug and abandon 12-inch diameter water line in PPCA	EA	1		
78	02520	Fire hydrant assembly, all depths, including 6-inch diameter gate valve and box	EA	1		
79	02520	Fire hydrant assembly, all depths, including 6-inch diameter gate valve and box in PPCA	EA	5		
80	02520	6-inch diameter fire hydrant branch by open-cut	LF	22		
81	02520	6-inch diameter fire hydrant branch by open-cut in PPCA	LF	220		
82	02520	Remove and salvage existing fire hydrant	EA	1		
83	02520	Remove and salvage existing fire hydrant in PPCA	EA	4		

Bidder's Initials [ ]

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
84	02751	Concrete pavement (all thickness, including reinforcement, Asphaltic surfacing, base & subgrade)	SY	325		
TOTAL BASE UNIT PRICES: FOR WLR ALONG BELLAIRE BLVD.						**$_____**

Bidder's Initials [ ]

C. EXTRA UNIT PRICE TABLE: For WLR in Shephered Forest and WLR along Bellaire Blvd.

Item No.	Spec Ref.	Extra Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
85	02318	Excavation around obstructions	CY	300	$30.00 (2)	$9,000.00 (2)
86	02318	Extra hand excavation	CY	300	$40.00 (2)	$12,000.00 (2)
87	02318	Extra machine excavation	CY	300	$30.00 (2)	$9,000.00 (2)
88	02318	Extra placement of backfill material	CY	600	$30.00 (2)	$18,000.00 (2)
TOTAL EXTRA UNIT PRICES						$48,000.00 (2)

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Bidder's Initials [ ]

D. CASH ALLOWANCE TABLE: For WLR in Shephered Forest and WLR along Bellaire Blvd.

Item No.	Spec Ref.	Cash Allowance Short Title	Cash Allowance in figures (1)
89	01110	Street Cut Permit Fee	$18,000.00
90	01110	Street Cut Permit Fee – For WLR in Bellaire Blvd.	$1,400.00
91	01110	Floodplain Development Permit Fee	$ 3,000.00
92	01110	Burlington Northern Sante Fe (BNSF) Railroad Fee	$ 3,000.00
TOTAL CASH ALLOWANCES			$ 25,400.00

REST OF PAGE INTENTIONALLY LEFT BLANK

Bidder's Initials [ ]

E. ALTERNATES TABLE:

Item No.	Spec Ref.	Alternate Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total Price for Alternate in figures
N/A		N/A				$0.00
TOTAL ALTERNATES						$0.00

REST OF PAGE INTENTIONALLY LEFT BLANK

Bidder's Initials [ ]

F. TOTAL BID PRICE: $_____
(Add Totals for Items A., B., B1., C., D., and E. above)

2.0 SIGNATURES: By signing this Document, I agree that I have received and reviewed all Addenda and considered all costs associated with the Addenda in calculating the Total Bid Price.

Bidder: _____
(Print or type full name of your proprietorship, partnership, corporation, or joint venture.*)

**By: _____
Signature Date

Name: _____
(Print or type name) Title

Address: _____
(Mailing)

_____
(Street, if different)

Telephone and Fax Number: _____
(Print or type numbers)

* If Bid is a joint venture, add additional Bid Form signature sheets for each member of the joint venture.

** Bidder certifies that the only person or parties interested in this offer as principals are those named above. Bidder has not directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding.

Note: This document constitutes a government record, as defined by § 37.01 of the Texas Penal Code. Submission of a false government record is punishable as provided in § 37.10 of the Texas Penal Code.

Footnotes for Tables B through E:
(1) Fixed Unit Price determined prior to Bid. Cannot be adjusted by the Bidder.
(2) Minimum Bid Price determined prior to Bid. Can be increased by the Bidder by crossing out the Minimum and noting revised price on the line above.
(3) Maximum Bid Price determined prior to Bid. Can be decreased but not increased by Bidder by crossing out the Maximum and noting revised price on the line above. A Bid that increases the Maximum Bid Price may be found non-conforming and non-responsive.
(4) Fixed Range Bid Price determined prior to Bid. Unit Price can be adjusted by Bidder to any amount within the range defined by crossing out prices noted and noting revised price on the line above.

END OF DOCUMENT

Bidder's Initials [ ]

Document 00520

AGREEMENT

Project: Water Line Replacement in Shepherd Forest II Area

Project Location: Area 1. The project is generally bound by W. 34th on the north, IH 610 (North Loop West) on the south, Yale on the east, Alba and Ansbury on the west.(Key Map No. 452 P, Q & R)

Area 2. Water Line Replacement along Bellaire Blvd.

Project Nos: Area 1. WBS No. S-000035-0192-4

Area 2. WBS No. S-000700-0068-4

The City: THE CITY OF HOUSTON, 900 Bagby Street, Houston, Texas 77002 (the "City")

and

Contractor: _____

(Address for Written Notice) _____

_____

Fax Number: _____ **Phone Number:** _____

City Engineer, with respect to Sections 4.3 thru 4.5 of the General Conditions, is:

J. Timothy Lincoln, P.E. (or his successor)

P. O. Box 1562, Houston, Texas 77251-1562 (Address for Written Notice)

City Engineer, with respect to all other terms of the General Conditions, is:

Joseph T. Myers, P.E. (or his successor)

Fax Number: (832) 395-2410

THE CITY AND CONTRACTOR AGREE AS FOLLOWS:

ARTICLE 1
THE WORK OF THE CONTRACT

1.1 Contractor shall perform the Work in accordance with the Contract.

ARTICLE 2
CONTRACT TIME

2.1 Contractor shall achieve Date of Substantial Completion within **410** days after Date of Commencement of the Work, subject to adjustments of Contract Time as provided in the Contract.

2.2 The Parties recognize that time is of the essence for this Agreement and that the City will suffer financial loss if the Work is not completed within the Contract Time. Parties also recognize delays, expense,

and difficulties involved in proving in a legal or arbitration proceeding actual loss suffered by the City if the Work is not completed on time. Accordingly, instead of requiring any such proof, the Parties agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay the City the amount stipulated in Document 00800 – Supplementary Conditions, for each day beyond Contract Time.

ARTICLE 3
CONTRACT PRICE

3.1 Subject to terms of the Contract, the City will pay Contractor in current funds for Contractor's performance of the Contract, Contract Price of **$**_____ which includes Alternates, if any, accepted below.

3.2 The City accepts Alternates as follows:

****

Delete or add lines below to indicate all Alternates that were included in Request for competative sealed proposals. Remove brackets and instructions when done. Change color of remaining text to black.

****

Alternate No. 1 ___[*Accepted or Not Accepted*]_____
Alternate No. 2 ___[*Accepted or Not Accepted*]_____
Alternate No. 3 ___[*Accepted or Not Accepted*]_____
Alternate No. 4 ___[*Accepted or Not Accepted*]_____

ARTICLE 4
PAYMENTS

4.1 The City will make progress payments to Contractor as provided below and in Conditions of the Contract.

4.2 The Period covered by each progress payment is one calendar month ending on the [___] 15th or [___] last day of the month.

4.3 The City will issue Certificates for Payment and will make progress payments on the basis of such Certificates as provided in Conditions of the Contract.

4.4 Final payment, constituting entire unpaid balance of Contract Price, will be made by the City to Contractor as provided in Conditions of the Contract.

ARTICLE 5
CONTRACTOR REPRESENTATIONS

5.1 Contractor represents:

5.1.1 Contractor has examined and carefully studied Contract documents and other related data identified in Request For or Competitive Sealed Proposals or Competitive Sealed Bids.

5.1.2 Contractor has visited the site and become familiar with and is satisfied as to general, local, and site conditions that may affect cost, progress, and performance of the Work.

5.1.3 Contractor is familiar with and is satisfied as to all federal, state, and local laws and regulations that may affect cost, progress, and performance of the Work.

5.1.4 Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in Contract documents and (2) reports and drawings of a hazardous environmental condition, if any, at the site which has been identified in Contract documents.

5.1.5 Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including applying specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract to be employed by Contractor, and safety precautions and programs incident thereto

5.1.6 Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for performance of the Work at Contract Price, within Contract Time, and in accordance with the Contract.

5.1.7 Contractor is aware of general nature of work to be performed by the City and others at the site that relates to the Work as indicated in Contract documents.

5.1.8 Contractor has correlated information known to Contractor, information and observations obtained from visits to the site, reports and drawings identified in the Contract, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract.

5.1.9 Contractor has given City Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract, and written resolution thereof by City Engineer is acceptable to Contractor.

5.1.10 Contract documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 6
MISCELLANEOUS PROVISIONS

6.1 The Contract may be terminated by either Party as provided in Conditions of the Contract.

6.2 The Work may be suspended by the City as provided in Conditions of the Contract.

ARTICLE 7
ENUMERATION OF CONTRACT DOCUMENTS

7.1 The following documents are incorporated into this Agreement:

7.1.1 Document 00700 - General Conditions.

7.1.2 Document 00800 - Supplementary Conditions.

7.1.3 Division 01 - General Requirements.

7.1.4 Divisions 02 through 16 of Specifications.

7.1.5 Drawings listed in Document 00015 - List of Drawings. Drawing No. _____ and bound separately.

7.1.6 Addenda [and Riders] which apply to the Contract, are as follows:

Addendum No. 1, dated None

Addendum No. 2, dated None

Addendum No. 3, dated None

Rider No. [___], dated None

7.1.7 Other documents:

	Document No.	Title
[X]	00410B	Bid Form – Part B
[X]	00470	Standard Pre-Bid Participation Plan Document
[ ]	00471	Pre-Bid Good Faith Efforts Report
[ ]	00472	Goal Deviation Request
[ ]	00500	Form of Business
[X]	00501	Resolution of Contractor (if a corporation)
[ ]	00570	Amended S/MWBE Participation Plan
[ ]	00571	Contractor's Good Faith Efforts Report
[ ]	00572	Plan Deviation Request
[ ]	00608	Contractor's Certification Regarding Non-Segregated Facilities for Project Funded by AIP Grant
[X]	00610	Performance Bond
[X]	00611	Statutory Payment Bond
[X]	00612	One-year Maintenance Bond
[X]	00613	One-year Surface Correction Bond
[X]	00620	Affidavit of Insurance (with the Certificate of Insurance attached)
[ ]	00623	Contractor's Act of Assurance (SRF Form ED-103)
[X]	00624	Affidavit of Compliance with Affirmative Action Program
[ ]	00628	Affidavit of Compliance with Disadvantaged Business Enterprise (DBE) Program for Project Funded By AIP Grant
[X]	00630	(POP-2) Certification of Compliance with Pay or Play Program
[X]	00631	(POP-3) City of Houston Pay or Play Program – List of Subcontractors
[X]	00800	Supplementary Conditions for Project CIP or AIP Funded
[ ]	00801	Supplementary Conditions for Project AIP Funded
[ ]	00802	SRF Supplementary Conditions
[X]	00805	Equal Employment Opportunity Program Requirements
[ ]	00806	EPA DBE and Wage Rate Requirements (SRF only)
[ ]	00807	Bidder/Contractor Requirements for DBE Program
[X]	00808	Minority and Women-owned Business Enterprise (MWBE) & Persons with Disabilities Business Enterprise (PDBE) Program

[ ]	00810	Federal Wage Rate - Highway
[ ]	00811	Federal Wage Rate - Building
[ ]	00812	Federal Wage Rate - Heavy
[X]	00820	Wage Rate for Engineering Construction
[ ]	00821	Wage Rate for Building Construction
[ ]	00830	Trench Safety Geotechnical Information
[X]	00840	Pay or Play Program
[ ]	00912	Rider

ARTICLE 8
SIGNATURES

8.1 This Agreement is executed in two original copies and is effective as of the date of countersignature by City Controller.

CONTRACTOR:

By: _____

Name: _____

Title: _____

Date: _____

Tax Identification Number: _____

(If Joint Venture)

By: _____

Name: _____

Title: _____

Date: _____

Tax Identification Number: _____

CITY OF HOUSTON, TEXAS

APPROVED:

By: _____
Director,
Department of Public Works and Engineering

SIGNED:

By: _____
Mayor

COUNTERSIGNED:

By: _____
City Controller

Date Countersigned:

_____

ATTEST/SEAL:

By: _____
City Secretary

Section 01110

SUMMARY OF WORK

PART 1 G E N E RA L

1.01 SECTION INCLUDES

A. Summary of Work includes work covered by contract documents, cash allowances, alternates, city-furnished products, work sequence, contractor use of premises, street cut ordinance, warranty and additional conditions for substantial completion.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Definitions

Small Diameter Water Lines: Water lines 20 inches in diameter and smaller. Unless otherwise noted in the Contract Documents, requirements pertaining to large diameter water lines do not apply to pipe, valves and appurtenances 20-inch diameter and smaller.

Large Diameter Water Lines: Water lines 24 inches in diameter and larger. References to large diameter water lines shall apply to pipe, valves and appurtenances 24-inch and larger.

B. Project Scope

Shephered Forest:

Work of the contract is for the construction of approximately 32,583 linear feet of water lines (38 linear feet of 4-inch, 279 linear feet of 6-inch, 26,912 linear feet of 8-inch and 5,354 linear feet of 12-inch) and construction of service lines, fire hydrants, valves, fittings, connections, and appurtenances as shown on the construction drawings, project manual or otherwise instructed by the City Engineer. The work also includes site and pavement restoration, tree protection, storm water pollution prevention and traffic control in relation to the construction of the water line.

Bellaire Boulevard:

Work of the contract also includes the construction of approximately 6,250 linear feet of water lines (1,612 linear feet of 8-inch, 158 linear feet of 12-inch and 4,487 linear feet of 16-inch) and construction of service lines, fire hydrants, valves, fittings, connections, and appurtenances as shown on the construction drawings, project manual along Bellaire Boulevard. The project drawings are under a different WBS Number with different City of Houston drawing number. Project name is Water Line Replacement along Bellaire Boulevard (WBS Number S-000700-0068-4) and the COH drawing number allotted is 54210 and includes 59 drawings. Base Unit Price Table in

Document 00410 is divided in two parts B: For WLR in Shephered Forest II Area and B1. For WLR in Bellaire Blvd. to keep the base unit prices separate from each other. Geotechnical and Environmental reports were not specifically prepared for this project but another City of Houston project had prepared Geotechnical and Environmental reports for that specific project covering Bellaire Boulevard. We have attached these reports in this project.

A. Geotechnical Study-Bellaire Boulevard Project by Tolunay-Wong Engineers, Inc. Dated September 2006.
B. Environmental Site Assessment Report Phase-I for College Avenue Project prepared by Tolunay-Wong Engineers, Inc. Dated September 2006.
C. Environmental Site Assessment Report Phase-II for Bellaire Boulevard Project prepared by Tolunay-Wong Engineers, Inc. Dated July 2007.

C. Construction

The trenchless construction method will be used for water line construction unless otherwise shown on the construction drawings, project manual or otherwise instructed by the City Engineer or otherwise requested by contractor and approved by the City Engineer. Whenever possible, the contractor shall make an effort to locate pits away from existing concrete or asphalt pavement, sidewalks, driveways, fences, culverts, inlets, manholes, power poles, light poles, trees, lawns, landscapes, existing structures and other improvements. No pits are allowed within driveways, canopy of 6-inch or larger trees or landscapes unless otherwise instructed by the City Engineer. No separate payment will be made for any non trenchless methods of installation unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

Conduct all construction operation under this contract in conformance with the erosion control practices described in Section 01410 - TPDES Requirements and Section 01570 - Storm Water Pollution Prevention Control and the Storm Water Pollution Prevention Plans included in the construction drawings. Work identified in this project falls under Small Construction Activity with area disturbed to be one or more acres but less than five acres. TPDES requirements applicable to Small Construction Activity will apply.

Any pavement (including wheel chair ramps, pavement curbs, sidewalks, driveways, bikeways, etc.), fences, gates, lawns, irrigation utilities, landscapes, ditches, culverts, inlets, manholes, signs or mail boxes and other improvements that have been disturbed due to utility construction shall be replaced with same quality material or better, according to the City Standard Specifications and Details located at

http://edocs.publicworks.houstontx.gov/engineering-and-construction/specifications.html

http://edocs.publicworks.houstontx.gov/engineering-and-construction/drawings.html

Include cost in Section 01740 - Site Restoration and bid accordingly.

Complete and follow the permit requirements of the City of Houston Floodplain Management Office (FMO) even though the project area lies outside of the flood plain limits. This is because permit is now required from FMO whenever permit is required from HCFCD. No separate payment will be made for any additional effort necessary to complete work unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

No work is anticipated within the limits of the Harris County Flood Control District (HCFCD) ditch right-of way for installation of water lines crossing HCFCD ditch (E107-00-00) along Stonecrest Drive from approx. STA 3+40 to STA 4+60; HCFCD ditch (E107-02-01) along Alba from approx. STA 22+70 to STA 22+90; HCFCD ditch (E106-00-00) along W. 30th from approx. STA 35+00 to STA 35+50 and along W 31st from approx. STA 40+00 to STA 40+50 as shown in construction drawings, sheets Nos. 65, 77, 26 and 44 respectively. Follow construction guidelines and directions as specified in the HCFCD Policy, Criteria and Procedure Manual if for any reason works need to be performed within the limits of the HCFCD ditch right-of way. If a conflict exists between the bid documents and the HCFCD guidelines and specifications, the more stringent requirement will govern. Obtained permit for crossing HCFCD ditch. Obtain bond if work needs to be performed within the limits of the HCFCD ditch right-of way. Contact Harris County Permit Office for permit and bond forms. No separate payment will be made for any additional effort necessary to complete work unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

Limits of Silty/Sandy Soil conditions are shown in construction drawings for construction of water lines on Sheet Nos. 26, 44 and 77 (Shephered Forest). No separate payment will be made for any additional effort necessary to complete work unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

Follow construction guidelines and directions provided by Enterprise Products Partners L.P./Enterprise Products Operating LLC in their attached letter dated February 3, 2014, at the end of Section 01110 – Summary of Work for construction of water lines along Alba Road on sheet No. 77. If a conflict exists between the bid documents and the Enterprise Products Operating LLC guidelines and specifications, the more stringent requirement will govern. No separate payment will be made for any additional effort necessary to complete work unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

Follow construction guidelines and directions provided by Burlington Northern Santa Fe Railroad Company (BNSF) in their attached letter dated April 25, 2014, at the end of Section 01110 - Summary of Work for construction of water lines along Alba Road on sheet No. 77 (Shephered Forest). If a conflict exists between the bid documents and the BNSF guidelines and specifications, the more stringent requirement will govern. No separate payment will be made for any additional effort necessary to complete work unless included as a bid item in Document 00410 – Bid Form. Include

cost in appropriate utility sections and bid accordingly.

Complete and follow the permit requirements of the TxDOT for construction of water lines along W 30th Street on sheet No. 29. Follow construction guidelines and directions provided by Texas Department of transportation (TXDOT) in their attached Utility Plan Approval dated July 29, 2015 for the construction work within SPUR 261. Submit plans for Traffic Control Plan approval prior to beginning construction work within SPUR 261. Contractors are required to bid accordingly.

D. Coordination

Construction of water line on the streets adjacent to the school should be performed during weekends and non-school hours, unless otherwise instructed by the City Engineer. Construction of water line on the streets adjacent to churches should be performed during non-church hours, unless otherwise instructed by the City Engineer. Unless otherwise approved by the City Engineer, use Uniformed Peace Officer for work along major thoroughfares, schools, churches, hospitals and work at signalized intersections.

Coordinate with Lutheran North High School located at 1130 W 34th St. by contacting at 713-880-3131.

Coordinate with the City of Houston Floodplain Management Office at least forty eight (48) hours prior to installation of the water lines noted in paragraph 1.02 C – Construction of this Section. Permit will be required even though the project area lies outside of the flood plain limits. This is because permit is now required from FMO whenever permit is required from HCFCD.

Coordinate with CenterPoint Energy by contacting Louis Cardenas and issue a "Texas One Call" to telephone No. 811 at least forty eight (48) hours prior to installation of the water lines noted in paragraph 1.02 C – Construction of this Section.

For AT&T Texas/SWBT Facilities, the Contractor shall call 1-800-344-8377 a minimum of 48 hours prior to construction to have underground lines field located. The Contractor shall support the cable/conduit as necessary during the construction phase. Coordinate with AT&T Texas Damage Prevention Manager Mr. Roosevelt Lee Jr. at (713) 567 4552 or e-mail him at rl7259@att.com if there are questions about boring or excavating near the AT&T Texas/SWBT Facilities.

Coordinate with Enterprise Pipeline LLC by contacting David Williams at (281) 239-3331 and issue a "Texas One Call" to telephone No. 811 at least forty eight (48) hours prior to installation of the water lines noted in paragraph 1.02 C – Construction of this Section.

Coordinate BNSF's Roadmaster at (713) 847-3580 or cell phone (928) 897-3193, at least ten (10) days, or more, prior to installation of water lines noted in paragraph 1.02

C – Construction of this Section for flagging protection and other safety measures as deemed necessary by BNSF's representative.

Coordinate with City of Houston Project Manager for Garden Oaks and Shepherd Forest drainage and paving sub project (WBS No. M-000285-0001-3) and with City of Houston Project Manager for Braesmont/ S. Rice/ Millbury/ Meyerland/ Garden Oaks/Shepherd Forest (WBS No. M-000100-0001-3)

Coordinate with Texas Department of Transportation at (281) 319 6450 during construction on North Shepherd Drive. Obtain TXDOT permit for the Water Line construction within the Shepherd Drive. Notify TxDOT seventy-two (72) hours prior to starting any construction of the line and also when construction is completed in order to have a TXDOT representative present.

The project limits for Bellaire Boulevard involves two other cities. The contractor needs to co-ordinate the construction activities with both the cities. The contractor will need to contact and inform both the cities 72 hours prior to start of any work on Bellaire Boulevard. The limits of City of West University Place and City of Southside Place are called out on the project drawings. Contact information is listed below:

City of West University Place
Mr. Patrick J. Walters
Operations Superintendent
3826 Amherst
City of West University Place, Texas 77005
Phone number: 713-662-5839

City of Southside Place
Mr. David N. Moss
City Manager
6309 Edloe Avenue
Houston, Texas 77005
Phone Number: 713-668-2341

E. Tree Protection

Contractor is responsible for obtaining a tree removal permit, unless provided by the Project Manager, prior to any tree removal. The permit will only be issued for the trees listed in the drawings. The permit can be obtained by contacting City of Houston, Department of Parks and Recreation representative Mr. Victor Cordova at (832) 395-8454. Notify Mr. Victor Cordova at least two (2) weeks in advance of clearing and cutting any tree.

Contractor shall adhere to the requirements of Section 01562 - Tree and Plant Protection, Section 02915 - Tree Planting, Section 01740 - Site Restoration and the tree protection plan provided in the set of construction drawings.

F. Geotechnical Investigation/ESA for Soil Conditions

The Compact Disc (CD) of the Geotechnical Investigation and Phase I ESA Reports listed in Document 00320 - Geotechnical Information and Document 00340 - Environmental Information are provided with the bid documents. The bid documents are available at

http://bidsets.publicworks.houstontx.gov/

G. Field Office

Refer to Section 01502 – Mobilization and Section 01520 – Temporary Field Office

Field Office is required for this project.

H. Substitute Service Program

Not Applicable.

I. General Notes

1. The flow lines and locations of all underground utilities must be located by whatever means may be required (metal detection equipment, probes, excavation, survey, coordination with utility companies) by the contractor prior to construction. All field verification work and utility adjustments shall be completed prior to excavation for proposed utilities. No separate payment will be made for this work, include cost in appropriate utility sections and bid accordingly.

   The notes "CAUTION EX. GAS FACILITIES IN AREA " CAUTION EX. CABLE FACILITIES IN AREA" are included as a precaution to the contractor, where the proposed water line crosses an existing Center Point Energy (CPE) Gas line smaller than 4-inch or when crossing an existing CPE/other underground or above ground facility. Contractor is required to exercise caution during construction of water line in the vicinity of these facilities.

2. Services are to be transferred between existing and proposed water lines with minimum disruption of service. Existing water lines must be maintained in service until service transfer is completed.

3. Call the Traffic Management and Maintenance Division of the City of Houston Public Works and Engineering Department when work is scheduled near signal conduits within the City of Houston (832) 395-3000. Call at least five working days in advance. The Contractor shall be responsible for any damages to existing traffic signal cables as a result of construction activities for the project.

4. Service line installation could be hindered by the cement stabilized sand backfill. No separate payment will be made for crossing cement stabilized backfill if encountered during service line installation, include cost in appropriate utility sections and bid accordingly.

5. The contractor to provide cut sheets (ground elevations and proposed line inverts with amount of cut, location of bends, fire hydrants, valves and other fittings at every 100 feet in tabular format) on each street to the City for approval prior to construction. No separate payment will be made for this work, include cost in appropriate utility sections and bid accordingly.

6. Contractor must refer to the City Standard Details located at

   http://edocs.publicworks.houstontx.gov/engineering-and-construction/drawings/standard-details.html

   for any details not included in the construction drawings.

7. Contractor shall coordinate ahead of time with business owners and residents for installation of water lines in encroached areas of the public right-of-way. No separate payment will be made for this work, include cost in appropriate utility sections and bid accordingly.

1.03 CASH ALLOWANCES

A. Include the following specific Cash Allowances in Contract Price under provision of Paragraph 3.11, Document 00700 - General Conditions:

1. Street Cut Permit Fee

   Contractor shall obtain street cut permit as per the requirement of the Paragraph 1.08 of this Section.

2. Floodplain Development Permit Fee

   Contractor shall obtain Floodplain Development Permit as per the requirement of the City of Houston Floodplain Management Office.

3. Burlington Northern Santa Fe (BNSF) Railroad Fee

   Contractor shall pay to BNSF for flagger services and other safety measures across BNSF Railroad crossing at Alba Road.

1.04 ALTERNATES

A. From the following list of Alternates, amount included in Contract Price for only those Alternates accepted by the City and listed in Paragraph 3.2 of the fully executed Document 00520 – Agreement.

Not Applicable.

1.05 CITY FURNISHED PRODUCTS

A. Items Furnished by City for Installation and Final Connection by Contractor: None

B. Contractor's Responsibilities:

1. Contractor will supply all new construction materials as outlined in Document 00410 – Bid Form.

2. Arrange and pay for product delivery at site.

3. Receive and unload products at site, jointly with City, inspect for completeness and damage.

4. Handle, store, install and finish products.

5. Repair or replace damaged items.

6. A service connection tap shall be provided directly from Distribution Line to an approved metering device servicing domestic water only unless specifically approved otherwise through permitting at Taps and Meters. Call Substitute Services Coordinator at 832-395-2057 before installing service leads for vacant lots and abandoned structures with or without meters.

7. Unless an approved permit exists for an independent service connection to the Lawn Sprinkler Meter (LSM), LSM will be installed through a branch off the domestic water meter service line that is usually created with a tee and a 90-degree bend.

8. A separate City Water Account must be established for each metered services either directly tapped off a Distribution Line or branched off a metered service line.

9. Connection of two or more domestic water meters to single service line will not be allowed except for Lawn Sprinkler Meters (LSM). In situations, where two or more domestic water meters that are located in single meter box and are connected to single service line, follow steps a, b and if necessary step c.

a. Replace the existing single service line with two or more new service lines, one service line for each domestic water meter, and tapped to the new water main as shown in the City Standard Details located at

http://edocs.publicworks.houstontx.gov/engineering-and-construction/drawings/standard-details.html

b. Install each water meter in a new individual meter box.

c. Relocate and reinstall water meters, with prior approval from Project Manager, as per the requirements of Section 02526 – Water Meters.

No separate payment will be made for the work listed above unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

1.06 WORK SEQUENCE

A. Construct Work according to the work sequence phases feasible to this project. Coordinate construction schedule and operations with Project Manager. Refer to Section 01326 – Construction Schedule (Bar Chart) for specific details.

B. Contractor shall submit sequence of construction work for review and approval by Project Manager before commencing construction.

C. Coordination of the Work: Refer to Section 01312 - Coordination and Meetings.

1.07 CONTRACTOR USE OF PREMISES

A. Comply with procedures for access to the site and Contractor's use of right-of-way as specified in Section 01145 - Use of Premises.

B. Maintain local driveway access to residential and commercial properties adjacent to work areas. Provide temporary driveway access to driveways in accordance with Section 01555 – Traffic Control and Regulation and Section 01145 – Use of Premises. Coordinate with business owners and residents. No separate payment will be made for this work unless included as a bid item in Document 00410 – Bid Form. Include cost in appropriate utility sections and bid accordingly.

C. Construction Operations are limited to City's right-of-way or easement provided by the City and areas shown or described in the Contract documents. Contractor must accommodate construction within these areas and bid accordingly.

D. The City's Utility Maintenance Division is not bound to assist the contractor in locating

existing water mains during construction.

Effort shall be given to locate proposed water valve and fire hydrants from flow lines of roadside ditches.

The existing utility lines with less than 4-inch in diameter are not shown on the profile of design drawings but they do exist as per plan and contractor shall pre-locate as required.

E. Utility Outages and Shutdown: Provide notification to the City and private utility companies (when applicable) a minimum of 48 hours, excluding weekends and holidays, in advance of required utility shutdown. Coordinate all work with the City as required.

Contractor shall contact utility coordinating committee at (713-223-4567 or 1-800-669-8344) a minimum of 48 hours prior to construction to field locate utilities.

1.08 STREET CUT ORDINANCE

A. Excavations on or under pavement in the City's right-of-way must have a permit. Comply with City of Houston, Texas Ordinance No. 2000-1115, an ordinance amending Chapter 40 of the Code of Ordinances, Houston, Texas, relating to excavating in the Public right-of-way and comply with amendments provided by Texas Ordinance No. 2006-0595 including the following fee schedule:

Schedule of Permit Application Fees*

Initial Application Fee:	
Tunneling, Jacking and Boring only	$137.60
All other Methods of Excavation	$192.65
Administrative Fee	$ 27.51
Permit Extension Application Fee:	
Other Than Steel Plate Temporary Surface	$ 27.51
Steel Plate Temporary Surface	$ 55.04
Data Entry Fee for Non-Electronic Submission (per application):	$ 55.04

* All fees/charges are non-refundable

Contractor shall comply with street cut requirements according to the City Infrastructure Design Manual located at

http://edocs.publicworks.houstontx.gov/engineering-and-construction/design-manuals.html

B. The bid items, to compensate the cost incurred due to Street Cut Ordinance, for pavement repair and replacement identified on the drawings are included in the Document 00410 – Bid Form.

C. Contractor shall obtain all required permits and signs prior to performing any methods of construction involving street excavation in the existing pavement.

D. The following table contains a list of streets that are identified as candidates to be cut and excavated for the construction of work listed in Section 1.02 - Project Scope. **These streets are either identified on the City's list of pavement as less than 5 years old or during field visit appeared to be less than 5 years old.** Contractor shall field verify current conditions and bid accordingly.

Item	Street Name	Sheet No.	Approximate Station Number	Quantity (SY)	Asphalt or Concrete
None	None	None	None	None	None
SUBTOTAL (ASPHALT)				None	
SUBTOTAL (CONCRETE)				None	
TOTAL				None	

E. The following table contains a list of streets that are identified as candidates to be cut and excavated for the construction of work listed in Section 1.02 - Project Scope. **These streets are either not identified on the City's list of pavement as less than 5 years old or during field visit appeared to be more than 5 years old.** Contractor shall field verify current conditions and bid accordingly.

Item	Street Name	Sheet No.	Approximate Station Number	Quantity (SY)	Asphalt or Concrete
1	W. 30th	19	1+20	15	Asphalt
2	W. 30th	26	33+50	15	Asphalt
3	W. 30th	26	33+70	15	Asphalt
4	W. 30th	26	34+00	15	Asphalt
5	W. 30th	28	46+20	20	Concrete
6	W. 30th	28	46+40	20	Concrete
7	W. 30th	29	47+30	20	Concrete
8	W. 30th	30	54+30	15	Asphalt
9	W. 30th	30	54+80	15	Asphalt
10	W. 30th	33	68+50	15	Asphalt
11	W. 30th	36	81+50	15	Asphalt
12	W. 31st	37	1+60	15	Asphalt
13	W. 31st	37	2+20	15	Asphalt
14	W. 32nd	49	16+70	15	Asphalt
15	W. 32nd	52	31+10	20	Concrete
16	W. 32nd	52	31+30	20	Concrete

Item	Street Name	Sheet No.	Approximate Station Number	Quantity (SY)	Asphalt or Concrete
17	W. 33rd	53	1+80	15	Asphalt
18	W. 33rd	56	16+50	20	Concrete
19	W. 34th	64	37+50	20	Concrete
20	Alba	75	11+80	15	Asphalt
21	Alba	76	15+00L	20	Concrete
22	Alba	76	15+00R	20	Concrete
23	Alba	76	16+00	15	Asphalt
24	Alba	76	17+10	15	Asphalt
25	Alba	76	17+80	15	Asphalt
26	Alba	76	19+20	15	Asphalt
27	Alba	76	19+30	15	Asphalt
28	Alba	77	21+70	15	Asphalt
29	Alba	77	23+00	15	Asphalt
30	Alba	77	23+20	15	Asphalt
31	Attridge	80	2+50	15	Asphalt
32	Attridge	80	2+70	15	Asphalt
33	Attridge	81	4+70	15	Asphalt
34	Attridge	81	7+10	15	Asphalt
35	Attridge	81	7+30	15	Asphalt
36	Attridge	81	8+20L	15	Asphalt
37	Attridge	81	8+20R	15	Asphalt
38	Randall	82	2+20	15	Asphalt
39	Randall	84	13+50	15	Asphalt
40	Randall	84	14+30	20	Concrete
41	Randall	83	6+80	15	Asphalt
42	Ashland	89	0+80	15	Asphalt
43	Ashland	89	1+10	15	Asphalt
44	Ashland	90	5+30	15	Asphalt
45	Ashland	90	5+50	15	Asphalt
46	Ashland	90	9+20	15	Asphalt
47	Ashland	90	9+60	15	Asphalt
48	Ashland	92	17+20	15	Asphalt
SUBTOTAL (ASPHALT)				570	
SUBTOTAL (CONCRETE)				200	
TOTAL- Shephered Forest				770	

The entire segment of Bellaire Boulevard is Concrete pavement and more than 5 years old.

1.09 WARRANTY

A. Comply with warranty requirements in accordance with Document 00700 - General Conditions.

1.10 ADDITIONAL CONDITIONS FOR SUBSTANTIAL COMPLETION

A. In addition to requirements outlined in Document 00700 – General Conditions, for Contractor to be substantially complete with the Work and call for inspection by Project Manager to confirm, the following conditions must be met or completed.

1. All pay items complete report.

2. Contractor shall contact Construction Project Manager to complete Texas Department of Licensing and Regulation Post Construction Inspection of pedestrian elements for Texas Accessibility Standards.

3. All safety related work including pavement stripping, signing and signalization.

B. No additional condition described in Paragraph 1.10 may be included in Contractor's punch list.

PART 2. P R O D U C T S - Not Used

PART 3 E X E C U T I O N - Not Used

END OF SECTION

Section 02105

CHEMICAL SAMPLING AND ANALYSIS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparatory work related to site remediation and excavation in a Potentially Petroleum Contaminated Area (PPCA).

B. Sampling and analysis of site material.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices

1. Preparatory work is paid on a lump sum basis. Item includes hiring environmental consultants, preparing Environmental Health and Safety Plan, preparing Environmental Work Plan, training personnel, and obtaining permits and additional insurance.

2. Underground Utility Construction in PPCA.

a. Underground utility construction and appurtenances in areas identified within PPCA limits is on a linear foot basis, each basis, or lump sum basis, as shown in Document 00405 - Schedule of Unit Price Work.

b. Payment includes compensation for labor, equipment, and supervision for mobilization, environmental monitoring and field screening, handling, sampling, and testing of contaminated soil and ground water. Contaminated soil may be Category I or II. Contaminated groundwater will be that encountered during excavation for underground utilities and flowing at a rate not greater than 20 gallons per minute. Included in this pay item is incremental cost for upgraded piping, gaskets, and appurtenant materials.

c. Limits of measurement under this section are noted on Drawings as "Begin PPCA Excavation" and "End PPCA Excavation", and other areas determined by Project Manager during the course of the work.

d. Payment will be made upon receipt of field test reports from approved analytical laboratory.

3. A force account for Extra Work for PPCA Handling will be used to compensate for time and materials required for additional work associated with PPCA when directed by Project Manager to perform such work and for which there is no bid item. Authorization and compensation for this work will be in accordance with Document 00700 - General Conditions.

4. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.03 REFERENCE STANDARDS

A. ASTM D 5092 - Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers.

B. Code of Federal Regulation (CFR), Title 40, Section 261.24. - Protection of the Environment.

C. CFR, Title 29, Section 1910.120. - Occupational Safety and Health Administration, Department of Labor.

D. CFR, Title 29, Section 1926. - Occupational Safety and Health Administration, Department of Labor.

E. CFR, Title 40, Section 261, Appendix II. - Protection of the Environment.

F. Texas Administrative Code (TAC), Title 30, Chapter 335. - Industrial Solid Waste & Municipal Hazardous Waste.

G. TAC, Title 30, Chapter 334. - Underground and Aboveground Storage Tanks.

H. TAC, Title 30, Chapter 106.533. - Exemptions from Permitting, Subchapter X. Waste Processes and Remediation.

I. U.S. Environmental Protection Agency (EPA), (SW-846) Test Methods for Evaluating Solid Waste, Office of Solid Waste and Emergency Response, Washington, D.C. (P1388-239223, November 1986).

J. Texas Commission on Environmental Quality (TCEQ) Interoffice Memo, dated 4/12/94, by Chris Chandler, RPR Section, PST Division, regarding "Revised Procedures for Classifying and Assigning Waste Codes for

Underground and Aboveground Petroleum Storage Tank Wastes" (text attached following this section).

1.04 DEFINITIONS

A. Petroleum: Crude oil, natural gas, natural gas liquids, liquefied natural gas, and synthetic gas usable for fuel, as well as distillates of crude oil including gasoline, kerosene, diesel oil, motor oil, waste oil, jet fuels, and fuel oil.

B. Potentially Petroleum Contaminated Area (PPCA): An area within station-to-station locations identified on Drawings where petroleum contamination has been detected in the soil or groundwater. PPCA also includes areas where contamination is suspected or encountered during utility installation outside areas identified on Drawings, and such contamination has been verified by Project Manager.

C. Category I Soil: Soil containing visual or physical evidence of contamination, as described in paragraph 3.01, and that is not Category II Soil.

D. Category II Soil: Soil that contains petroleum contamination in excess of levels identified in paragraph 3.04, and is consistent with a classification as Special Waste-PST as defined by TCEQ in their interoffice memo dated 4/12/94, or soil that contains visible free product or is impacted with non-petroleum compounds detected above Risk Reduction Standard Number 2 levels as defined in Texas Administrative Code, Title 30, Chapter 335.

E. Potentially Contaminated Groundwater: Water recovered in a groundwater control system located in PPCA or groundwater that contains visual or physical evidence of contamination, as described in paragraph 3.01, and such contamination has been verified by Project Manager.

1.05 SUBMITTALS

A. Conform to requirements of Section 01330 - Submittal Procedures.

B. Submit an Environmental Work Plan within 30 days after issuance of Notice to Proceed.

1. The Environmental Work Plan shall be prepared by a Corrective Action Project Manager licensed in Texas, who has completed 40-hours of Health and Safety Training and the required annual refresher training, and in the employment of a registered Corrective Action Specialist firm.

2. The Environmental Work Plan shall include the following items. Compile and arrange in a format that can be reviewed by TCEQ.

   a. Proposed sequence of construction through PPCA;

   b. Procedures for screening soil in PPCA, identifying Category I or II Soil;

   c. Procedures for handling material from PPCA;

   d. Proposed location of stockpile areas;

   e. Proposed reuse of Category I Soil as trench backfill below depths of 30 inches;

   f. Proposed methods for disposal or recycling of Category I or II Soil;

   g. Proposed carriers of Category I or II Soil or potentially contaminated groundwater with verification each is properly licensed;

   h. Proposed recycle/disposal sites for Category I or II Soil or potentially contaminated groundwater with verification that each is properly licensed;

   i. Copy of permit required for discharge of potentially contaminated groundwater in sanitary sewer system, if to be disposed in sanitary sewer;

   j. Name and qualifications of Corrective Action Project Manager and professional environmental consultants for health, environmental, and safety issues regarding operations within PPCA; and,

   k. Proposed analytical laboratory with verification it is accredited by A2LA or other recognized association, or it is a participant in the EPAs Performance Evaluation Program.

3. Do not commence work in PPCA until Environmental Work Plan has been reviewed and accepted by Project Manager.

C. Submit Environmental Health and Safety Plan within 30 days after issuance of Notice to Proceed.

1. The Health and Safety Plan shall be prepared by a Corrective Action Project Manager licensed in Texas, who has completed 40 hours of

health and safety training, and required annual refresher training, or a Certified Industrial Hygienist.

2. Include methods and procedures for assuring work, which will be conducted under conditions expected in the field, is safe.

D. As work proceeds, submit field screening, monitoring and analytical laboratory test results on a weekly basis for soil and on a daily basis for groundwater. Summarize test results in tables together with applicable regulatory criteria.

E. Submit copies of correspondence, reports, permits and other documents provided to, or received from, regulatory agencies.

1.06 PERSONNEL REQUIREMENTS

A. Provide trained personnel who have completed minimum health and safety programs specified by the Occupational Safety and Health Administration in 29 CFR 1910.120. Before beginning work at the site, each employee that will work in PPCA is required to have completed 40 hours health and safety training and the required annual refresher training.

PART 2 P R O D U C T S

2.01 MATERIALS

A. Do not use polyvinyl chloride or other plastic material, unless approved by Project Manager.

B. Water Line Pipe Material.

1. Furnish ductile-iron pipe or steel pipe material within station-to-station locations identified as PPCA on Drawings.

2. Provide restrained joints for ductile-iron pipe or welded joints for steel pipe.

3. Provide pipe material conforming to Section 02501 - Ductile-Iron Pipe and Fittings or Section 02502 - Steel Pipe and Fittings.

C. Sanitary Sewer Pipe Material.

1. Furnish ductile-iron pipe, centrifugally cast fiberglass pipe, or equivalent protective materials approved by Project Manager.

2. Provide restrained joints.

3. Provide pipe material conforming to Section 02501 - Ductile-Iron Pipe and Fittings or Section 02504 - Centrifugally Cast Fiberglass Pipe. Use pipe with a minimum pressure rating of 150 psi.

D. Use Viton (FKM) type gaskets, or other material as recommended by the pipe manufacturer, for water lines, sanitary and storm sewer pipe, and appurtenances requiring gaskets.

PART 3 E X E C U T I O N

3.01 POTENTIALLY PETROLEUM CONTAMINATED AREAS

A. Conduct operations in PPCA in accordance with the accepted Environmental Work Plan and the Environmental Health and Safety Plan and to minimize the spread of contamination. In other areas which are either detected or suspected to be potentially petroleum contaminated areas, immediately notify Project Manager and proceed with work in accordance with this Section, unless otherwise directed by Project Manager.

B. Immediately notify Project Manager and TCEQ's Region 12 Field Office whenever Category I or II Soil or potentially contaminated groundwater are encountered.

1. Provide location, depth, type (soil or groundwater), source (if known), and evidence of suspected contamination.

2. Determine if Category I Soil or potentially contaminated groundwater is present by visual or physical evidence of contamination. Visual or physical evidence includes:

   a. Petroleum or chemical odor.

   b. Indication of levels of contamination by air monitoring devices employed as part of the Environmental Health and Safety Plan.

   c. Soil or groundwater discoloration.

   d. Material oozing/dripping into excavation.

   e. Liquid or oily sheen floating on groundwater.

   f. Buried containers or refuse.

g. Field screening "head-space" results in excess of a 25 ppm reading on a photoionization detector (PID) or flame ionization detector (FID).

C. Install piping and gasket materials and appurtenances in conformance with appropriate section, except as modified in this Section.

D. Construct trench dams within a utility trench at each boundary of PPCA and laterals to minimize potential for contaminant transport within pipe bedding material. A trench dam shall consist of at least 24 inches of cement stabilized sand with 10 percent bentonite clay added, extending from 6 inches below bottom of trench to within 12 inches of limits of topsoil or pavement.

3.02 ENVIRONMENTAL MONITORING

A. An environmental consultant shall monitor conditions in PPCA, as specified in the Environmental Health and Safety Plan. Maintain safe working conditions in accordance with OSHA requirements (29 CFR 1926).

3.03 SCREENING PPCA SOILS

A. An environmental consultant shall perform field screening of soil removed from excavation or tunneling in PPCA.

B. Screening Procedures.

1. Place samples in a sealed plastic bag and place in a warm location for 15 minutes prior to screening.

2. Properly calibrate the PID/FID using a calibration gas. For PID use 100 ppm isobutylene and for FID use 100 ppm methane.

3. Open bag just enough to insert instrument probe and take maximum headspace reading.

4. Screen at least twice per hour while removing soils in open cut areas or shafts.

5. During tunneling, screen once for each pipe length in pipe jacked tunnels or each advance of tunnel shield in primary-lined tunnels. Screen at least once per shift when excavating.

3.04 SAMPLING AND TESTING

A. Frequency.

1. Sample soil in PPCA at a rate of not less than one composite sample for every 20 cubic yards of excavation or volume corresponding to every 50 linear feet of installed underground utility, whichever is more frequent.

2. Sample water from PPCA to be discharged to a sanitary sewer one week prior to initiation of discharge, and at a rate of one grab sample once per day during discharge to sanitary sewer.

B. Analyze soil samples for parameters listed in Table 01160-1, Soil Criteria - Petroleum Only, and in accordance with SW-846. Handle as a Category II Soil if analytical results indicate any one, or more, parameters exceed allowable Maximum Concentration listed in Table 01160-1. If benzene concentration from composite sample is greater than 5 milligrams per kilogram (mg/kg) or lead concentration is greater than 30 mg/kg, perform Toxicity Characteristic Leaching Procedure (TCLP) analysis of appropriate compound for that sample to determine if a more stringent disposal classification is warranted. If contaminants other than petroleum are suspected, immediately notify Project Manager who will determine the list of parameters to be analyzed. If such are encountered, compensation will be made under the Allowance for PPCA Handling. Use a 4-part representative composite sample for analysis of parameters, except when inconsistent with SW-846.

C. Analyze groundwater samples for discharge to sanitary sewers. Analyze samples for BTEX by EPA Method 602, 8020, or 8021; TPH by EPA Method 418.1 or Method TX 1005; and LEL in accordance with EPA Method 1010.

D. Conduct analyses by proposed analytical testing laboratory listed in Environmental Work Plan.

3.05 AIR MONITORING REQUIREMENTS

A. Ensure health and safety of workers at the construction site. Maintain air quality within the construction zone to conform to exposure limits specified in Code of Federal Regulations (CFR) Title 29, Section 1910.120 enforceable by OSHA.

B. Provide adequate shoring and sufficient escape ladders in accordance with applicable trench safety regulatory requirements.

C. In the trench, continuously operate a combustible gas indicator (CGI) with LEL/O_2 meter to monitor vapor and oxygen levels. Properly calibrate CGI and provide an alarm that sounds if greater than or equal to 20 percent Lower Explosive Limit (LEL), less than or equal to 19.5 percent oxygen, or greater than or equal to 25 percent oxygen is reached. Record monitoring data from CGI every 15 minutes to ensure safe work conditions.

D. Take appropriate measures during construction to keep LEL levels below 20 percent in the trench. If vapor concentrations exceed 20 percent of LEL stop construction work, turn off equipment, and have workers immediately vacate the PPCA in an upwind direction.

E. Take readings with PID/FID 50 feet downwind of area during excavation or work in contaminated excavation areas and until one hour after cessation of such work. Take readings within breathing zone at approximately 4 feet above ground level. Record readings, date, time, initials of person taking reading, PID/FID serial number and last calibration date of PID/FID in bound field book.

END OF SECTION

Attachment to Section 02105

PETROLEUM CONTAMINATION

Following, for informational purposes only, is the text of the 4/12/94 Interoffice Memo from Chris Chandler of the Texas Commission on Environmental Quality (TCEQ), RPR Section, PST Division, regarding Revised Procedures for Classifying and Assigning Waste Codes for Underground and Aboveground Petroleum Storage Tank Wastes:

This document is a revision of the waste classification memo dated July 18, 1991 which revised the original March 11, 1991 document. The main difference between the first two documents was the elimination of the distinction between industrial and nonindustrial petroleum substance wastes. <u>This latest version has been revised to reflect changes in the rules and in the agency itself. Significant changes are denoted by underlines</u>. Please discard the previous document.

An appropriate response to any leaking petroleum storage tank incident must always include the proper handling and disposal of all generated wastes. In the majority of cases these wastes include contaminated soils and/or wastewater. Before a disposal destination can be determined for a particular waste, the waste must be classified based on the concentrations of contaminants. The procedures for classification of petroleum contaminated wastes are detailed in the attached Guidance Document for the proper Management of Wastes Associated With Underground and Aboveground Petroleum Storage Tanks. The waste first must be analyzed by a laboratory and then, based upon the results of the analysis, a classification can be assigned to the waste with its corresponding waste code number. The waste code is a predesignated number based upon both the waste's classification and the type of contaminants.

Many disposal facilities are now requiring the generator of any petroleum substance waste to obtain a waste classification from TCEQ that assigns a waste code number to that particular waste before the facility will accept it (even though this is not a regulatory requirement for nonhazardous PST wastes). In order to receive this waste code, the generator first must submit laboratory reports and other information providing the results of analysis for the waste. This information should be attached to a completed copy of TCEQ Form No. 0197. Only after receipt of this documentation should the waste code assignment be made. Waste code numbers should never be issued based upon analytical results unsupported by laboratory documentation.

Laboratory reports should include a description of the analytical procedures utilized, the condition in which the sample was received, and the signature of the laboratory personnel. Also, reports must be accompanied by a description of the sample collection and handling procedures. If the procedures described are not in accordance with EPA-approved and/or TCEQ-accepted procedures, the results should be rejected as invalid.

Soil samples should be collected at the rate of one sample for every fifty cubic yards of material, and each sample should be a composite which is representative of the fifty cubic yard unit. Water samples <u>from inside storage vessels</u> should be collected from

the top of the water column in order to identify the highest contaminant level. Water should be sampled at the rate of one sample per 3000 gallons of water, or a minimum of one sample per container if there is more than one container.

When a waste is categorized as Class II PST or Special Waste-PST, the generator must document the volume, means of transportation, and ultimate destination for the waste. Once all of the proper information has been received by the PST of FO Division in writing, the waste classification and code number can be verbally issued to the generator. The number should be written on the submitted Form No. 0197 in the space marked TCEQ Use Only, and a copy of the form mailed or faxed to the Responsible Party (not the contractor or consultant). Also include the date, the person issuing the code number and the Regional Office number on the form. A copy of the completed form and all submitted information should be sent to the Central Office (or regional office as appropriate).

Regional Field Inspectors as well as PST Division Coordinators should issue waste classifications and code numbers for only Class II PST and Special Wastes-PST on cases they are responsible for coordinating.

Additionally, for all waste classification requests which are not associated with LPST sites (such as for disposal of water used to clean tanks or for disposal of soil/backfill material not associated with a confirmed release), the I&HW Division or the appropriate Regional Office should oversee the waste classification. All hazardous and industrial Class I waste must be manifested in accordance with the Industrial Solid Waste Rules, Chapter 335, Texas Administrative Code. Generators of any hazardous wastes or industrial Class I waste should be referred to the Waste Evaluation Section of the TCEQ Industrial and Hazardous Waste Division at (512) 239-6832.

Following are the waste classification and code numbers for typical nonhazardous wastes generated at leaking underground and aboveground petroleum storage tank sites involving the release of petroleum substances only (i.e., gasoline, diesel, kerosene, jet fuel, etc.).

CONTAMINATED SOILS

Contaminant Level	**Classification**	**Waste Code Number**
If greater than 150 ppm BTEX **OR** 600 ppm TPH	Special Waste PST	PSTW4891
If less than 150 ppm BTEX **AND** 600 ppm TPH	Class II PST Waste	PSTW4892

Note Soils saturated ("drippy") with gasoline are likely to be ignitable. Contaminated soils analyzed as ignitable are classified as hazardous waste and therefore

can only be transported by a registered hazardous waste hauler and only disposed of at a permitted facility authorized to receive hazardous wastes.

CONTAMINATED WATER

Contaminant Level	Classification	Waste Code Number
Any concentration of dissolved contamination with no phase-separated product	Class II PST Waste	PSTW1021

As routinely requested in TCEQ's letters, documentation of the handling and disposition of all wastes generated in a LPST response action must be provided to TCEQ. It is essential that we track PST wastes through signed receipts and, when required, manifests to prevent their illegal dumping.

Should you have any questions or comments, please contact me at 512/239-2245 or the Waste Evaluation Section at 512/239-6832.

(Signed) Chris Chandler

END OF ATTACHMENT

Section 02120

OFF-SITE TRANSPORTATION AND DISPOSAL

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Off-site disposal of non-hazardous and hazardous solid, liquid and resinous waste.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices

1. Payment for transportation and disposal of Class II Soil at approved facility is on a cubic yard basis.

2. Payment for transportation and disposal of Class I Soil at approved facility is on a cubic yard basis.

3. No separate payment will be made for soil reused as backfill material.

4. Payment for transportation and disposal of contaminated groundwater at approved facility is on a per gallon basis.

5. No separate payment for ground water discharged into a sanitary sewer.

6. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.03 REFERENCES

A. CFR, Title 29, Section 1910.120.- Occupational Safety and Health Administration, Department of Labor.

B. Texas Administrative Code (TAC), Title 30, Chapter 335.- Industrial Solid Waste & Municipal Hazardous Waste.

C. TAC, Title 30, Chapter 334.- Underground and Aboveground Storage Tanks.

D. TAC, Title 30, Chapter 106.533.- Exemptions from Permitting, Subchapter X, Waste Processes and Remediation.

E. U.S. Environmental Protection Agency (EPA), (SW-846) Test Methods for Evaluating Solid Waste, Office of Solid Waste and Emergency Response, Washington, D.C. (P1388-239223, November 1986).

PART 2 P R O D U C T S (Not Used)

PART 3 E X E C U T I O N

3.01 HANDLING CATEGORY I AND II SOILS

A. Do not place Category II Soil back into excavation. Properly dispose of Category II Soil at the facility listed in Environmental Work Plan. Category I Soil consistent with classification as Class II PST Waste as defined by Texas Commission on Environmental Quality (TCEQ) in their interoffice memo dated 4/12/94, and not Category II Soil (as demonstrated through laboratory testing) can be reused as backfill material, provided;

1. Soil is reused in the same area from which it originated at depths greater than 30 inches below top of pavement, finished grade or ditch flowline, whichever is lower.

2. Soil has suitable engineering properties for backfill material as specified in Section 02320 - Utility Backfill Material.

3. Does not have indications of impact by contaminants other than petroleum.

B. Do not spread Category I or II Soil on ground surface.

C. Place Category I or II Soil in covered roll-off box with a minimum 20-mil plastic liner or in a stockpile at temporary storage area, pending receipt of analytical results and receipt of authorization from TCEQ and the disposal site for final disposal; or, in trucks for transport directly to the disposal facility.

1. Do not commingle Category I or II Soil from different locations or with different sources.

2. Temporary storage area to meet following criteria:

a. Within 2 miles of project site, to allow access by City personnel, unless otherwise approved by Project Manager.

b. Outside the 100-year floodplain.

c. Outside of, and not adjacent to, an area known or suspected to be a wetland.

d. Acceptable to Project Manager.

3. Secure using temporary fencing or other means of controlling access.

4. Place stockpiled soils on an impervious membrane. Surround with a berm to prevent migration of soils or moisture either into or out of the stockpile, other than evaporation.

5. Protect and cover the stockpile with minimum 20-mil plastic or other approved waterproof membrane covering. Replace damaged covers.

6. Do not place soil over monitoring wells or piezometers, utility line manholes, or any other potential route for water to migrate to subsurface.

7. Handle runoff from the temporary storage area in accordance with paragraph 3.06, Handling Water.

8. Do not stockpile soil for greater than 30 days.

9. Remove remaining material, including excavated soil from construction site, from temporary storage area prior to completion of Work.

D. Remove, handle, transport, stockpile, and dispose of Category II Soil under direction of Corrective Action Project Manager. Dispose waste classified (i.e., meets characteristics or other definitions of) a hazardous waste consistent with Resource Conservation and Recovery Act (RCRA) and 30 TAC Chapter 335.

E. Transport Category I or II Soil in accordance with Department of Transportation (DOT) and TCEQ rules and regulations.

F. Dispose Category I Soil, not reused as backfill, under direction of Corrective Action Project Manager, at a properly licensed facility with prior approval of Project Manager.

G. Obtain signed manifests from the receiving facility and provide originals to Project Manager.

H. Decontaminate large equipment to prevent cross-contamination with clean material. Steam clean or pressure wash dump trucks, bulldozers, backhoes, and other large equipment prior to use in uncontaminated areas after being used in PPCA.

3.02 HANDLING WATER

A. Prior to discharging petroleum contaminated groundwater, obtain an Industrial Wastewater Discharge Permit (no cost) from the City for disposal directly to a sanitary sewer which discharges to a City-owned wastewater treatment plant.

B. Procedures.

1. Provide equipment sized to handle flows anticipated by dewatering operations.

2. Include commercially available oil/water separator unit as part of the treatment system for dewatering operation discharging to sanitary sewer.

3. Do not exceed limits listed in Table 01160-2, Potentially Contaminated Groundwater Discharge Limits for groundwater discharged to the sanitary sewer. Provide additional treatment systems as needed prior to discharge to sanitary sewers where groundwater contamination levels exceed those noted in Table 01160-2. Approval by Project Manager shall be obtained for proposed treatment system prior to initiation of treatment and discharge.

4. Comply with all applicable requirements of 30 TAC, Chapter 106.533, including submitting a PI-7 form to the TCEQ for a standard exemption of oil/water separator unit, and any additional treatment systems. Submit copy of PI-7 form to Project Manager.

5. Do not discharge treated water into sanitary sewer if water level is within one foot of the top of sanitary sewer manhole or would cause an overflow situation.

6. Recover free product collected in treatment equipment. Recycle for beneficial reuse or dispose of recovered contaminants in a manner acceptable to Project Manager and TCEQ.

7. Transport potentially contaminated groundwater and free product in accordance with DOT and TCEQ rules and regulations for flammable products. Use DOT-licensed carrier for transport.

8. Obtain signed manifests for potentially contaminated groundwater and free product from the receiving facility and provide originals to Project Manager.

9. Furnish laboratory reports to Project Manager within one week of sample date.

C. Install and operate groundwater control systems, as described in Section 01578 - Control of Groundwater and Surface Water. Design and operate groundwater control systems so water from PPCA is handled in a system separated and isolated from groundwater control systems outside PPCA.

D. Handle, test, treat, and discharge potentially contaminated groundwater to the sanitary sewer in accordance with City of Houston, Industrial Wastewater Discharge Permit requirements, or have water evacuated and hauled for off-site treatment and disposal at a TCEQ-permitted facility. Perform discharge under direction of Corrective Action Project Manager.

3.03 AIR MONITORING REQUIREMENTS

A. Ensure health and safety of workers at the construction site. Maintain air quality within the construction zone to conform to exposure limits specified in Code of Federal Regulations (CFR) Title 29, Section 1910.120 enforceable by OSHA.

B. Provide adequate shoring and sufficient escape ladders in accordance with applicable trench safety regulatory requirements.

C. In the trench, continuously operate a combustible gas indicator (CGI) with LEL/O_2 meter to monitor vapor and oxygen levels. Properly calibrate CGI and provide an alarm that sounds if greater than or equal to 20 percent Lower Explosive Limit (LEL), less than or equal to 19.5 percent oxygen, or greater than or equal to 25 percent oxygen is reached. Record monitoring data from CGI every 15 minutes to ensure safe work conditions.

D. Take appropriate measures during construction to keep LEL levels below 20 percent in the trench. If vapor concentrations exceed 20 percent of LEL stop construction work, turn off equipment, and have workers immediately vacate the PPCA in an upwind direction.

E. Take readings with PID/FID 50 feet downwind of area during excavation or work in contaminated excavation areas and until one hour after cessation of such work. Take readings within breathing zone at approximately 4 feet above ground level. Record readings, date, time, initials of person taking reading, PID/FID serial number and last calibration date of PID/FID in bound field book.

3.04 DISPOSAL OF MATERIAL

A. Non-categorized Material. Dispose of excess or unsuitable excavated materials, not Category I or II Soil, off-site in accordance with Section 01576 - Waste Material Disposal.

B. Category I or II Soil. Dispose of excess or unsuitable excavated materials off-site at a state registered Treatment, Storage, or Disposal (TSD) facility. Obtain signed manifests from the receiving facility and provide originals to Project Manager.

TABLE 01160-1
SOIL CRITERIA - PETROLEUM ONLY

Contaminant	Maximum[a] Concentration (mg/kg)	Method
TPH	1500	EPA 418.1/TX 1005
Total BTEX [b]	150	EPA 8020/8021
Total Lead [c]	250	EPA 6000/6010/7000

Notes: [a] If any parameters exceed the maximum concentrations, then the soil shall be considered Category II Soil and a Special Waste-PST as defined by the TCEQ in their interoffice memo dated 4/12/94.
[b] If benzene is greater than 5.0 mg/kg then analyze TCLP benzene which should be <0.3 mg/l.
[c] If total lead is greater than 30 mg/kg then analyze TCLP lead which should be <1.5 mg/l.

Definitions: TCLP - toxicity characteristic leachate procedure (40 CFR 261, Appendix II)
BTEX - benzene, toluene, ethyl benzene, and total xylenes
TPH - total petroleum hydrocarbons
mg/kg - milligrams per kilogram
mg/l - milligrams per liter

TABLE 01160-2
POTENTIALLY CONTAMINATED GROUNDWATER DISCHARGE LIMITS

Parameter	Discharge to Sanitary Sewer	
	Limit	Method
TPH (mg/l)	30.0	EPA 418.1/TX 1005
Total BTEX (mg/l)	1.0	EPA 602/8020/8021
Lower Explosive Limit (%)	10	EPA 1010

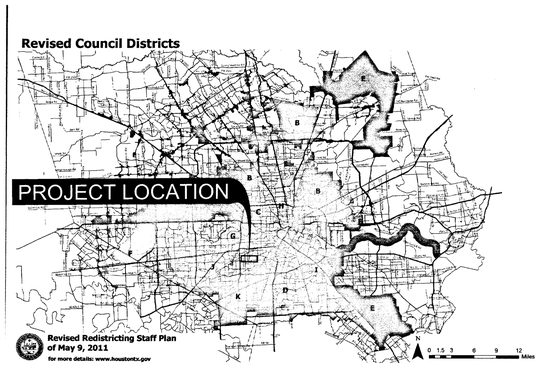
Notes: See definitions above.

END OF SECTION

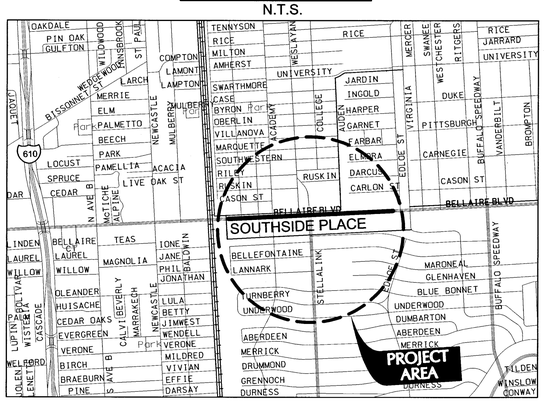
CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING AND CONSTRUCTION DIVISION
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

DESIGN WBS NO. S-000700-A017-3
CONSTRUCTION WBS NO. S-000700-0068-4
WORK ORDER # 17



LOCATION MAP
N.T.S.



VICINITY MAP
KEY MAP NO. 532E & 532F
GIMS MAP NO. 5255C
COUNCIL DISTRICT SOUTHSIDE PLACE

MAYOR
ANNISE D. PARKER

CONTROLLER
RONALD C. GREEN

DISTRICT COUNCIL MEMBERS

BRENDA STARDIG DISTRICT A	JERRY DAVIS DISTRICT B	ELLEN COHEN DISTRICT C	DWIGHT BOYKINS DISTRICT D
DAVE MARTIN DISTRICT E	RICHARD NGUYEN DISTRICT F	OLIVER PENNINGTON DISTRICT G	ED GONZALEZ DISTRICT H
ROBERT GALLEGOS DISTRICT I	MIKE LASTER DISTRICT J	LARRY GREEN DISTRICT K	

COUNCIL MEMBERS AT-LARGE

STEPHEN C. COSTELLO POSITION 1	DAVID W. ROBINSON POSITION 2
MICHAEL KUBOSH POSITION 3	C.O. "BRAD" BRADFORD POSITION 4

JACK CHRISTIE
POSITION 5

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

STATE OF TEXAS — OMAR J. CORREDOR — 47746 — REGISTERED PROFESSIONAL ENGINEER — 4/16/15

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED
ENGINEERING FIRM F-003922

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

4-27-15 WATER	5/20/15 TRAFFIC AND TRANSPORTATION
McDonald WASTEWATER	N/A SIGNALS
Ellen S. Maas 4/23/15 STORM WATER	Arthur Morris 4/27/15 MANAGING ENGINEER
4-27-15 STREET & BRIDGE	4-27-15 PARK-FORESTRY DEPT
5/11/2015 CONSTRUCTION	N/A SPONSOR DIV / DEPT

8/3/15
CITY ENGINEER DATE

5/28/15
DIRECTOR OF PUBLIC WORKS AND ENGINEERING DATE

SHEET No. 1 OF 59

54210

No.	Date	Revisions	App.

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Thursday, April 16, 2015 8:45:59 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\GENERAL\OCW-BELL-COVER SHEET.DWG

SHEET	DESCRIPTION
	GENERAL
1	COVER SHEET
2	INDEX OF DRAWINGS
3	UTILITY NOTES
4	CONSTRUCTION AND TOPO LEGEND
5	OVERALL PROJECT LAYOUT
	SURVEY CONTROL
6-7	SURVEY CONTROL MAP
8-9	SURVEY CONTROL POINT SWING TIES
10	C.O.H. MONUMENT SWING TIES
	PLAN & PROFILE
	BELLAIRE BLVD.
11	FROM STA. 1+00.00 TO STA. 5+40.00 (PLAN)
12	FROM STA. 1+00.00 TO STA. 5+40.00 (PROFILE)
13	FROM STA. 5+40.00 TO STA. 10+00.00 (PLAN)
14	FROM STA. 5+40.00 TO STA. 10+00.00 (PROFILE)
15	FROM STA. 10+00.00 TO STA. 14+20.00 (PLAN)
16	FROM STA. 10+00.00 TO STA. 14+20.00 (PROFILE)
17	FROM STA. 14+20.00 TO STA. 18+60.00 (PLAN)
18	FROM STA. 14+20.00 TO STA. 18+60.00 (PROFILE)
19	FROM STA. 18+60.00 TO STA. 23+20.00 (PLAN)
20	FROM STA. 18+60.00 TO STA. 23+20.00 (PROFILE)
21	FROM STA. 23+20.00 TO STA. 27+40.00 (PLAN)
22	FROM STA. 23+20.00 TO STA. 27+40.00 (PROFILE)
23	FROM STA. 27+40.00 TO STA. 31+80.00 (PLAN)
24	FROM STA. 27+40.00 TO STA. 31+80.00 (PROFILE)
25	FROM STA. 31+80.00 TO STA. 36+20.00 (PLAN)
26	FROM STA. 31+80.00 TO STA. 36+20.00 (PROFILE)
27	FROM STA. 36+20.00 TO STA. 40+60.00 (PLAN)
28	FROM STA. 36+20.00 TO STA. 40+60.00 (PROFILE)
29	FROM STA. 40+60.00 TO STA. 45+00.00 (PLAN)
30	FROM STA. 40+60.00 TO STA. 45+00.00 (PROFILE)
31	FROM STA. 45+00.00 TO STA. 47+00.00 (PLAN)
32	FROM STA. 45+00.00 TO STA. 47+00.00 (PROFILE)
	STELLA LINK @ BELLAIRE BLVD.
33	FROM STA. 1+00.00 TO STA. 4+00.00
	AUDEN BLVD. @ BELLAIRE BLVD.
34	FROM STA. 1+00.00 TO STA. 4+00.00
	EDLOE ST. @ BELLAIRE BLVD.
35	FROM STA. 1+00.00 TO STA. 4+00.00

SHEET	DESCRIPTION
	STORM WATER POLLUTION PREVENTION
36	STORM WATER POLLUTION PREVENTION TYPICAL LAYOUT
37	STORM WATER POLLUTION PREVENTION PLAN DETAIL
	TREE PRESERVATION
38	TREE PRESERVATION LAYOUT
	STANDARDS
39	BARRICADE STANDARDS
40	STREET CUT DETAILS
41-42	WATER DETAILS
43	SIDEWALK DETAILS
	TRAFFIC CONTROL
44	TRAFFIC CONTROL PLAN & NOTES
45	TRAFFIC CONTROL PHASES
46-47	OVERALL TRAFFIC CONTROL PLAN
48	OMITTED
49-59	TRAFFIC CONTROL PLAN

No.	Date	Revisions	App

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED
5/13/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

INDEX OF DRAWINGS

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 2 OF 59	

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Wednesday, May 13, 2015 1:51:39 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\GENERAL\OCW-BELL-SHEET INDEX.DWG

FOR REDUCED PLANS
original scale in inches

AT&T TEXAS/SWBT FACILITIES

1. THE LOCATIONS OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

2. THE CONTRACTOR SHALL CALL 1-800-344-8377 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

3. WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING, THE CONTRACTOR SHALL EXPOSE THE AT&T/SWBT FACILITIES.

4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES OR BURIED CABLE FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN CONDUIT IN THE AREA.

6. PLEASE CONTACT THE AT&T TEXAS DAMAGE PREVENTION MANAGER MR. ROOSEVELT LEE JR. AT (713)567-4552 OR EMAIL HIM AT RL7259@ATT.COM , IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATING NEAR OUR AT&T TEXAS/SWBT FACILITIES.

CENTERPOINT ENERGY (GAS) - GENERAL NOTES

CAUTION: UNDERGROUND GAS FACILITIES

LOCATIONS OF CENTERPOINT ENERGY MAIN LINES (TO INCLUDE CENTERPOINT ENERGY, INTRASTATE PIPELINE, LLC. WHERE APPLICABLE) ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. OUR SIGNATURE ON THESE PLANS ONLY INDICATES THAT OUR FACILITIES ARE SHOWN IN APPROXIMATE LOCATION. IT DOES NOT IMPLY THAT A CONFLICT ANALYSIS HAS BEEN MADE. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT (713) 223-4567 , 1-800-669-8344 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

* WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713) 945-8036 OR (713) 945-8037 (7:00 A.M. TO 4:30 P.M.) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.

* WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

* WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

* FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OR (713) 207-4200.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

CENTERPOINT ENERGY (ELECTRIC) - GENERAL NOTES

WARNING: OVERHEAD ELECTRICAL FACILITIES

OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

* ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX(6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND

* OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN 10 FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS, ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713) 207-2222.

ACTIVITIES ON OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY

NO APPROVAL TO USE, CROSS OR OCCUPY CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6248 OR (713) 207-5769.

GENERAL NOTES:

1. THE FLOW LINES AND LOCATIONS OF ALL UNDERGROUND UTILITIES MUST BE LOCATED BY WHATEVER MEANS MAY BE REQUIRED (METAL DETECTION EQUIPMENT, PROBES, EXCAVATION, SURVEY, COORDINATION WITH UTILITY COMPANIES) BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ALL FIELD VERIFICATION WORK AND UTILITY ADJUSTMENTS SHALL BE COMPLETED PRIOR TO EXCAVATION FOR PROPOSED UTILITIES. NO SEPARATE PAY: INCLUDE COST IN UNIT PRICE FOR WORK IN APPROPRIATE SECTIONS.

2. SERVICES ARE TO BE TRANSFERRED BETWEEN EXISTING AND PROPOSED WATER LINES WITH MINIMUM DISRUPTION OF SERVICE. EXISTING WATER LINES MUST BE MAINTAINED IN SERVICE UNTIL SERVICE TRANSFER IS DONE.

3. CALL THE TRAFFIC MANAGEMENT AND MAINTENANCE DIVISION OF THE CITY OF HOUSTON PUBLIC WORKS AND ENGINEERING DEPARTMENT WHEN WORK IS SCHEDULED NEAR SIGNAL CONDUITS WITHIN THE CITY OF HOUSTON (832) 395-3000. CALL AT LEAST FIVE WORKING DAYS IN ADVANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGES TO EXISTING TRAFFIC SIGNAL CABLES AS A RESULT OF CONSTRUCTION ACTIVITIES FOR THE PROJECT. NO SEPARATE PAYMENT FOR REPAIR TO SIGNAL CONDUIT.

4. SERVICE LINE INSTALLATION COULD BE HINDERED BY THE CEMENT STABILIZED SAND BACKFILL. INCLUDE COST OF CROSSING CEMENT STABILIZED BACKFILL IF ENCOUNTERED DURING SERVICE LINE INSTALLATION IN THE UNIT PRICE OF SERVICES.

5. THE CONTRACTOR TO PROVIDE CUT SHEETS (GROUND ELEVATIONS AND PROPOSED LINE INVERTS WITH AMOUNT OF CUT, LOCATION OF BENDS, FIRE HYDRANTS, VALVES AND OTHER FITTINGS AT EVERY 100 FEET IN TABULAR FORMAT) ON EACH STREET TO THE CITY FOR APPROVAL PRIOR TO CONSTRUCTION AT NO ADDITIONAL COST TO THE CITY.

6. CONTRACTOR MUST REFER TO THE CITY OF HOUSTON STANDARD DETAIL DRAWINGS INCLUDED IN THE CITY OF HOUSTON'S "STANDARD CONSTRUCTION DETAILS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, AND STREET PAVING" DATED OCTOBER, 2002, FOR ANY OTHER DETAILS NOT INCLUDED IN THE CONSTRUCTION DRAWINGS.

7. CONTRACTOR SHALL COORDINATE AHEAD OF TIME WITH BUSINESS OWNERS AND RESIDENTS FOR INSTALLATION OF WATER LINES IN ENCROACHED AREAS OF THE PUBLIC RIGHT-OF-WAY. NO SEPARATE PAY.

8. CONTRACTOR SHALL CONTACT AND COORDINATE WITH MR. DAVID MOSS WITH CITY OF SOUTHSIDE PLACE AT 713.668.2341 AT LEAST TWO WEEKS PRIOR TO THE START OF CONSTRUCTION.

No.	Date	Revisions	Asp.

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFIL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15

CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15

CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UNDERGROUND LINES SHOWN

Date: 4-16-15

Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:

CABLE Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4-16-15

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

UTILITY NOTES

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 3 OF 59	

PLOTTED ON: Wednesday, April 15, 2015 4:40:37 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\GENERAL\OCW-BELL-UTILITY NOTES.DWG

FOR REDUCED PLANS
original scale in inches

3 2 1 0

TOPOGRAPHIC FEATURES

EW	EDGE WATER
FL	FLOW LINE
CLD	CENTERLINE DITCH
LB	LOW BANK
HB	HIGH BANK
TOE	TOE OF SLOPE
WL	WATER LINE
CLRD	CENTERLINE ROAD
ER	END OF RADIUS
POC	POINT ON CURVE
PC	POINT OF CURVE
PRC	POINT OF REVERSE CURVE
INTX	INTERSECTION
COR	CORNER
APT	ANGLE POINT
E	EDGE
E	EAST
W	WEST
N	NORTH
S	SOUTH

SURFACE FEATURES

ADR	ASPHALT DRIVEWAY
AS	ASPHALT
BC	TOP CURB
BCG	TOP CURB W/ GUTTER
BK	BRICK
CC	CONCRETE
CCR	CONCRETE RAMP
CDR	CONCRETE DRIVEWAY
EAP	EDGE ASPHALT
EB	EDGE BRICK
EC	EDGE CONCRETE
ECP	EDGE CONCRETE PAVING
EF	EDGE FOUNTAIN
EG	EDGE GRAVEL
EPG	EDGE PEA GRAVEL
ES	EDGE STONE
ET	EDGE TILE
EWD	EDGE WOOD
GUT	GUT
GRS	GRASS
GRV	GRAVEL
GDR	GRAVEL DRIVEWAY
NG	NATURAL GROUND
PG	PEA GRAVEL
RA	RAMP
SS*	SOLID SRIPE
DS*	DASHED STRIPE
SW	SIDEWALK
TC	TOP CURB

TREES AND SHRUBS

AA*	ASH
BP*	BRADFORD PEAR
CB*	CHINABERRY
CE*	CEDAR
CELM*	CEDAR ELM
CM*	CREPE MYRTLE
CT*	CHINESE TALLOW
CTW*	COTTON WOOD
CY*	CYPRESS
ELM*	ELM
FIG*	FIG
HA*	HACKBERRY
HDG	HEDGE ROW
HO*	HOLLY
LOQ*	LOQUAT
MAG*	MAGNOLIA
MIM*	MIMOSA
MPL*	MAPLE
OAK*	OAK
PEC*	PECAN
PI*	PINE
PLN	PLANTER
PM*	PALM
RB*	RIVER BIRCH
SAGO*	SAGO PALM
SG*	SWEETGUM
SHB*	SHRUB
SY*	SYCAMORE
TL	TREE LINE
TR	TREE
WAX*	WAX MYRTLE
WI*	WILLOW
YO*	YOUPON

UTILITIES

GAS UTILITIES

GLR	GAS LINE ROUTE
GM	GAS METER
GPD	GAS PEDESTAL
GR	GAS RISER
GV	GAS VALVE
PLMRK	PIPE LINE MARKER
PLR	PIPE LINE ROUTE
UG*	UNDERGROUND GAS
YLG	YARD GAS LIGHT

ELECTRIC UTILITIES

CBX	CONTROL BOX
CON	CONDUIT
EBX	ELECTRIC BOX
EGO	GATE OPENER
ELC	ELEC CAP
EM	ELECTRIC METER
EMH	ELEC MANHOLE
EPD	ELECTRIC PED
ER	ELECTRIC RISER
FLT	FLOOD LIGHT
GA	GUY ANCHOR
LP	LIGHT POLE
LS	LIGHT STANDARD
MP	METER POLE
OH	OVERHEAD LINES
PP	POWER POLE
TWR	HL&P TOWER
UE	BURIED ELEC
VLE	ELEC VAULT
YL	YARD LIGHT

TELEPHONE UTILITIES

PB	PAY TELEPHONE
SNT	TELEPHONE CABLE SIGN
TMH	TELEPHONE MANHOLE
TP	TELEPHONE PEDASTAL
UT	BURIED TEL
VLT	TELEPHONE VAULT

WATER UTILITIES

BO	BLOW OFF VALVE
FH	FIRE HYDRANT
FV	FLUSH VALVE
ICV	IRRIGATION CONTROL VALVE
MW*	MONITORING WELL
SH	SPRINKLER HEAD
VLW	WATER VAULT
WM	WATER METER
WMH	WATER MANHOLE
WR	WATER RISER
WV	WATER VALVE
WW	WATER WELL

STORM S EWER

BOX	BOX CULV
CMP*	CORRIGATED METAL PIPE
CPP*	CORRIGATED PLASTIC PIPE
DR	DRAIN
GTI	GRATE INLET
GTV	GATE VALVE
HDW	HEADWALL
INL	INLET
AINL	A INLET
BINL	B INLET
BBINL	BB INLET
CINL	C INLET
EINL	E INLET
JBX	JUNCTION BOX
PVC*	PVC
RCP*	REINFORCED CONCRETE PIPE
STL*	STEEL PIPE
STM	STORM MANHOLE

SANITARY SEWER

CO	CLEAN OUT
LST	LIFT STATION
T	TEE

SIGNES AND TRAFFIC

BBRD	BILLBOARD
CLA	CLASSIC ARM
MPST	METAL POST
WPST	WOOD POST
SN	SIGN
SN/STP	STOP SIGN
SN/SPLM	SPEED LIMIT SIGN
SN/NPKG	NO PARKING SIGN
SN/SCHL	SCHOOL SIGN
SN/PEDX	PED CROSSING SIGN
SN/RR	RR CROSSING SIGN
SN/N	STREET NAME SIGN
SN/MTRO	METRO BUS STOP
SN/SP/N	STOP SIGN W/STREET NAME
SIGP	SIGNAL POLE
MB	MAIL BOX
TRBOX	TRAFFIC SIGNAL PULL BOX
SNW	WOOD SIGN
TSCB	TRAFFIC SIGNAL CONTOLLER BOX
SNO	OVERHEAED SIGN
SN2	2 POST SIGN
SNCC	CONCRETE SIGN

FENCES, WALLS, AND GUARDS

BD	BOLLARD
COL	COL
FN	FENCE
BWF	BARBED WIRE FENCE
CLF	CHAIN LINK FENCE
FNI	WROUGHT IRON FENCE
FNP	PIPE FENCE
FNS	SMOOTH WIRE FENCE
FNW	WOOD FENCE
GDR	GUARDRAIL
CCPST	CONCRETE POST
WAB	BRICK WALL
WAC	WALL CONCRETE
WAL	WALL
WAS	STONE WALL
WAW	WOOD WALL

MISC

AC	AC UNIT
ARM	CLASSIC ARM
AW	AIR WATER RISER
BBG	GOAL
BH	BORE HOLE
BTV	BURIED TV
CIB	CONC I BEAM
CLR	CLEARING LIMITS
CW	CAT WALK
GP	GAS PUMP
HDR	HANDRAIL
LID	LID
MB	MAIL BOX
MH	MAN HOLE
MRSH	MARSH
PVCR*	PVC RISER
RAL	RAIL
SAW	SAMPLE WELL
TVP	TV PEDESTAL
VD	VOID
VP	VERTICAL PIPE
VV	VALVE
WELL	WELL HEAD

STRUCTURES

BLD	BUILDING
BNC	BENCH
BUS	BUS STOP
CPT	CARPORT
OSB	OFFSET BUILDING
OVH	OVERHANG
POB	POS BUILDING

CONTROLLING MONUMENTS

FD3/8IR	
FD1/2IR	
FD1/2IP	
FD5/8IR	
FD3/4IR	
FD3/4IP	
FD1IR	
FD1PIP	FOUND PINCHED PIPE
FD1GIP	FOUND GALVANIZED IRON PIPE
FD1/2IP	
CIP	CAPPED IRON PIPE
CIR	CAPPED IRON ROD
MAG	MAG NAIL
PK	PK NAIL
RRS	RR SPIKE
CUTX	
TV12	TRAVERSE 1/2 IR
TV120	TRAVERSE 120 D NAIL
TV58	TRAVERSE 5/IR
TV60	TRAVERESE 60 D NAIL
TCIR	TRAVERSE CAPPED IRON ROD
TVMAG	TRAVERSE MAG NAIL
TVMON	TRAVERSE MONUMENT
TVPK	TRAVERSE PK NAIL
TVRR	TRAVERSE RR SPIKE
TVX	TRAVERSE CUT X
DEED	DEED
HT	HUB WITH TACK
CP	CONTROL POINT

OFFSETS

BOS	BUIDING OFFSET
OIR	OFFSET IRON ROD
OSP	OFFSET PAVING
OSSA	OFFSET SANITARY SEWER
OSST	OFFSET STROM SEWER
OSWL	OFFSET WATER LINE
POS	OFFSET POING
RAD	RADIUS POINT

- POWER POLE
- WATER METER
- ELECTRIC JUNCTION BOX
- TRAFFIC SIGN
- MANHOLE
- B OR BB INLET
- DOWN GUY
- FIRE HYDRANT
- WATER VALVE
- BUILDING
- FENCE
- SHRUB
- TREE
- PALM TREE
- UTILITY PAINT MARKER
- CONTROL POINT & TEMPORARY BENCH MARK
- LIGHT
- BOLLARD
- C.O.H. MONUMENT
- FOUND BOUNDARY MONUMENT

No.	Date	Revisions	App.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
April 15, 2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

CONSTRUCTION AND TOPO LEGEND

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 4 OF 59	

PLOTTED ON:Wednesday, April 15, 2015 4:40:51 PM
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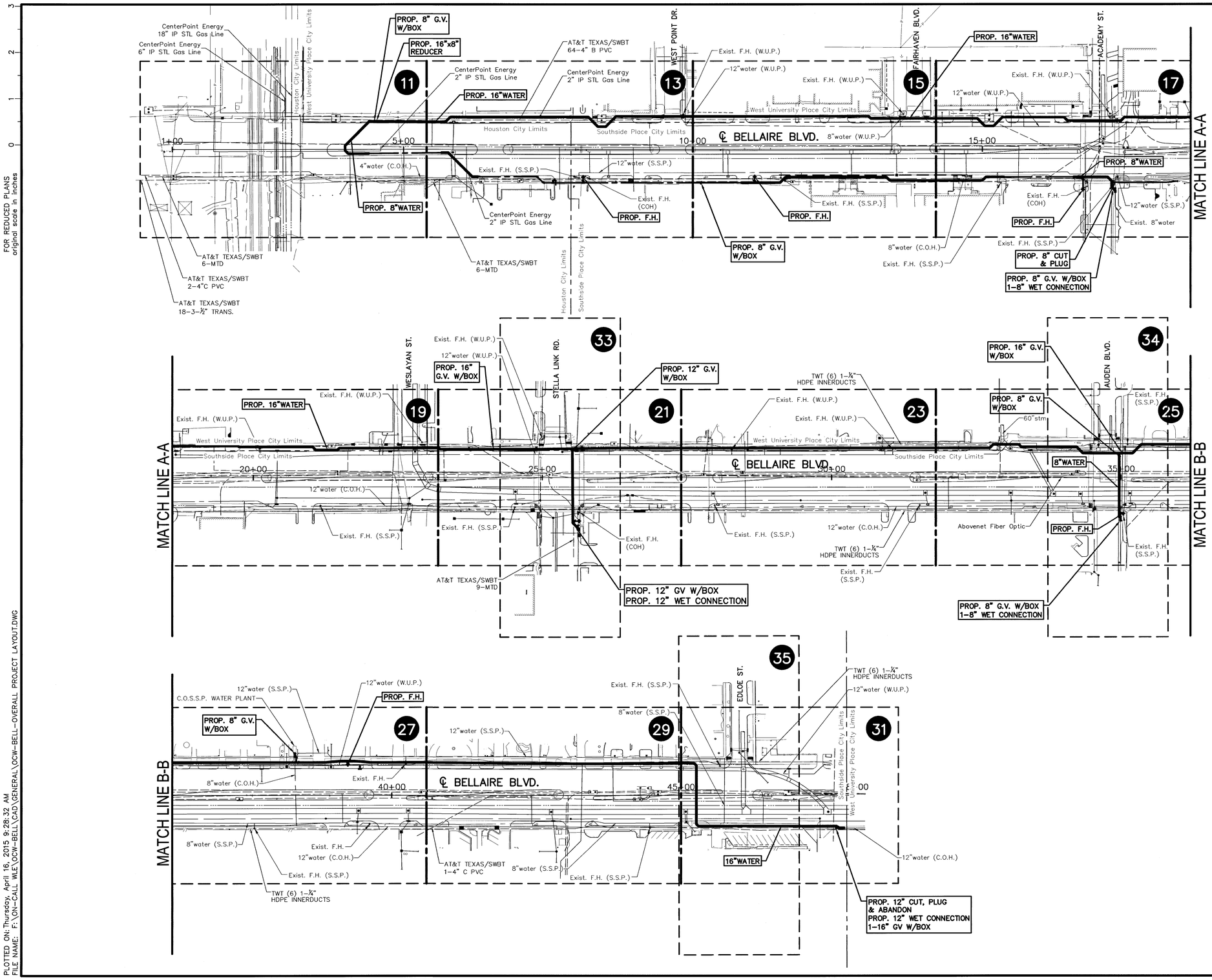

LEGEND

- ## — PLAN AND PROFILE SHEET NUMBER
- PLAN & PROFILE SHEET LIMITS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- PROP. WATERLINE
- EXIST. WATERLINE

0 80' 160'

FOR REDUCED PLANS original scale in inches: 0 1 2 3

PLOTTED ON: Thursday, April 16, 2015 9:28:32 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\GENERAL\OCW-BELL-OVERALL PROJECT LAYOUT.DWG

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS — OMAR J. CORREDOR — 47746 — REGISTERED PROFESSIONAL ENGINEER — 4/16/2015

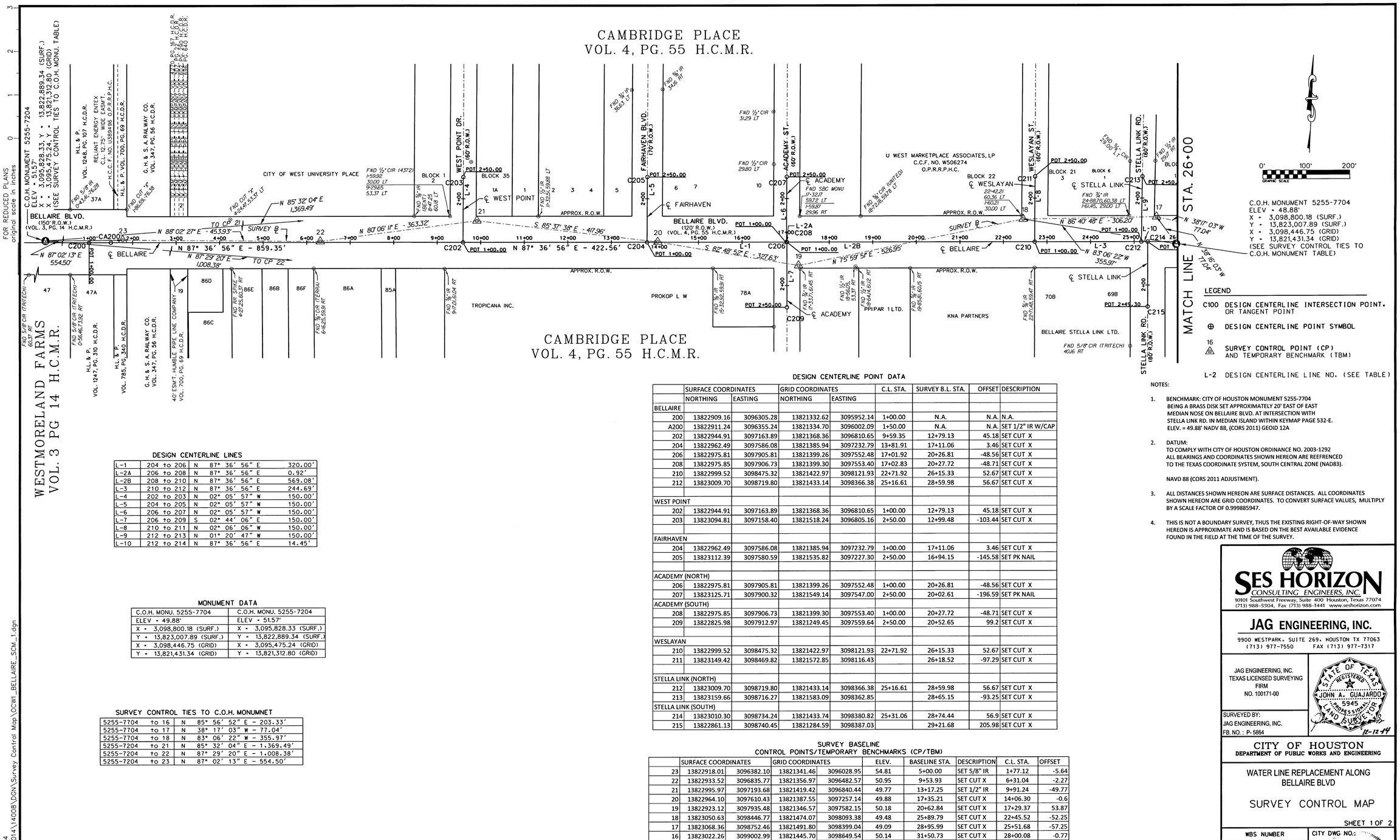
SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

OVERALL PROJECT LAYOUT

WBS NUMBER	CITY DWG NO.: 54210
S-000700-A017-3	
DRAWING SCALE	
1" = 80'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 5 OF 59	



NOTES:

1. BENCHMARK: CITY OF HOUSTON MONUMENT 5255-7704 BEING A BRASS DISK SET APPROXIMATELY 20' EAST OF EAST MEDIAN NOSE ON BELLAIRE BLVD. AT INTERSECTION WITH STELLA LINK RD. IN MEDIAN ISLAND WITHIN KEYMAP PAGE 532-E. ELEV. = 49.88' NADV 88, (CORS 2011) GEOID 12A

2. DATUM: TO COMPLY WITH CITY OF HOUSTON ORDINANCE NO. 2003-1292 ALL BEARINGS AND COORDINATES SHOWN HEREON ARE REEFRENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD83).

   NAVD 88 (CORS 2011 ADJUSTMENT).

3. ALL DISTANCES SHOWN HEREON ARE SURFACE DISTANCES. ALL COORDINATES SHOWN HEREON ARE GRID COORDINATES. TO CONVERT SURFACE VALUES, MULTIPLY BY A SCALE FACTOR OF 0.999885947.

4. THIS IS NOT A BOUNDARY SURVEY, THUS THE EXISTING RIGHT-OF-WAY SHOWN HEREON IS APPROXIMATE AND IS BASED ON THE BEST AVAILABLE EVIDENCE FOUND IN THE FIELD AT THE TIME OF THE SURVEY.

DESIGN CENTERLINE POINT DATA

	SURFACE COORDINATES		GRID COORDINATES		C.L. STA.	SURVEY B.L. STA.	OFFSET	DESCRIPTION
	NORTHING	EASTING	NORTHING	EASTING				
BELLAIRE								
200	13822909.16	3096305.28	13821332.62	3095952.14	1+00.00	N.A.	N.A.	N.A.
A200	13822911.24	3096355.24	13821334.70	3096002.09	1+50.00	N.A.	N.A.	SET 1/2" IR W/CAP
202	13822944.91	3097163.89	13821368.36	3096810.65	9+59.35	12+79.13	45.18	SET CUT X
204	13822962.49	3097586.08	13821385.94	3097232.79	13+81.91	17+11.06	3.46	SET CUT X
206	13822975.81	3097905.81	13821399.26	3097552.48	17+01.92	20+26.81	-48.56	SET CUT X
208	13822975.85	3097906.73	13821399.30	3097553.40	17+02.83	20+27.72	-48.71	SET CUT X
210	13822999.52	3098475.32	13821422.97	3098121.93	22+71.92	26+15.33	52.67	SET CUT X
212	13823009.70	3098719.80	13821433.14	3098366.38	25+16.61	28+59.98	56.67	SET CUT X
WEST POINT								
202	13822944.91	3097163.89	13821368.36	3096810.65	1+00.00	12+79.13	45.18	SET CUT X
203	13823094.81	3097158.40	13821518.24	3096805.16	2+50.00	12+99.48	-103.44	SET CUT X
FAIRHAVEN								
204	13822962.49	3097586.08	13821385.94	3097232.79	1+00.00	17+11.06	3.46	SET CUT X
205	13823112.39	3097580.59	13821535.82	3097227.30	2+50.00	16+94.15	-145.58	SET PK NAIL
ACADEMY (NORTH)								
206	13822975.81	3097905.81	13821399.26	3097552.48	1+00.00	20+26.81	-48.56	SET CUT X
207	13823125.71	3097900.32	13821549.14	3097547.00	2+50.00	20+02.61	-196.59	SET PK NAIL
ACADEMY (SOUTH)								
208	13822975.85	3097906.73	13821399.30	3097553.40	1+00.00	20+27.72	-48.71	SET CUT X
209	13822825.98	3097912.97	13821249.45	3097559.64	2+50.00	20+52.65	99.2	SET CUT X
WESLAYAN								
210	13822999.52	3098475.32	13821422.97	3098121.93	22+71.92	26+15.33	52.67	SET CUT X
211	13823149.42	3098469.82	13821572.85	3098116.43		26+18.52	-97.29	SET CUT X
STELLA LINK (NORTH)								
212	13823009.70	3098719.80	13821433.14	3098366.38	25+16.61	28+59.98	56.67	SET CUT X
213	13823159.66	3098716.27	13821583.09	3098362.85		28+65.15	-93.25	SET CUT X
STELLA LINK (SOUTH)								
214	13823010.30	3098734.24	13821433.74	3098380.82	25+31.06	28+74.44	56.9	SET CUT X
215	13822861.13	3098740.45	13821284.59	3098387.03		29+21.68	205.98	SET CUT X

DESIGN CENTERLINE LINES

L-1	204 to 206	N	87° 36' 56" E	320.00'
L-2A	206 to 208	N	87° 36' 56" E	0.92'
L-2B	208 to 210	N	87° 36' 56" E	569.08'
L-3	210 to 212	N	87° 36' 56" E	244.69'
L-4	202 to 203	N	02° 05' 57" W	150.00'
L-5	204 to 205	N	02° 05' 57" W	150.00'
L-6	206 to 207	N	02° 05' 57" W	150.00'
L-7	206 to 209	S	02° 44' 06" E	150.00'
L-8	210 to 211	N	02° 06' 06" W	150.00'
L-9	212 to 213	N	01° 20' 47" W	150.00'
L-10	212 to 214	N	87° 36' 56" E	14.45'

MONUMENT DATA

C.O.H. MONU. 5255-7704	C.O.H. MONU. 5255-7204
ELEV = 49.88'	ELEV = 51.57'
X = 3,098,800.18 (SURF.)	X = 3,095,828.33 (SURF.)
Y = 13,823,007.89 (SURF.)	Y = 13,822,889.34 (SURF.)
X = 3,098,446.75 (GRID)	X = 3,095,475.24 (GRID)
Y = 13,821,431.34 (GRID)	Y = 13,821,312.80 (GRID)

SURVEY CONTROL TIES TO C.O.H. MONUMNET

5255-7704	to 16	N	85° 56' 52" E - 203.33'
5255-7704	to 17	N	38° 17' 03" W - 77.04'
5255-7704	to 18	N	83° 06' 22" W - 355.97'
5255-7204	to 21	N	85° 32' 04" E - 1,369.49'
5255-7204	to 22	N	87° 29' 20" E - 1,008.38'
5255-7204	to 23	N	87° 02' 13" E - 554.50'

SURVEY BASELINE
CONTROL POINTS/TEMPORARY BENCHMARKS (CP/TBM)

	SURFACE COORDINATES		GRID COORDINATES		ELEV.	BASELINE STA.	DESCRIPTION	C.L. STA.	OFFSET
23	13822918.01	3096382.10	13821341.46	3096028.95	54.81	5+00.00	SET 5/8" IR	1+77.12	-5.64
22	13822933.52	3096835.77	13821356.97	3096482.57	50.95	9+53.93	SET CUT X	6+31.04	-2.27
21	13822995.97	3097193.68	13821419.42	3096840.44	49.77	13+17.25	SET 1/2" IR	9+91.24	-49.77
20	13822964.10	3097610.43	13821387.55	3097257.14	49.88	17+35.21	SET CUT X	14+06.30	-0.6
19	13822923.12	3097935.48	13821346.57	3097582.15	50.18	20+62.84	SET CUT X	17+29.37	53.87
18	13823050.63	3098446.77	13821474.07	3098093.38	49.48	25+89.79	SET CUT X	22+45.52	-52.25
17	13823068.36	3098752.46	13821491.80	3098399.04	49.09	28+95.99	SET CUT X	25+51.68	-57.25
16	13823022.26	3099002.99	13821445.70	3098649.54	50.14	31+50.73	SET CUT X	28+00.08	-0.77
15	13823035.78	3099330.43	13821459.22	3098976.94	49.63	34+78.44	SET CUT X	31+27.79	-0.65
14	13822997.77	3099709.91	13821421.22	3099356.38	48.03	38+59.82	SET CUT X	35+05.36	53.11
13	13823016.46	3100158.09	13821439.90	3099804.51	47.77	43+08.39	SET CUT X	39+53.94	53.09
12	13823085.02	3100500.90	13821508.46	3100147.28	48.03	46+57.99	SET CUT X	42+99.31	-1.16
11	13823098.29	3100829.10	13821521.72	3100475.44	48.18	49+86.45	SET CUT X	46+27.77	-0.76
10	13823050.58	3100993.79	13821474.02	3100640.11	47.40	51+57.92	SET CUT X	47+90.34	53.76

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9900 WESTPARK, SUITE 269, HOUSTON TX 77063
(713) 977-7550 FAX (713) 977-7317

JAG ENGINEERING, INC.
TEXAS LICENSED SURVEYING FIRM
NO. 100171-00

SURVEYED BY:
JAG ENGINEERING, INC.
FB. NO. : P-5864

STATE OF TEXAS REGISTERED JOHN A. GUAJARDO 5945 PROFESSIONAL LAND SURVEYOR
12-12-14

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

SURVEY CONTROL MAP

SHEET 1 OF 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
1" = 100'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 6 OF 59	

PLOTTED ON: 12/15/2014
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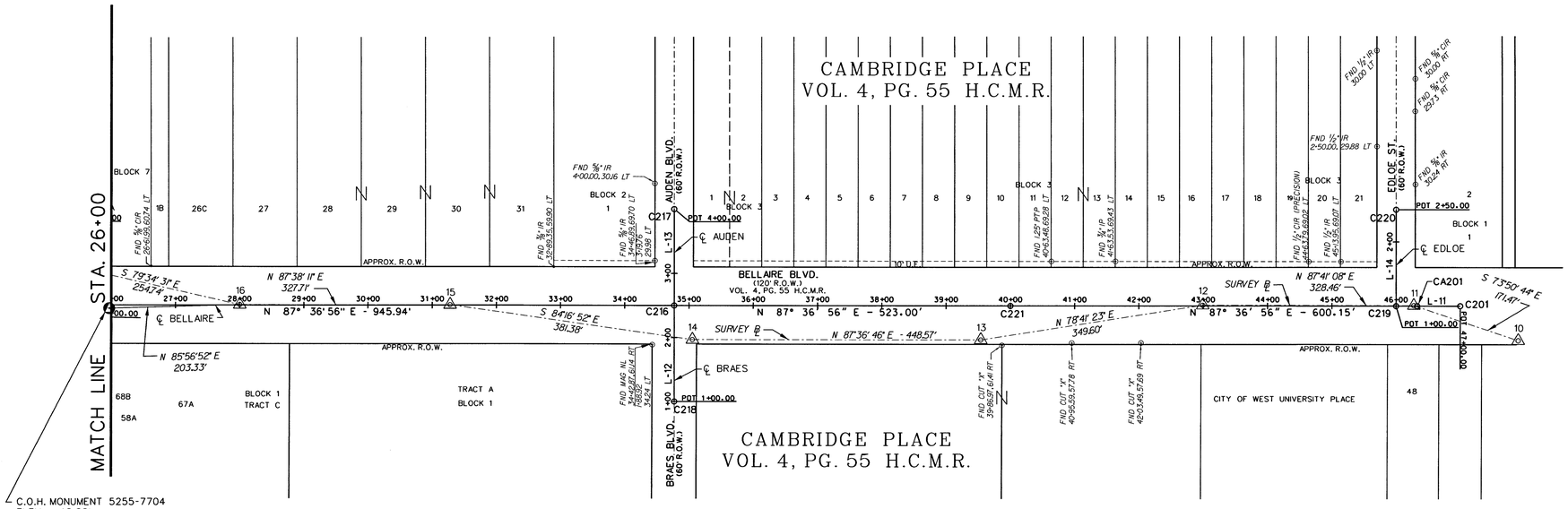

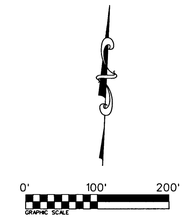

FOR REDUCED PLANS
original scale in inches
0 1 2 3

LEGEND

C100	DESIGN CENTERLINE INTERSECTION POINT. OR TANGENT POINT
⊕	DESIGN CENTERLINE POINT SYMBOL
16 △	SURVEY CONTROL POINT (CP) AND TEMPORARY BENCHMARK (TBM)
L-2	DESIGN CENTERLINE LINE NO. (SEE TABLE)

NOTES:

1. BENCHMARK: CITY OF HOUSTON MONUMENT 5255-7704 BEING A BRASS DISK SET APPROXIMATELY 20' EAST OF EAST MEDIAN NOSE ON BELLAIRE BLVD. AT INTERSECTION WITH STELLA LINK RD. IN MEDIAN ISLAND WITHIN KEYMAP PAGE 532-E. ELEV. = 49.88' NADV 88, (CORS 2011) GEOID 12A

2. DATUM:
TO COMPLY WITH CITY OF HOUSTON ORDINANCE NO. 2003-1292 ALL BEARINGS AND COORDINATES SHOWN HEREON ARE REEFRENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD83).

NAVD 88 (CORS 2011 ADJUSTMENT).

3. ALL DISTANCES SHOWN HEREON ARE SURFACE DISTANCES. ALL COORDINATES SHOWN HEREON ARE GRID COORDINATES. TO CONVERT SURFACE VALUES, MULTIPLY BY A SCALE FACTOR OF 0.999885947.

4. THIS IS NOT A BOUNDARY SURVEY, THUS THE EXISTING RIGHT-OF-WAY SHOWN HEREON IS APPROXIMATE AND IS BASED ON THE BEST AVAILABLE EVIDENCE FOUND IN THE FIELD AT THE TIME OF THE SURVEY.

DESIGN CENTERLINE LINES

L-11	219 to 201	N	87° 36' 56" E	99.85'
L-12	218 to 216	N	02° 29' 33" W	150.00'
L-13	216 to 217	N	02° 29' 33" W	150.00'
L-14	219 to 220	N	02° 29' 33" W	150.00'

DESIGN CENTERLINE POINT DATA

	SURFACE COORDINATES		GRID COORDINATES		C.L. STA.	SURVEY B.L. STA.	OFFSET	DESCRIPTION
	NORTHING	EASTING	NORTHING	EASTING				
BELLAIRE								
214	13823010.30	3098734.24	13821433.74	3098380.82	25+31.06	28+74.44	56.9	SET CUT X
216	13823049.66	3099679.36	13821473.10	3099325.83	34+77.00	38+24.25	-48.58	SET CUT X
221	13823071.42	3100201.90	13821494.86	3099848.31	40+00.00	43+62.13	-45.3	SET CUT X
219	13823096.38	3100801.53	13821519.81	3100447.87	46+00.15	49+58.84	0.79	SET CUT X
A201	13823097.75	3100834.36	13821521.18	3100480.70	46+33.00	49+91.66	-0.95	SET CUT X
201	13823100.54	3100901.30	13821523.97	3100547.63	47+00.00	50+55.18	-22.25	N.A.
BRAES								
218	13822899.80	3099685.88	13821323.26	3099332.35	1+00.00	38+45.68	99.88	SET CUT X
216	13823049.66	3099679.36	13821473.10	3099325.83	1+50.00	38+24.25	-48.58	SET CUT X
AUDEN								
216	13823049.66	3099679.36	13821473.10	3099325.83	1+50.00	38+24.25	-48.58	SET CUT X
217	13823199.52	3099672.84	13821622.94	3099319.31	4+00.00	38+02.83	-197.04	SET CUT X
EDLOE								
219	13823096.38	3100801.53	13821519.81	3100447.87	1+00.00	49+58.84	0.79	SET CUT X
220	13823246.24	3100795.01	13821669.66	3100441.36	2+50.00	49+58.37	-149.21	SET CUT X

SURVEY BASELINE
CONTROL POINTS/TEMPORARY BENCHMARKS (CP/TBM)

	SURFACE COORDINATES		GRID COORDINATES		ELEV.	BASELINE STA.	DESCRIPTION	C.L. STA.	OFFSET
23	13822918.01	3096382.10	13821341.46	3096028.95	54.81	5+00.00	SET 5/8" IR	1+77.12	-5.64
22	13822933.52	3096835.77	13821356.97	3096482.57	50.95	9+53.93	SET CUT X	6+31.04	-2.27
21	13822995.97	3097193.68	13821419.42	3096840.44	49.77	13+17.25	SET 1/2" IR	9+91.24	-49.77
20	13822964.10	3097610.43	13821387.55	3097257.14	49.88	17+35.21	SET CUT X	14+06.30	-0.6
19	13822923.12	3097935.48	13821346.57	3097582.15	50.18	20+62.84	SET CUT X	17+29.37	53.87
18	13823050.63	3098446.77	13821474.07	3098093.38	49.48	25+89.79	SET CUT X	22+45.52	-52.25
17	13823068.36	3098752.46	13821491.80	3098399.04	49.09	28+95.99	SET CUT X	25+51.68	-57.25
16	13823022.26	3099002.99	13821445.70	3098649.54	50.14	31+50.73	SET CUT X	28+00.08	-0.77
15	13823035.78	3099330.43	13821459.22	3098976.94	49.63	34+78.44	SET CUT X	31+27.79	-0.65
14	13822997.77	3099709.91	13821421.22	3099356.38	48.03	38+59.82	SET CUT X	35+05.36	53.11
13	13823016.46	3100158.09	13821439.90	3099804.51	47.77	43+08.39	SET CUT X	39+53.94	53.09
12	13823085.02	3100500.90	13821508.46	3100147.28	48.03	46+57.99	SET CUT X	42+99.31	-1.16
11	13823098.29	3100829.10	13821521.72	3100475.44	48.18	49+86.45	SET CUT X	46+27.77	-0.76
10	13823050.58	3100993.79	13821474.02	3100640.11	47.40	51+57.92	SET CUT X	47+90.34	53.76

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JAG ENGINEERING, INC.
9900 WESTPARK, SUITE 269, HOUSTON TX 77063
(713) 977-7550 FAX (713) 977-7317

JAG ENGINEERING, INC.
TEXAS LICENSED SURVEYING FIRM
NO. 100171-00

STATE OF TEXAS
REGISTERED
JOHN A. GUAJARDO
5945
PROFESSIONAL
LAND SURVEYOR
12-12-14

SURVEYED BY:
JAG ENGINEERING, INC.
FB. NO. : P- 5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

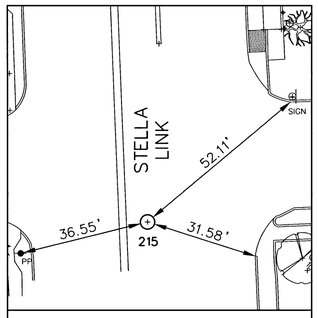
WATER LINE REPLACEMENT ALONG
BELLAIRE BLVD

SURVEY CONTROL MAP

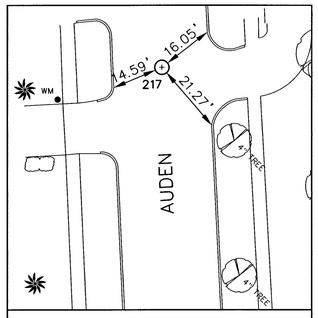
SHEET 2 OF 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
1" = 100'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 7 OF 59	

PLOTTED ON:12/15/2014
FILE NAME: H:\Proj-2014\14008\DGN\Survey Control Map\OCW1_BELLAIRE_SCM_2.dgn



CL 215



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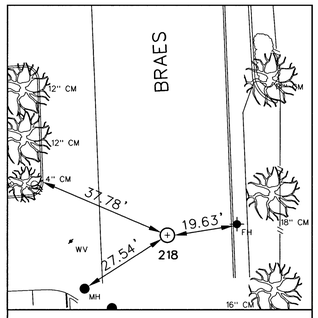

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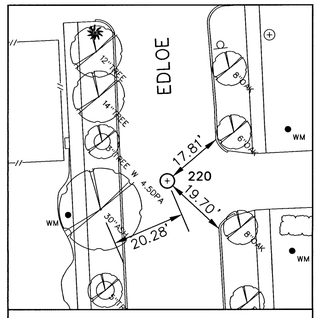

CL 220

LEGEND

56+ SURVEY BASELINE CONTROL POINT/TBM

255 ⊕ DESIGN CENTERLINE POINT

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TEXAS LICENSED SURVEYING
FIRM
NO. 100171-00

STATE OF TEXAS
REGISTERED
JOHN A. GUAJARDO
5945
PROFESSIONAL
LAND SURVEYOR
12-12-14

SURVEYED BY:
JAG ENGINEERING, INC.
FB. NO. : P- 5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

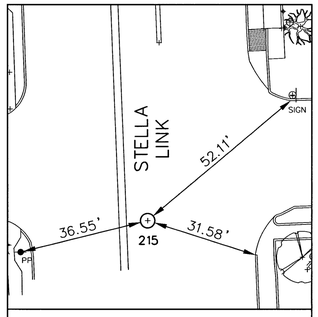
WATER LINE REPLACEMENT ALONG
BELLAIRE BLVD
SURVEY
CONTROL POINT SWING TIES

SHEET 1 OF 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	54210
CITY OF HOUSTON PM	DRAWING NUMBER
MUMTAZ BAIG, P.E.	
SHEET NO. 8 OF 59	

FOR REDUCED PLANS
original scale in inches
0 1 2 3

PLOTTED ON:1/30/2015
FILE NAME: H:\Proj-2014\14008\DGN\Survey Control Map\survey control point swing ties.dgn



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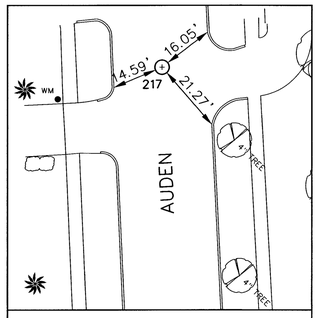

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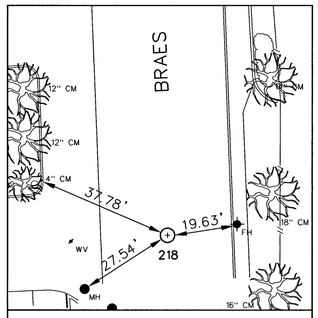
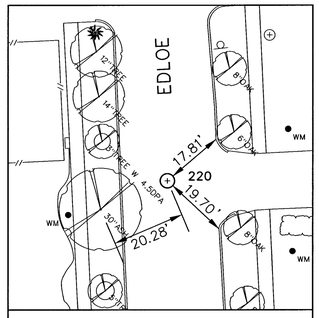


CL 218



CL 220

LEGEND

56+ SURVEY BASELINE CONTROL POINT/TBM

255 ⊕ DESIGN CENTERLINE POINT

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CONSULTING ENGINEERS, INC.
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JAG ENGINEERING, INC.
TEXAS LICENSED SURVEYING
FIRM
NO. 100171-00

STATE OF TEXAS
REGISTERED
JOHN A. GUAJARDO
5945
PROFESSIONAL
LAND SURVEYOR
12-12-14

SURVEYED BY:
JAG ENGINEERING, INC.
FB. NO. : P- 5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG
BELLAIRE BLVD
SURVEY
CONTROL POINT SWING TIES

SHEET 2 OF 2

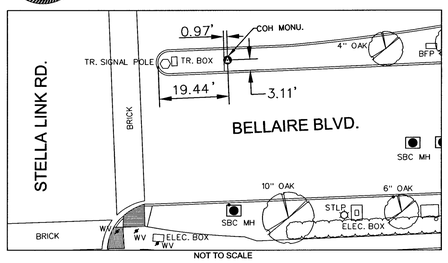
WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 9 OF 59	

FOR REDUCED PLANS
original scale in inches

PLOTTED ON: 12/15/2014
FILE NAME: H:\Proj-2014\14008\DGN\Survey Control Map\survey control point swing ties.dgn

CITY OF HOUSTON

CITY SURVEY 5255-7704
SITE CONTROL MONUMENT



NOT TO SCALE

Project WBS# S-000700-A017-3
Texas Coordinate System of 1983,
South Central Zone, U. S. Survey Feet
X= 3,098,446.75 (GRID)
Y= 13,821,431.34 (GRID)
Lat.= 29° 42' 21.47397" N
Lon.= 95° 26' 23.91340" W

Keymap Page: 532-E
Orthometric Elevation = 49.88'
Ellipsoid Height= -39.68'
Geoid: 12A
Datum Source & Adjustment:
NAD 83 CORS Adjustment

Reference Frame Used: NAD '83 (CORS 2011) (EPOCH: 2010)
Vertical Adjustment used: NAVD '88 (CORS 2011 ADJUSTMENT)
General Location: C.O.H. BRASS DISK SET APPROXIMATELY 20FT EAST OF EAST MEDIAN NOSE ON BELLAIRE BLVD. AT INTERSECTION WITH STELLA LINK RD. IN MEDIAN ISLAND.
Date Set: 2-25-2014 Type of Mark: C. O. H. Brass Disk
3 Nearest project control points (bearings and distances stated below):

5255-7704 TO 16 Az	85° 56' 52"	DISTANCE 203.30'
5255-7704 TO 17 Az	321° 42' 57"	DISTANCE 77.02'
5255-7704 TO 18 Az	276° 53' 38"	DISTANCE 355.94'

NOTE:
1. Bearings are grid bearings.
2. Scale Factor = 0.999885947
3. Surface= Grid / S.F.

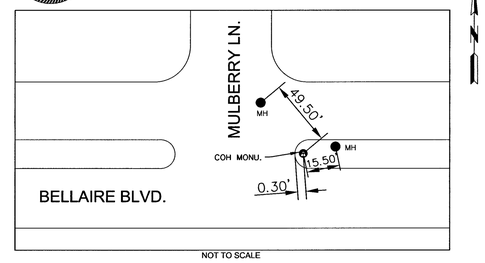
STATE OF TEXAS REGISTERED JOHN A. GUAJARDO 5945 PROFESSIONAL LAND SURVEYOR

Surveyed by: JAG Engineering, Inc.
9900 Westpark Dr., Ste. 269
Houston, TX 77063

City of Houston, Harris County, Texas

CITY OF HOUSTON

CITY SURVEY 5255-7204
SITE CONTROL MONUMENT



NOT TO SCALE

Project WBS# S-000700-A017-3
Texas Coordinate System of 1983,
South Central Zone, U. S. Survey Feet
X= 3,095,475.24 (GRID)
Y= 13,821,312.80 (GRID)
Lat.= 29° 42' 21.19510" N
Lon.= 95° 26' 57.63693" W

Keymap Page: 531-H
Orthometric Elevation = 51.57'
Ellipsoid Height= -37.96'
Geoid: 12A
Datum Source & Adjustment:
NAD 83 CORS Adjustment

Reference Frame Used: NAD '83 (CORS 2011) (EPOCH: 2010)
Vertical Adjustment used: NAVD '88 (CORS 2011 ADJUSTMENT) BY CONVENTIONAL
General Location: 2" BRASS DISK FOUND IN CONC. IN EAST MEDIAN NOSE OF BELLAIRE AT THE INTERSECTION WITH MULBERY LANE. (CITY OF BELLAIRE BENCHMARK #29)
Date Set: DEC. 2004 Type of Mark: Brass Disk
3 Nearest project control points (bearings and distances stated below):

5255-7204 TO 21 Az	85° 32' 04"	DISTANCE 1,369.35'
5255-7204 TO 22 Az	87° 29' 20"	DISTANCE 1,008.28'
5255-7204 TO 23 Az	87° 02' 13"	DISTANCE 554.46'

NOTE:
1. Bearings are grid bearings.
2. Scale Factor = 0.999885947
3. Surface= Grid / S.F.

STATE OF TEXAS REGISTERED JOHN A. GUAJARDO 5945 PROFESSIONAL LAND SURVEYOR

Surveyed by: JAG Engineering, Inc.
9900 Westpark Dr., Ste. 269
Houston, TX 77063

City of Houston, Harris County, Texas

NOTES:

1. BENCHMARK: CITY OF HOUSTON MONUMENT 5255-7704
BEING A BRASS DISK SET APPROXIMATELY 20' EAST OF EAST MEDIAN NOSE ON BELLAIRE BLVD. AT INTERSECTION WITH STELLA LINK RD. IN MEDIAN ISLAND WITHIN KEYMAP PAGE 532-E.
ELEV. = 49.88' NADV 88, (CORS 2011) GEOID 12A

2. DATUM:
TO COMPLY WITH CITY OF HOUSTON ORDINANCE NO. 2003-1292
ALL BEARINGS AND COORDINATES SHOWN HEREON ARE REEFRENCED TO THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (NAD83).

NAVD 88 (CORS 2011 ADJUSTMENT).

3. ALL DISTANCES SHOWN HEREON ARE SURFACE DISTANCES. ALL COORDINATES SHOWN HEREON ARE GRID COORDINATES. TO CONVERT SURFACE VALUES, MULTIPLY BY A SCALE FACTOR OF 0.999885947.

4. THIS IS NOT A BOUNDARY SURVEY, THUS THE EXISTING RIGHT-OF-WAY SHOWN HEREON IS APPROXIMATE AND IS BASED ON THE BEST AVAILABLE EVIDENCE FOUND IN THE FIELD AT THE TIME OF THE SURVEY.

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JAG ENGINEERING, INC.
TEXAS LICENSED SURVEYING FIRM
NO. 100171-00

STATE OF TEXAS REGISTERED JOHN A. GUAJARDO 5945 PROFESSIONAL LAND SURVEYOR
12-12-14

SURVEYED BY:
JAG ENGINEERING, INC.
FB. NO. : P- 5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

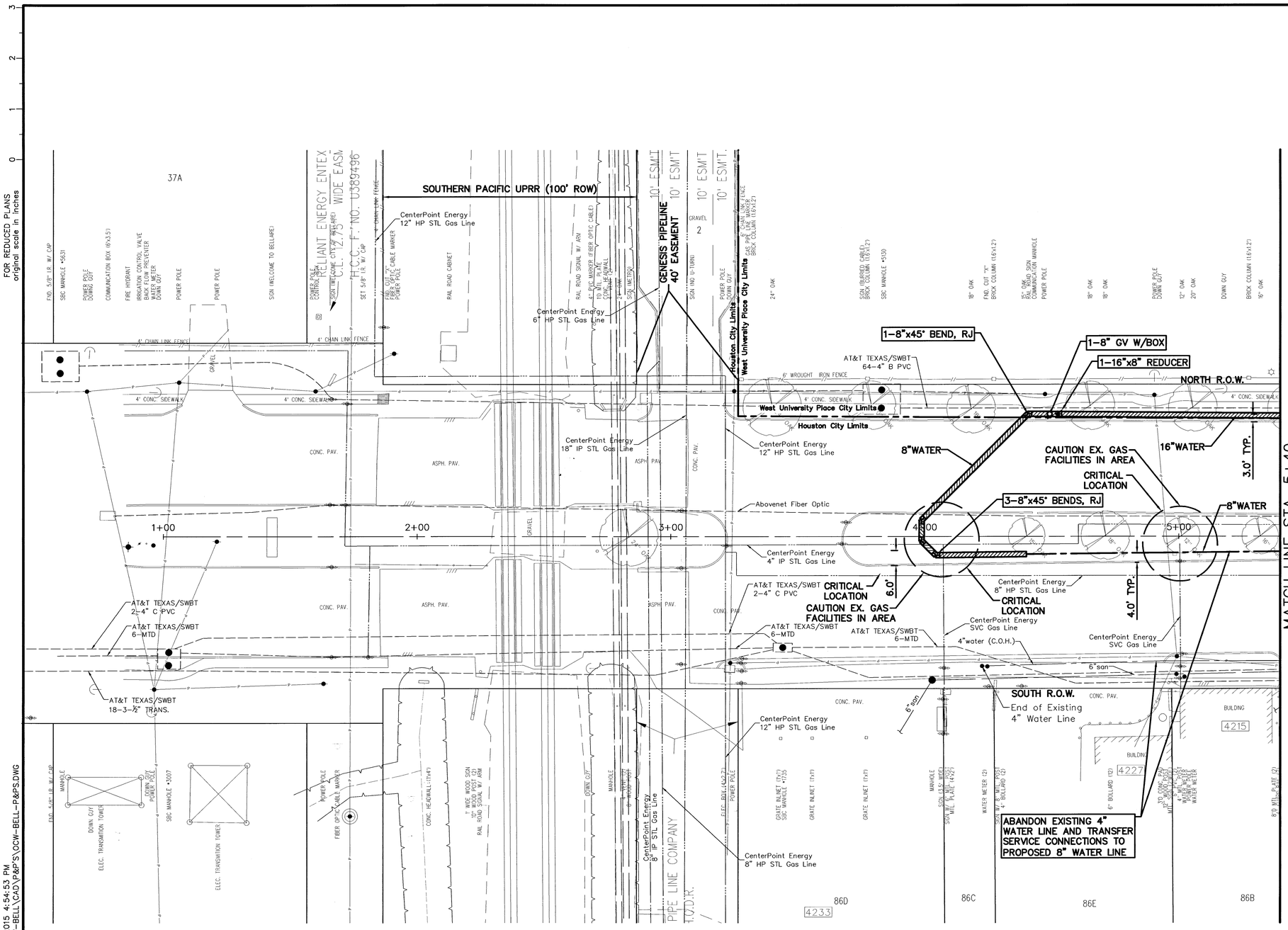
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD
C.O.H. MONUMENT SWING TIES

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 10 OF 59	

FOR REDUCED PLANS original scale in inches

PLOTTED ON: 12/15/2014
FILE NAME: H:\Proj-2014\14008\DGN\Survey Control Map\COH MONUMENT SWING TIES.dgn

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #23
BELLAIRE BLVD., STA 1+77.12, 5.64' LT ELEV.: 54.81'

TO ARRANGE FOR LINES TO BE BURIED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN
Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/15/2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

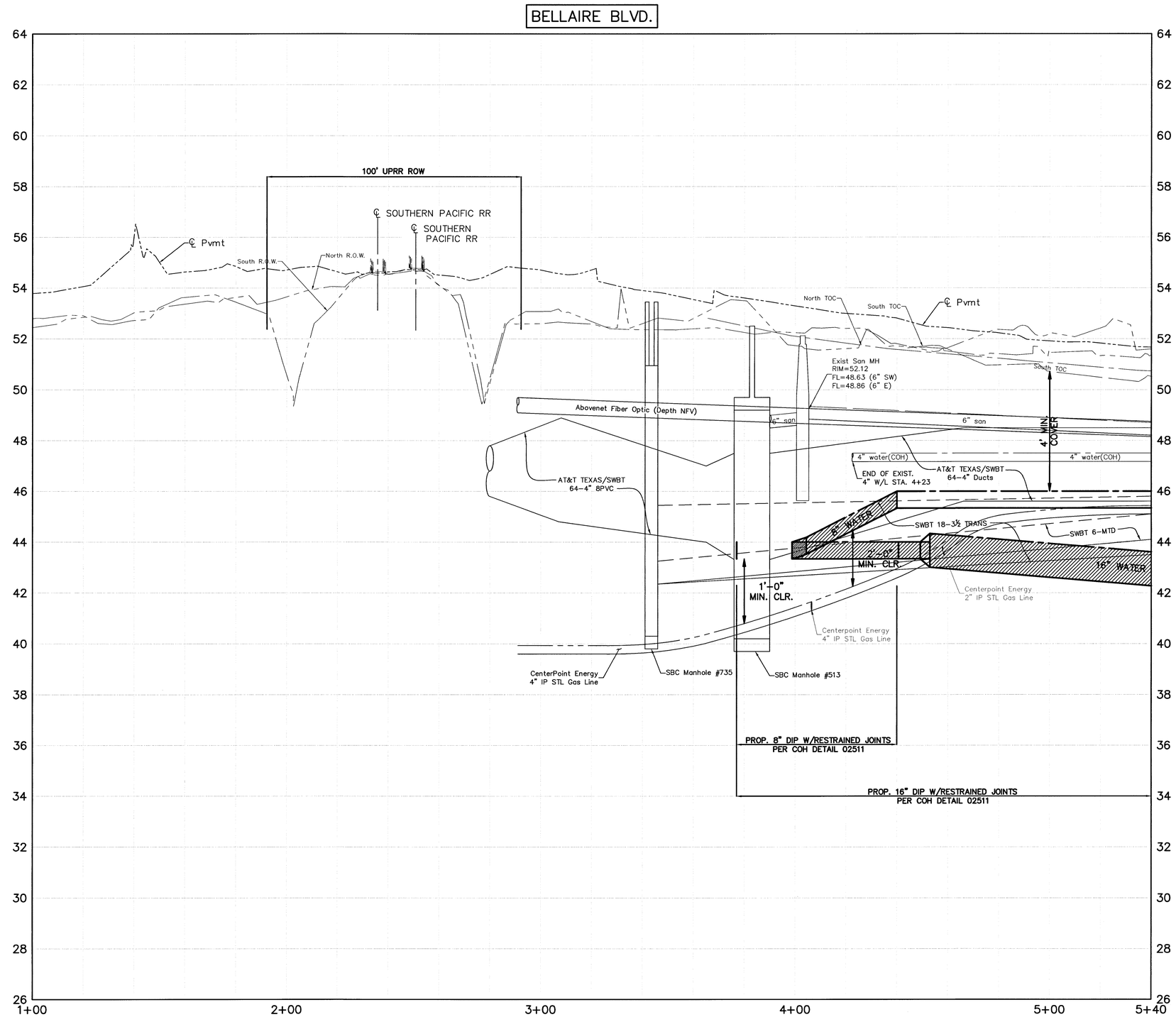
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 1+00.00 TO STA. 5+40.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 11 OF 59	

PLOTTED ON: Wednesday, April 15, 2015 4:54:53 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG



FOR REDUCED PLANS original scale in inches

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #23
BELLAIRE BLVD., STA 1+77.12, 5.64' LT ELEV.: 54.81'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MARKED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS L.A.W TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that gas lines shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Authorization valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

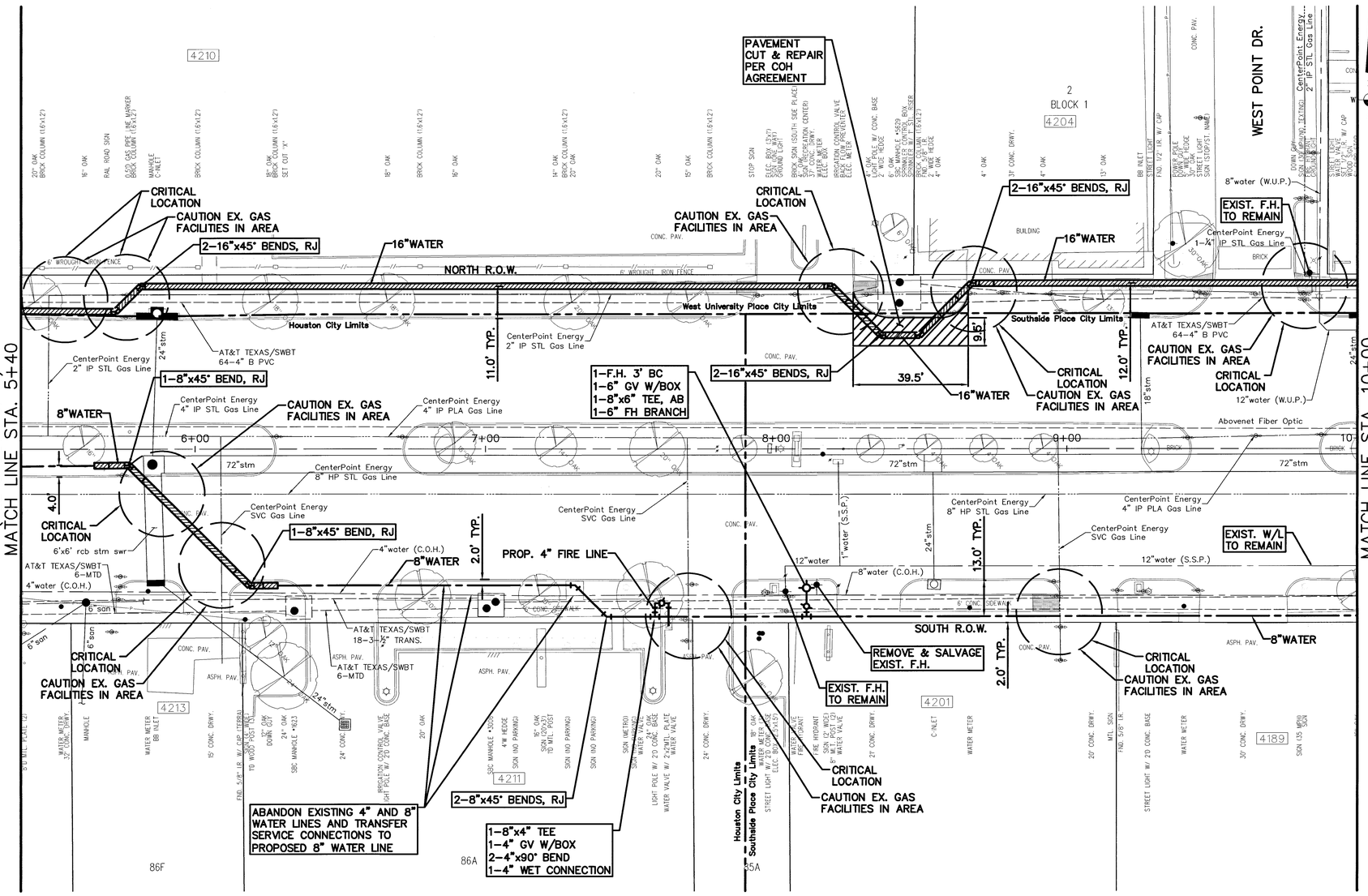
PLAN
FROM STA. 1+00.00 TO STA. 5+40.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 12 OF 59	

PLOTTED ON: Wednesday, April 15, 2015 4:55:04 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches

(SEE SHEET NO. 11)
MATCH LINE STA. 5+40



(SEE SHEET NO. 15)
MATCH LINE STA. 10+00

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #22
BELLAIRE BLVD., STA. 6+31.04, 2.27' LT ELEV.: 50.95'

TO AVOID FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
P. 47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

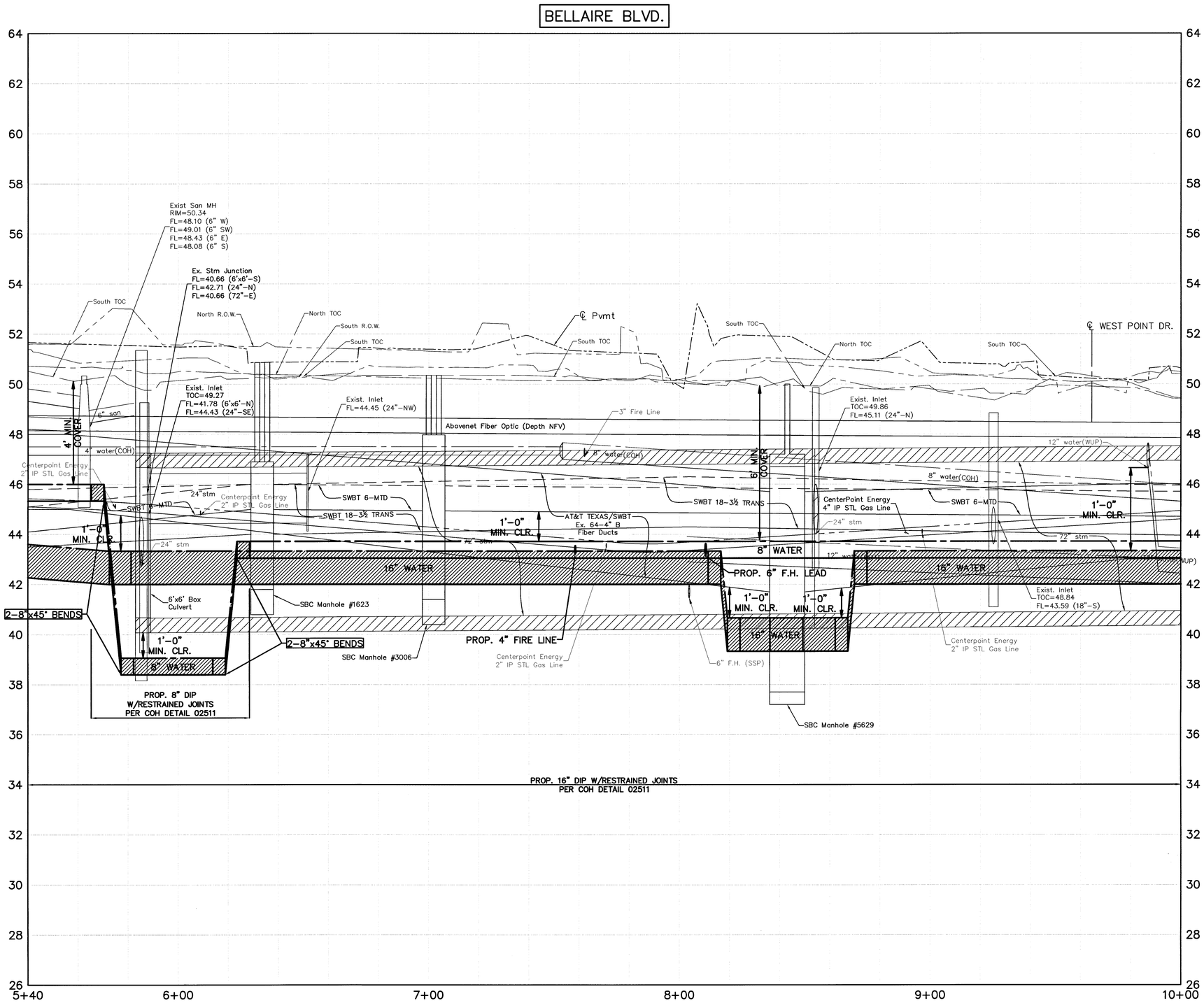
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 5+40.00 TO STA. 10+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 13 OF 59	

PLOTTED ON:Wednesday, April 15, 2015 4:55:15 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&PS\OCW-BELL-P&PS.DWG



FOR REDUCED PLANS
original scale in inches

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #22
BELLAIRE BLVD., STA. 6+31.04, 2.27' LT ELEV.: 50.95'

TO AVOID FOR LINES TO BE STAKED OFF OR MOVED CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16/15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS 4/16/2015 OMAR J. CORREDOR 47746 REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

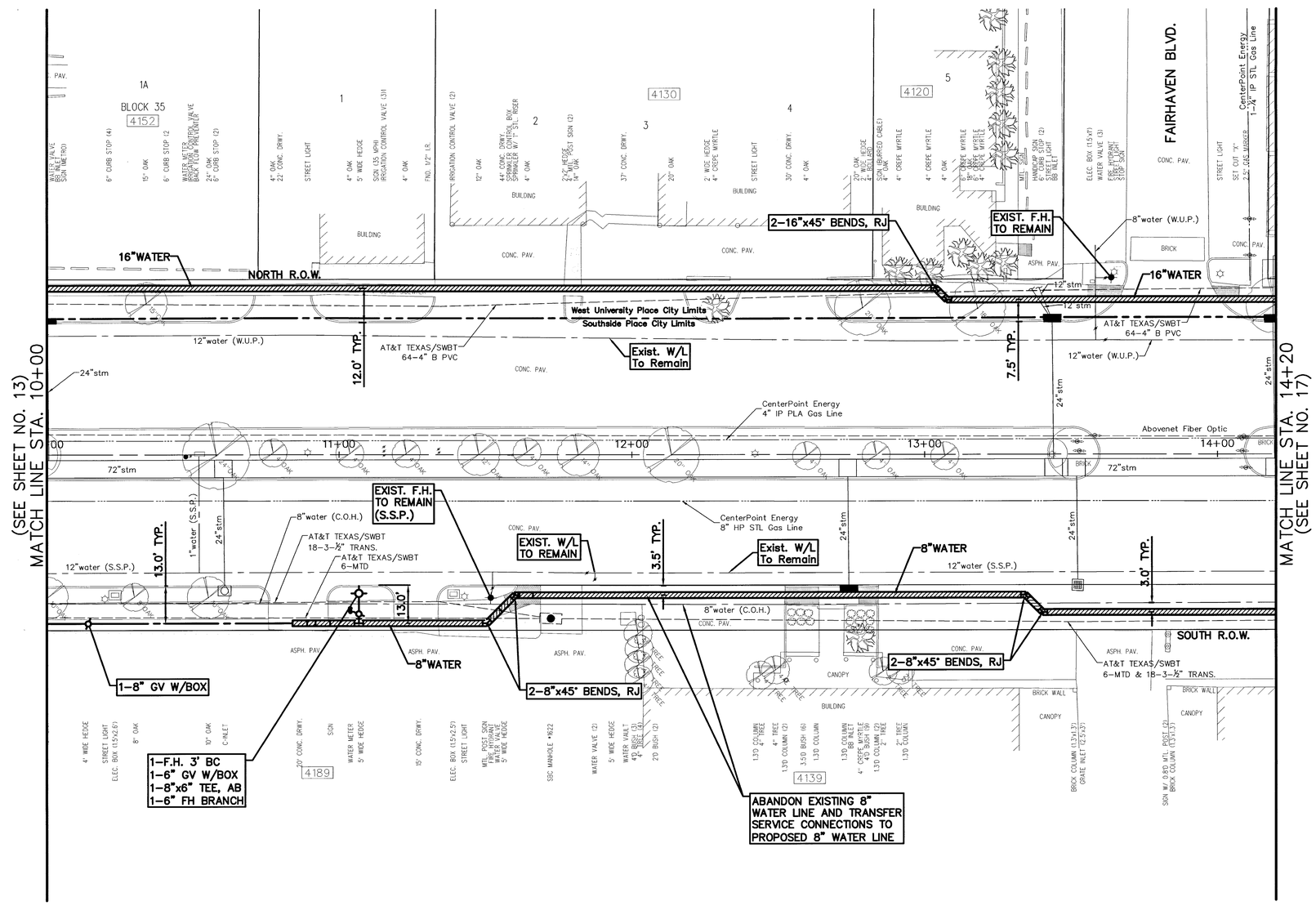
PROFILE
FROM STA. 5+40.00 TO STA. 10+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
HORIZ. 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 14 OF 59	

54210 DRAWING NUMBER

PLOTTED ON: Wednesday, April 15, 2015 4:55:29 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&PS\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #20
BELLAIRE BLVD., STA. 14+06.30, 0.6' LT ELEV.: 49.88'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown ONP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/15/2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

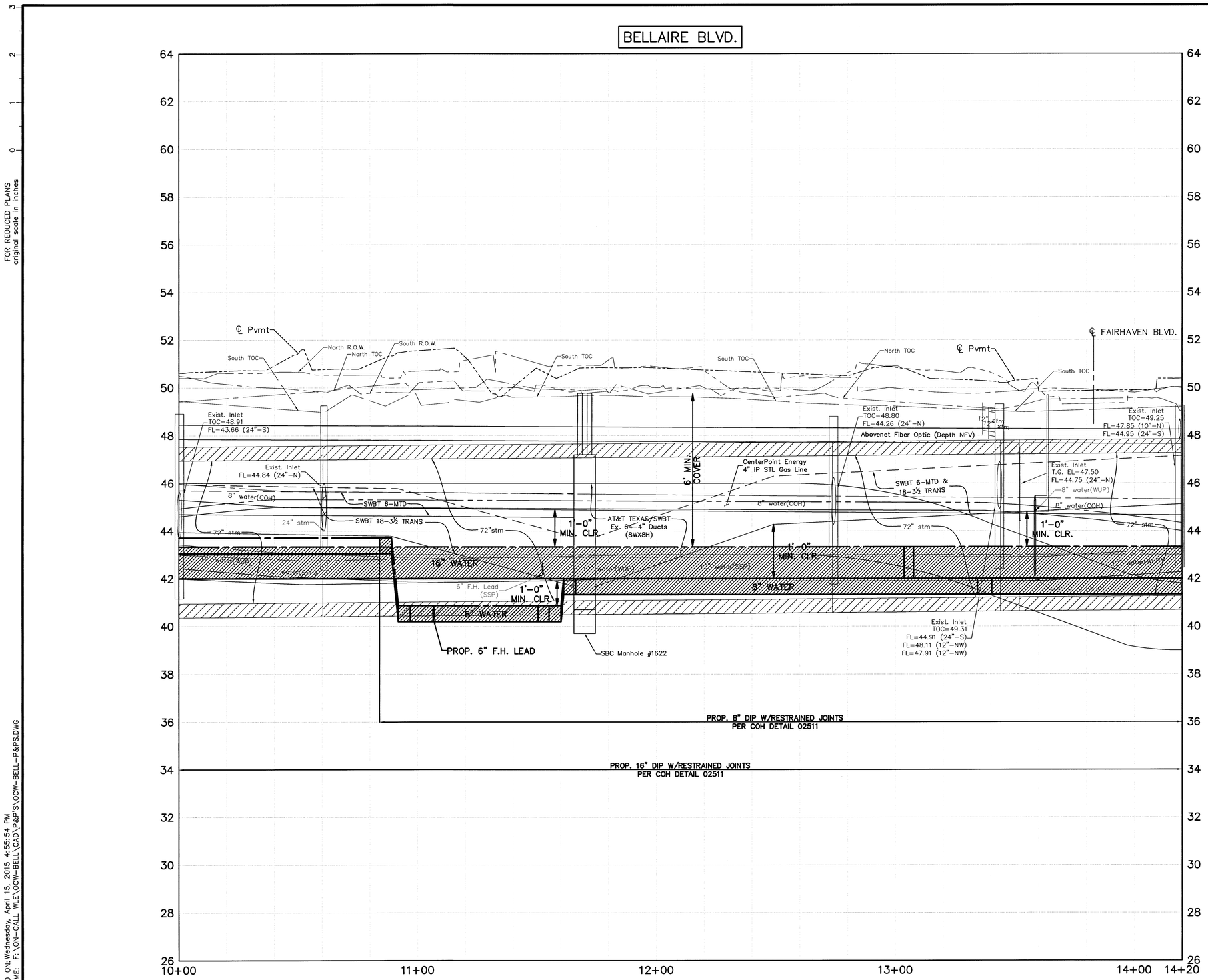
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 10+00.00 TO STA. 14+20.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ. 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 15 OF 59	

PLOTTED ON: Wednesday, April 15, 2015 4:55:40 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #20
BELLAIRE BLVD., STA. 14+06.30, 0.6' LT ELEV.: 49.88'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown ONP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/15/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 10+00.00 TO STA. 14+20.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 16 OF 59	

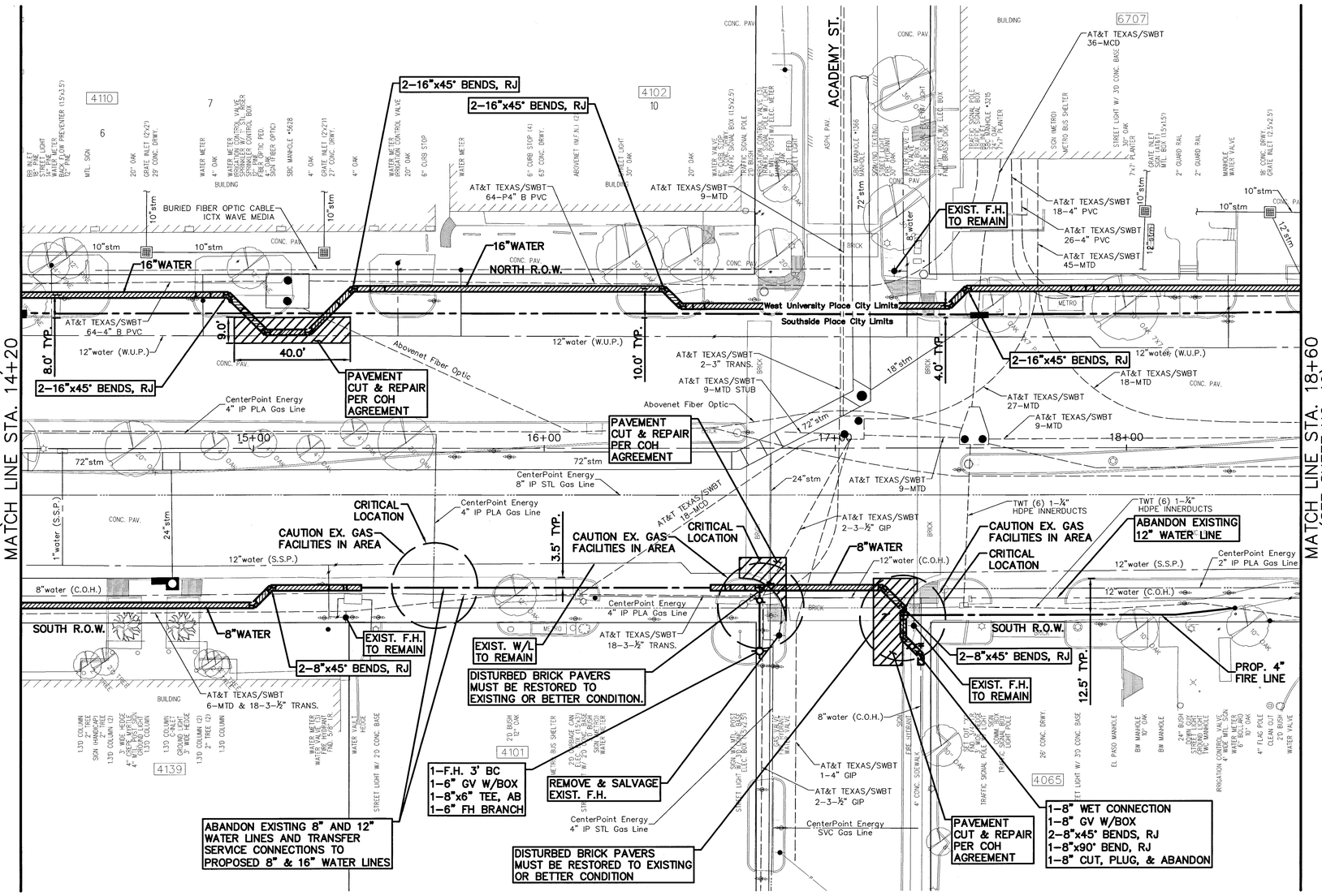
FOR REDUCED PLANS original scale in inches

PLOTTED ON: Wednesday, April 15, 2015 4:55:54 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches

(SEE SHEET NO. 15)
MATCH LINE STA. 14+20

MATCH LINE STA. 18+60
(SEE SHEET NO. 19)



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #19
BELLAIRE BLVD., STA. 17+29.37, 53.87' RT ELEV.: 50.18

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CentePoint Energy/ Natural Gas Facilities Verification ONLY.
(The Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature expires six months.

Date: 4/16/15
CentePoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(The Signature verifies stating underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UNDER LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE: Approved for underground conduit facilities only.

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CONSULTING ENGINEERS, INC.
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

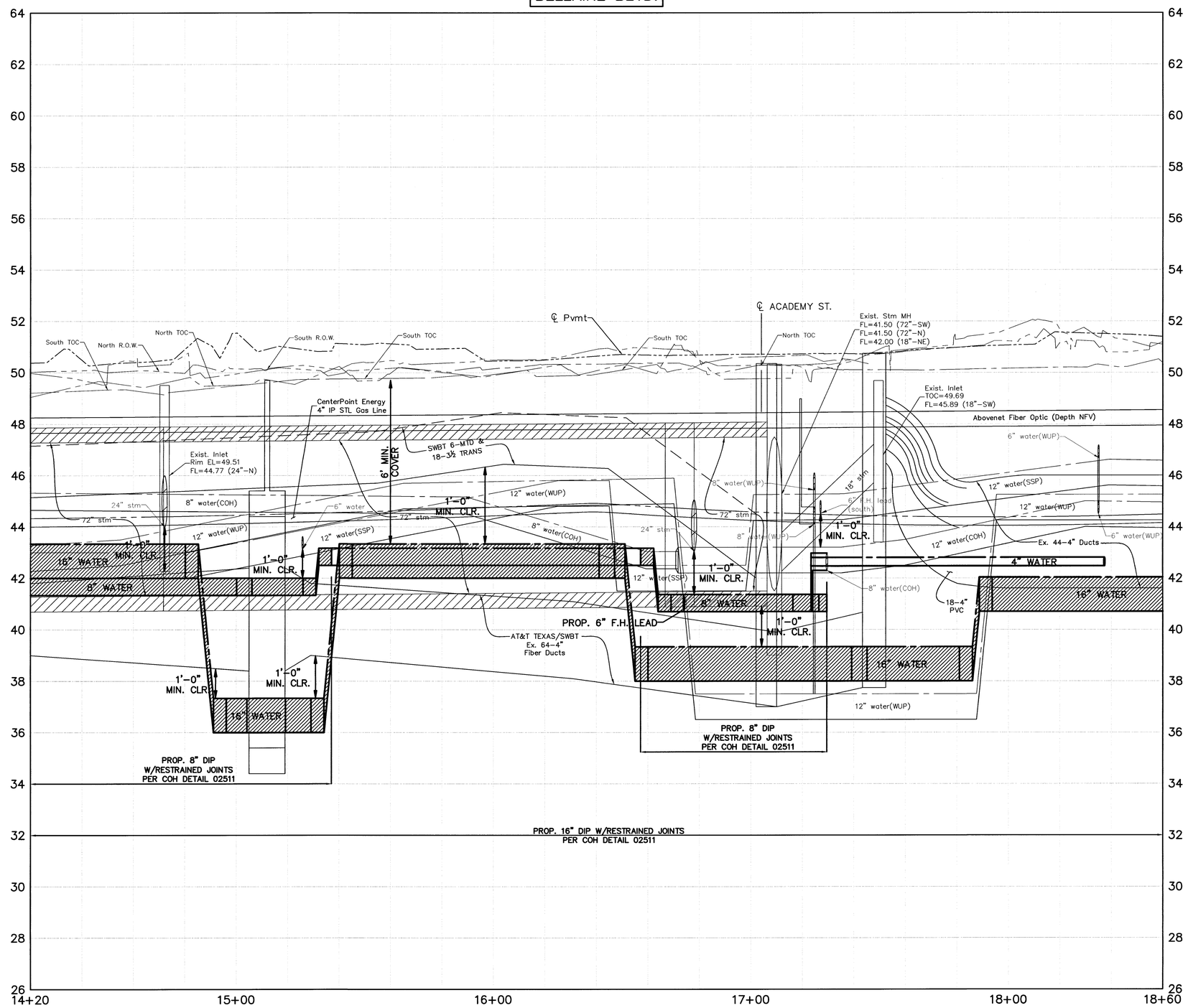
PLAN
FROM STA. 14+20.00 TO STA. 18+60.00

WBS NUMBER	CITY DWG. NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 17 OF 59	

PLOTTED ON:Friday, April 17, 2015 9:08:51 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches

BELLAIRE BLVD.



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #19
BELLAIRE BLVD., STA. 17+29.37, 53.87' RT ELEV.: 50.18

TO ARRANGE FOR LINES TO BE TURNED OFF OR MARKED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN.

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4-16-2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 14+20.00 TO STA. 18+60.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
HORIZ. 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 18 OF 59	

FILED
54210
DRAWING NUMBER

PLOTTED ON: Thursday, April 16, 2015 10:15:40 AM
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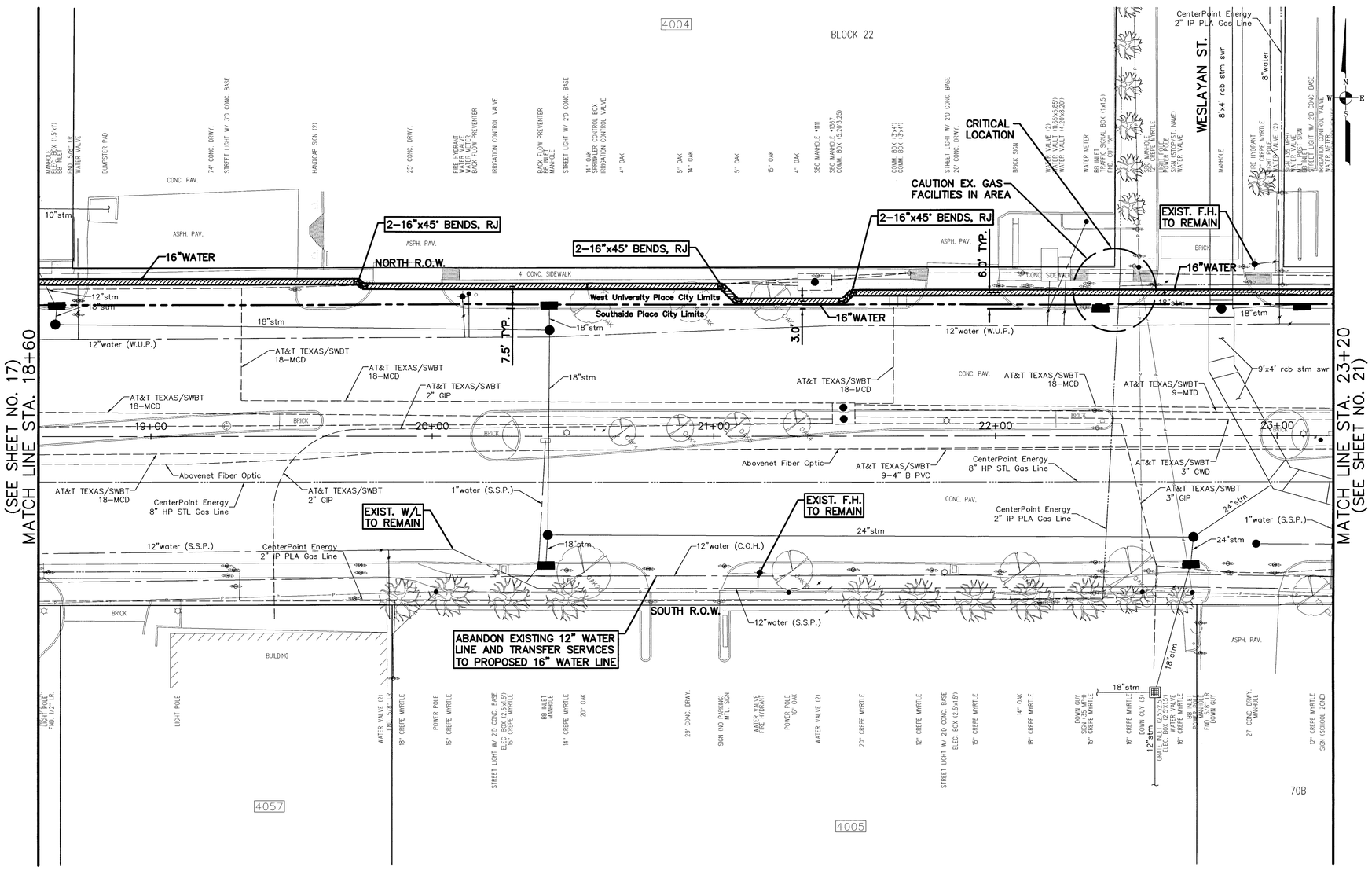

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #18
BELLAIRE BLVD., STA. 22+45.52, 52.25' LT ELEV.: 49.48'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(See service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE: Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/16/2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

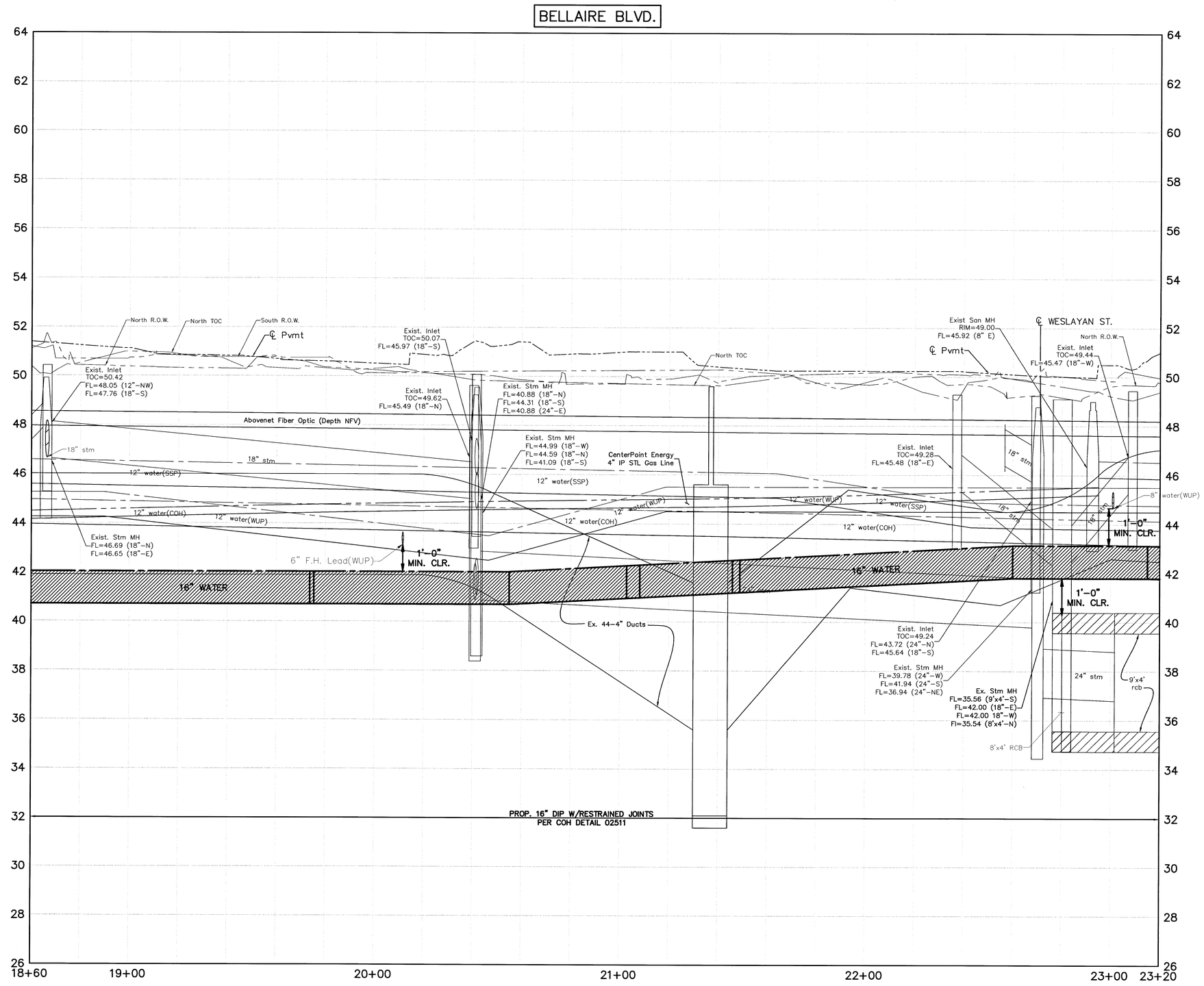
BELLAIRE BLVD.

PLAN
FROM STA. 18+60.00 TO STA. 23+20.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 19 OF 59	

FOR REDUCED PLANS
original scale in inches

PLOTTED ON: Friday, April 17, 2015 9:09:07 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG



FOR REDUCED PLANS
original scale in inches

PLOTTED ON: Thursday, April 16, 2015 10:16:05 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #18
BELLAIRE BLVD., STA. 22+45.52, 52.25' LT ELEV.: 49.48'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED CALL CENTERPOINT ENERGY AT 713-207-2222.

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VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
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(This Signature verifies that we have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16/15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4-16-2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

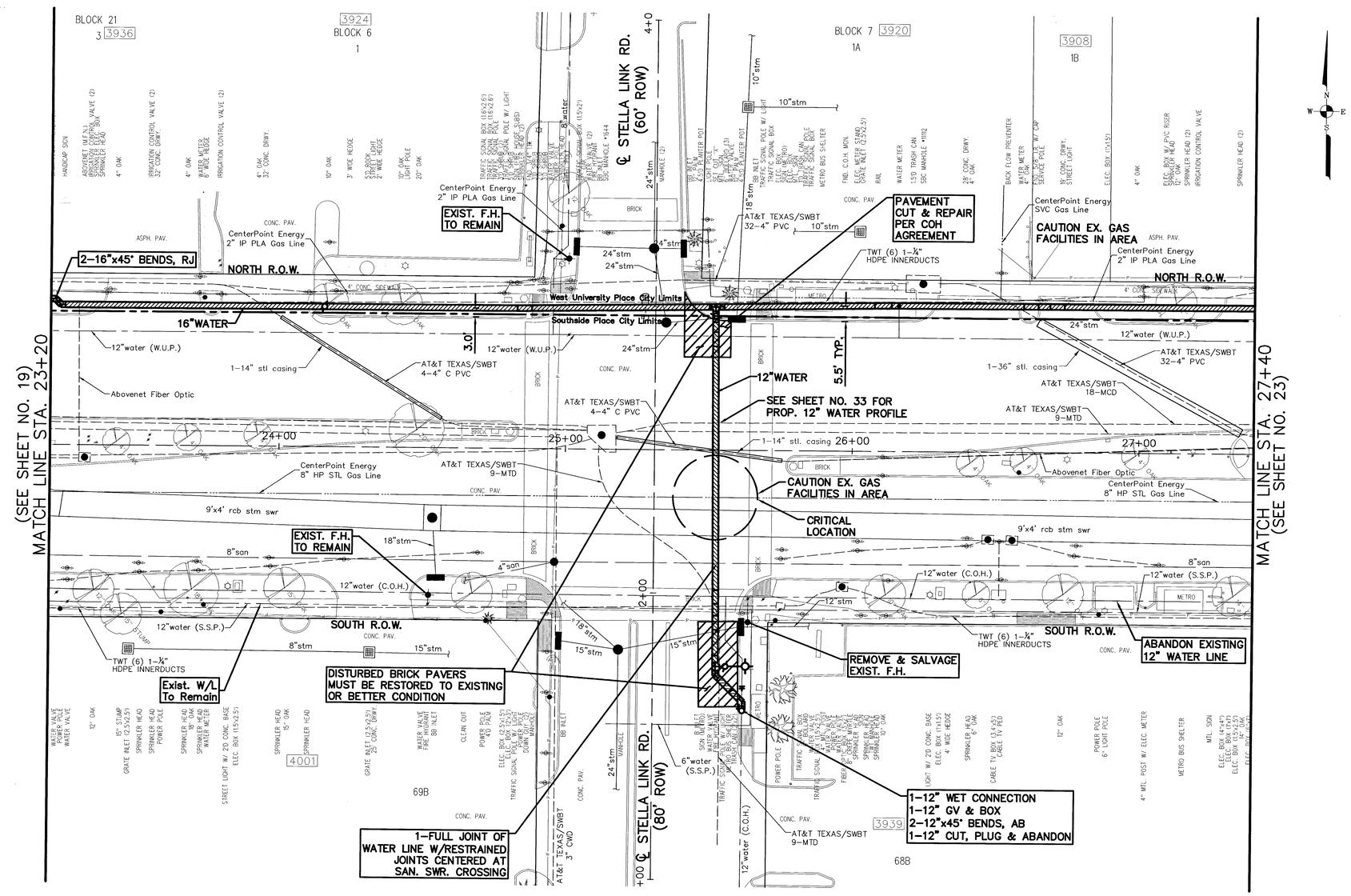
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 18+60.00 TO STA. 23+20.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 20 OF 59	

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #17
BELLAIRE BLVD., STA. 25+51.68, 57.25' LT ELEV.: 49.09'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN.
Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

CABLE/ Approved for underground conduit facilities only.
Date:

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

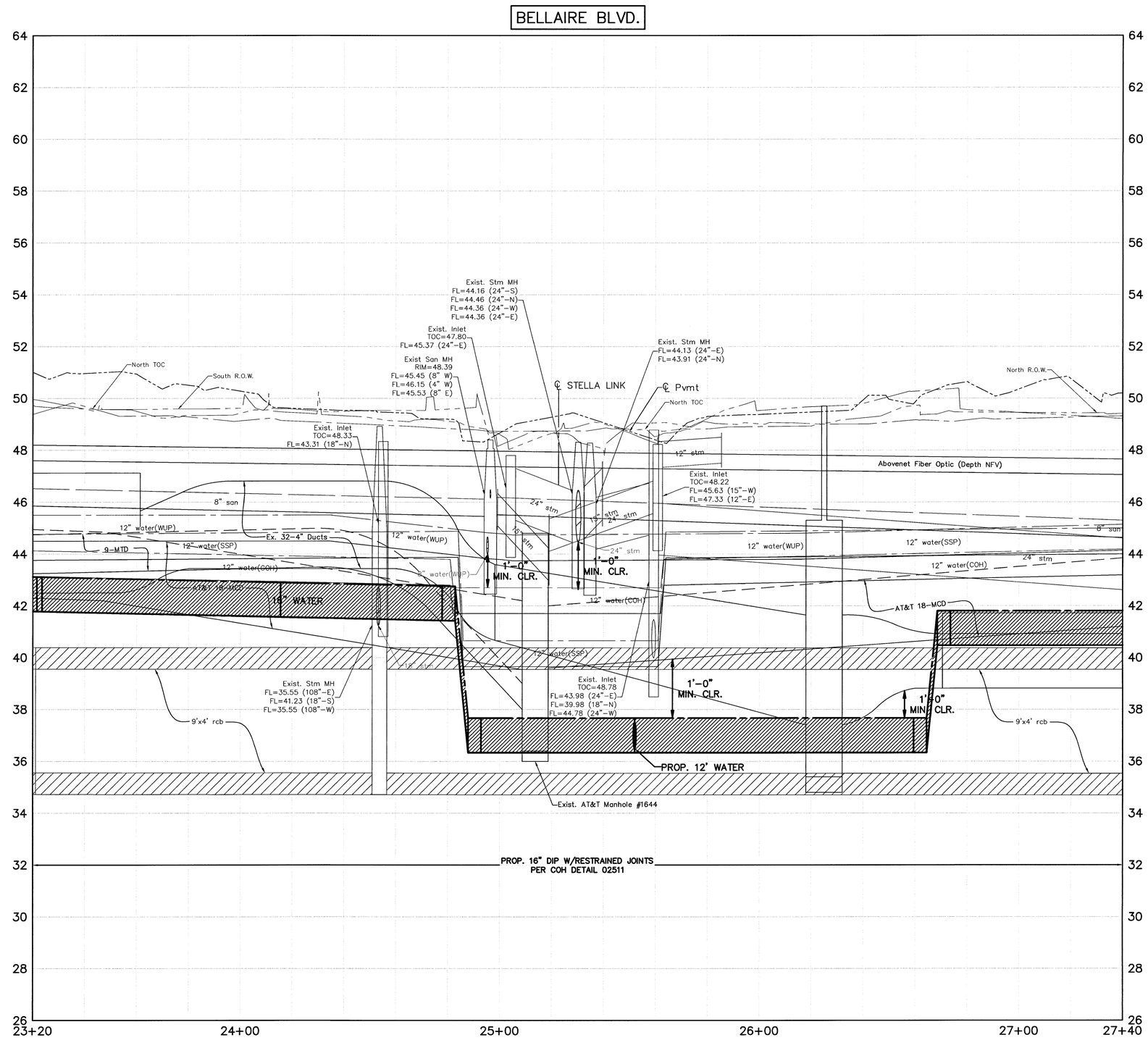
WATER LINE REPLACEMENT ALONG
BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 23+20.00 TO STA. 27+40.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 21 OF 59	

PLOTTED ON: Thursday, April 16, 2015 10:45:01 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG



FOR REDUCED PLANS
original scale in inches

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #17
BELLAIRE BLVD., STA. 25+51.68, 57.25' LT ELEV.: 49.09'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG FOR THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Simmon Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
Gas service lines are not shown.)
Signature valid for six months.

Simmon Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities, Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN.
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.
Date: 4-16-15

CABLE: Approved for underground conduit facilities only. Date:

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/15

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

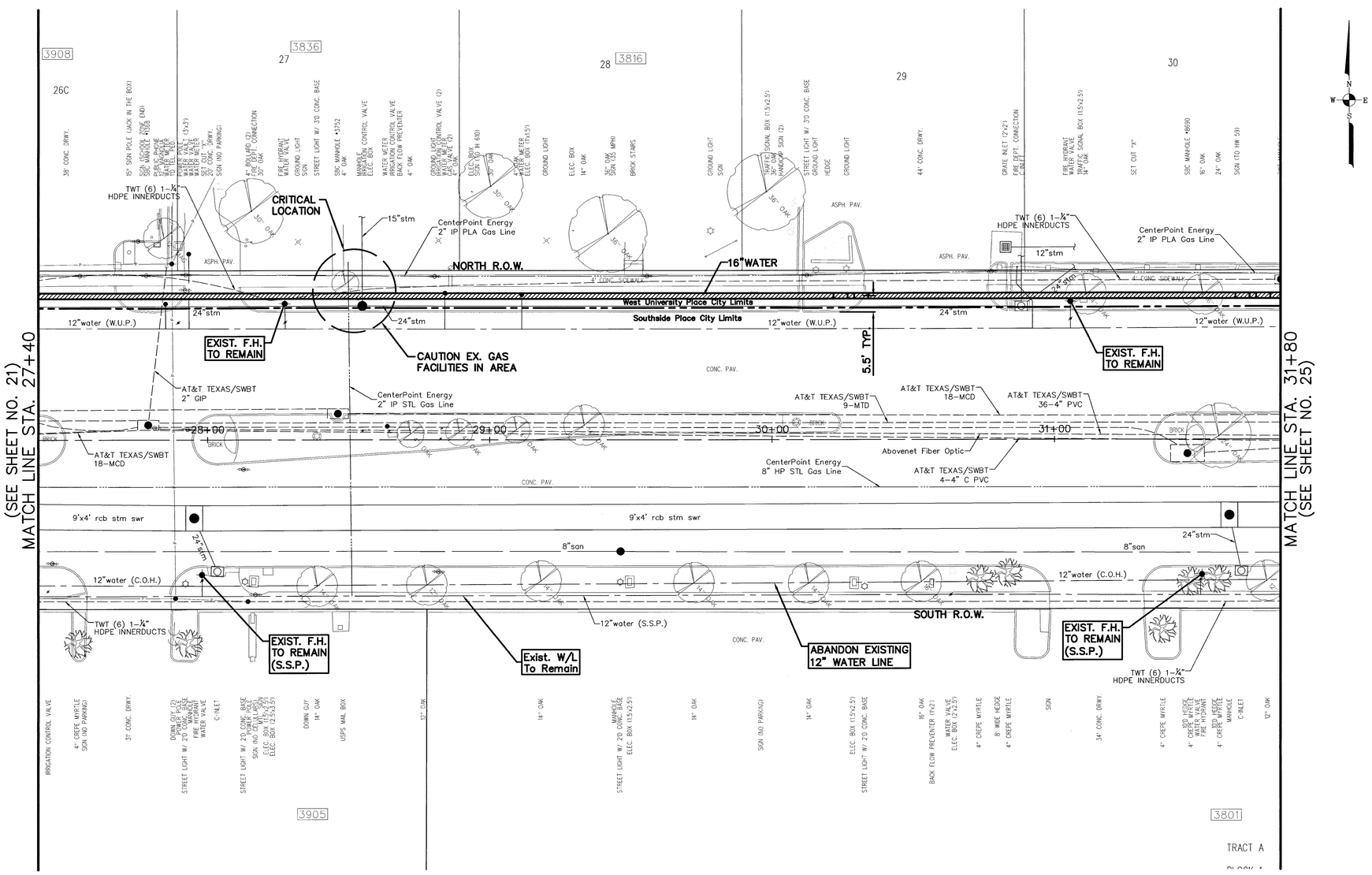
BELLAIRE BLVD.

PROFILE
FROM STA. 23+20.00 TO STA. 27+40.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 22 OF 59	

PLOTTED ON:Friday, April 17, 2015 9:09:21 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #16
BELLAIRE BLVD., STA. 28+00.08, 0.77' LT ELEV.: 50.14'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16/15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/16/2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

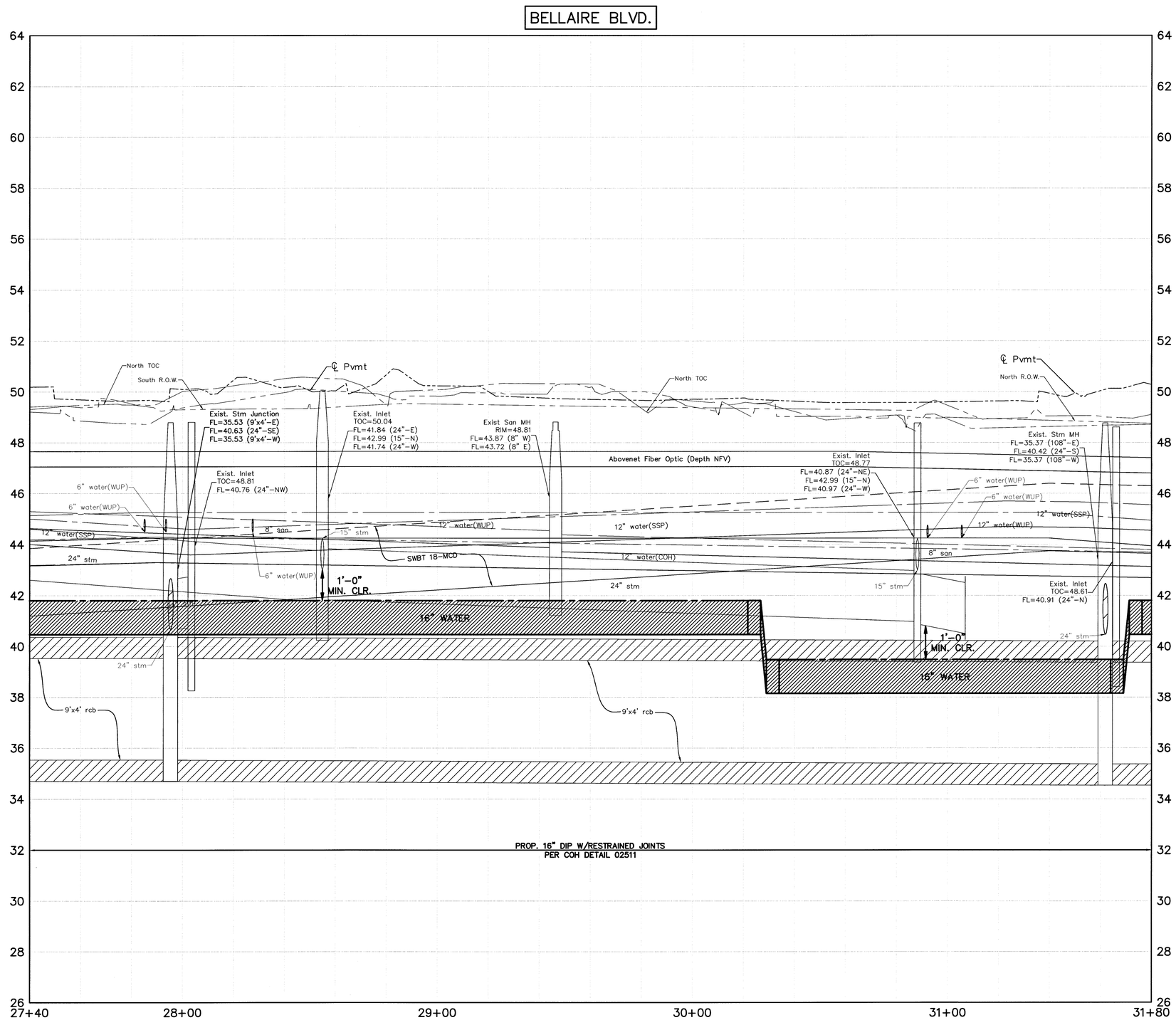
BELLAIRE BLVD.

PLAN
FROM STA. 27+40.00 TO STA. 31+80.00

WBS NUMBER	CITY DWG. NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 23 OF 59	

PLOTTED ON: Thursday, April 16, 2015 9:42:35 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PPS.DWG

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #16
BELLAIRE BLVD., STA. 28+00.08, 0.77' LT ELEV.: 50.14'

NOTICE:
TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4-16-15

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 27+40.00 TO STA. 31+80.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 24 OF 59	

REGISTERED PROFESSIONAL ENGINEER 54210 DRAWING NUMBER

PLOTTED ON: Thursday, April 16, 2015 8:38:34 AM
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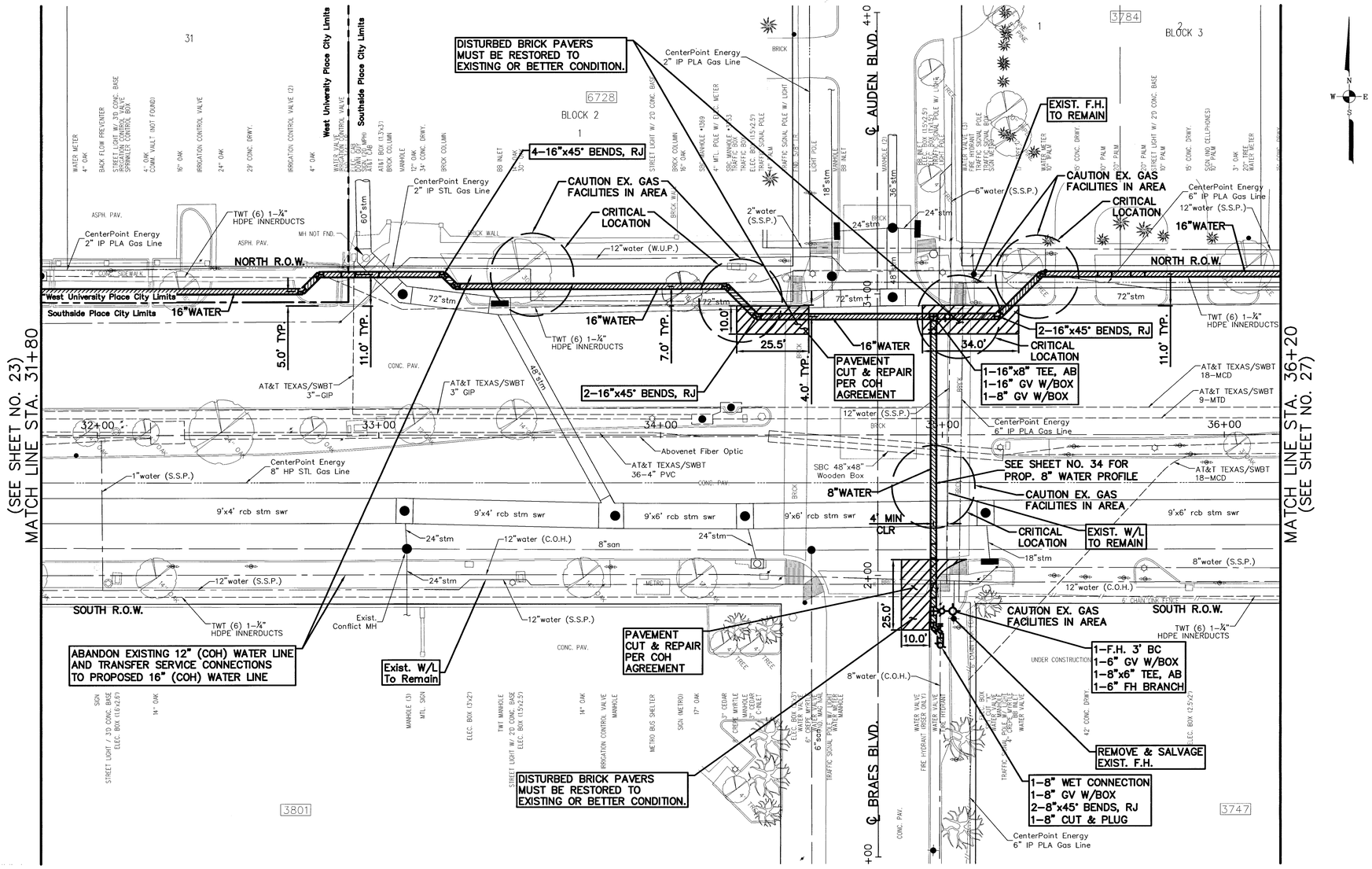
FOR REDUCED PLANS original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #15
BELLAIRE BLVD., STA. 31+27.79, 0.65' LT ELEV.: 49.63'

TO AVERAGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(Use signature verifies that gas line shown ON Natural Gas base correctly-not to be used for conflict verification.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(Use Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITIES LINES SHOWN.
Date: 4-16-15
Approval for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

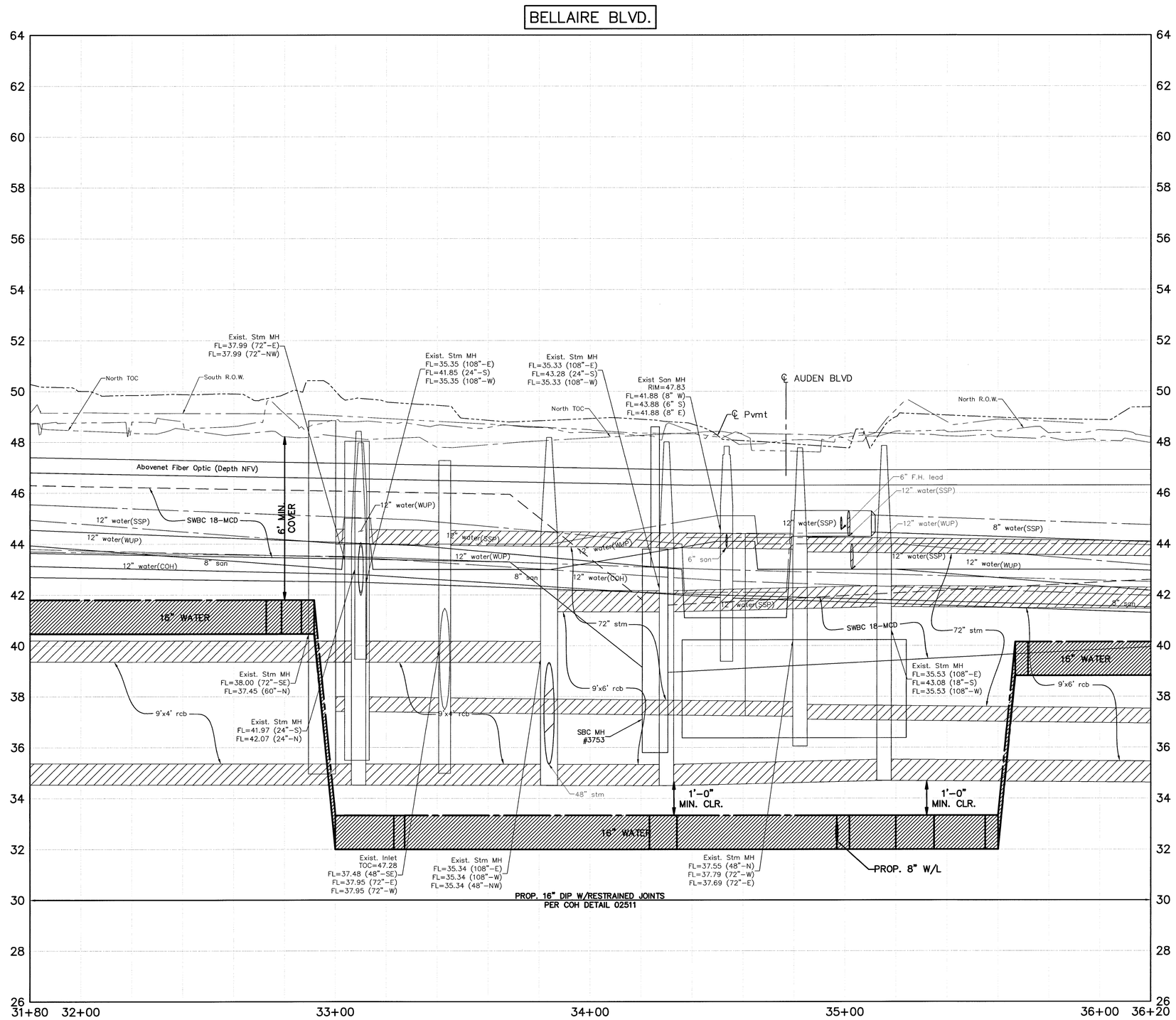
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 31+80.00 TO STA. 36+20.00

WBS NUMBER	CITY DWG. NO.
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 25 OF 59	

PLOTTED ON: Thursday, April 16, 2015 10:31:09 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG



FOR REDUCED PLANS
original scale in inches

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #15
BELLAIRE BLVD., STA. 31+27.79, 0.65' LT ELEV.: 49.63'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN
Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 31+80.00 TO STA. 36+20.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	FILED 54210 DRAWING NUMBER
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 26 OF 59	

PLOTTED ON: Thursday, April 16, 2015 9:56:49 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches

(SEE SHEET NO. 25)
MATCH LINE STA. 36+20

MATCH LINE STA. 40+60
(SEE SHEET NO. 29)

1–8" WET CONNECTION
2–8"x45° BENDS, AB
1–16"x8" TEE, AB
1–16" GV W/BOX
1–8" GV W/BOX
1–8" CUT, PLUG, & ABANDON

1–F.H., 8.0' B.C.
1–16"x6" TEE, AB
1–6" GV W/BOX
1–6" F.H. BRANCH

ABANDON EXISTING 12" (COH) WATER LINE AND TRANSFER SERVICE CONNECTIONS TO PROPOSED 16" (COH) WATER LINE

REMOVE & SALVAGE EXIST. F.H. (COH)

EXIST. F.H. TO REMAIN (S.S.P.)

Exist. W/L To Remain

CAUTION EX. GAS FACILITIES IN AREA

16"WATER

NORTH R.O.W.

SOUTH R.O.W.

C.O.S.S.P. WATER PLANT

BLOCK 3

CenterPoint Energy 6" IP PLA Gas Line

CenterPoint Energy 8" HP STL Gas Line

AT&T TEXAS/SWBT 18–MCD

AT&T TEXAS/SWBT 37–4" PVC

AT&T TEXAS/SWBT 36–4" PVC

AT&T TEXAS/SWBT 9–MTD

AT&T TEXAS/SWBT 6–MCD

Abovenet Fiber Optic

TWT (6) 1–¼" HDPE INNERDUCTS

12"water (S.S.P.)

12"water (W.U.P.)

12"water (C.O.H.)

8"water (S.S.P.)

8"water (C.O.H.)

1"water (S.S.P.)

9'x6' rcb stm swr

8"san

24"stm

18"stm

12"stm

72"stm

CONC. PAV.

6' CHAIN LINK FENCE

UNDER CONSTRUCTION

11.0' TYP.

13.0' TYP.

37+00

38+00

39+00

40+00

3776 3772 3768 3764 3760 3752 3748 3744 3747

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255–7704 ELEV.:48.88'

PROJECT T.B.M. #13
BELLAIRE BLVD., STA. 39+53.94, 53.09' RT ELEV.: 47.77'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MARKED CONTACT CENTERPOINT ENERGY AT 713–207–2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that gas lines shown ONP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature Valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988–5504, Fax (713) 988–1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC. TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4-16-2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

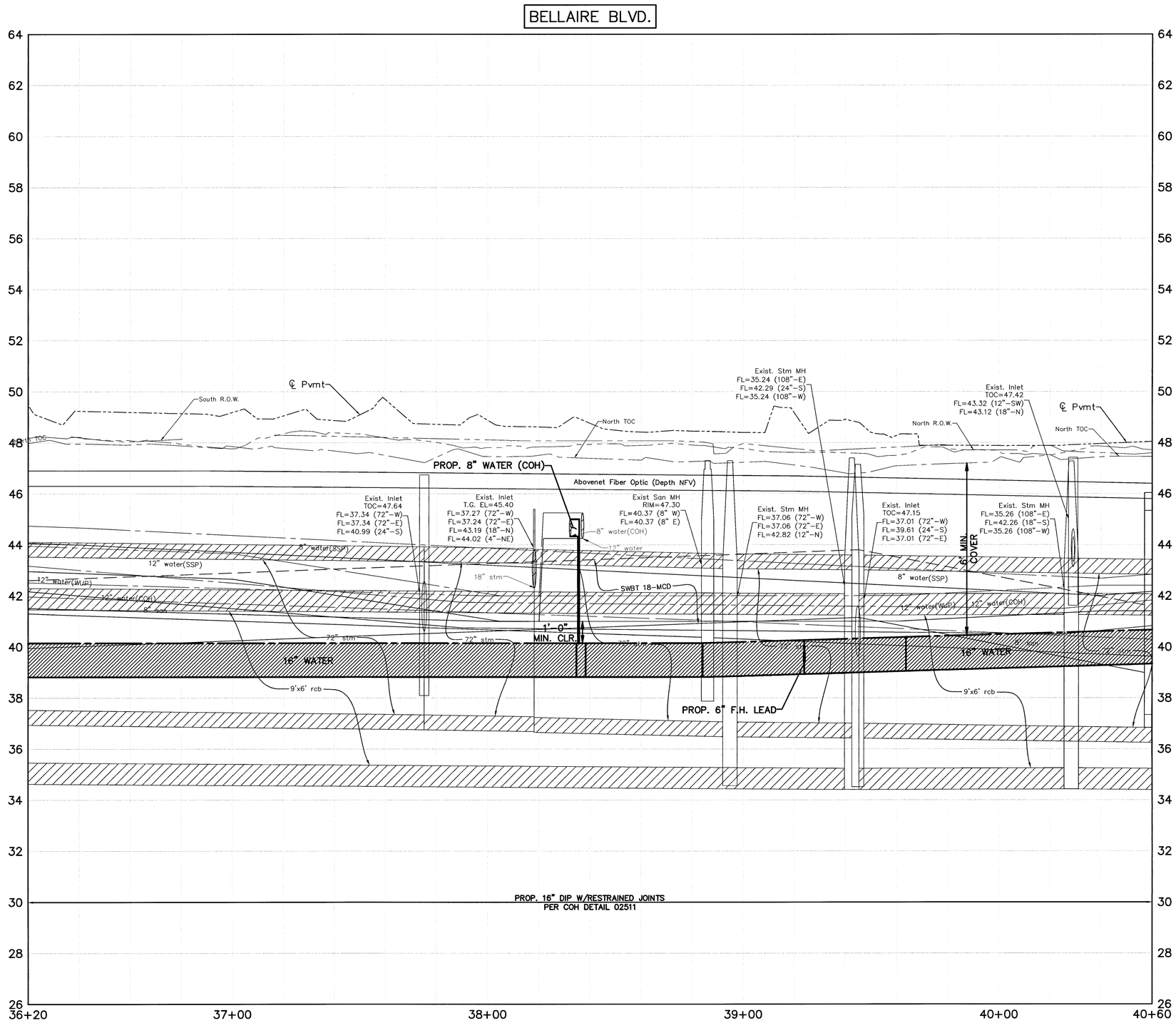
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 36+20.00 TO STA. 40+60.00

WBS NUMBER	CITY DWG NO.:
S–000700–A017–3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 27 OF 59	

PLOTTED ON: Thursday, April 16, 2015 8:39:11 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&P'S.DWG



FOR REDUCED PLANS
original scale in inches

PLOTTED ON: Thursday, April 16, 2015 8:39:24 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #13
BELLAIRE BLVD., STA. 39+53.94, 53.09' RT ELEV.: 47.77'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/16/2015
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

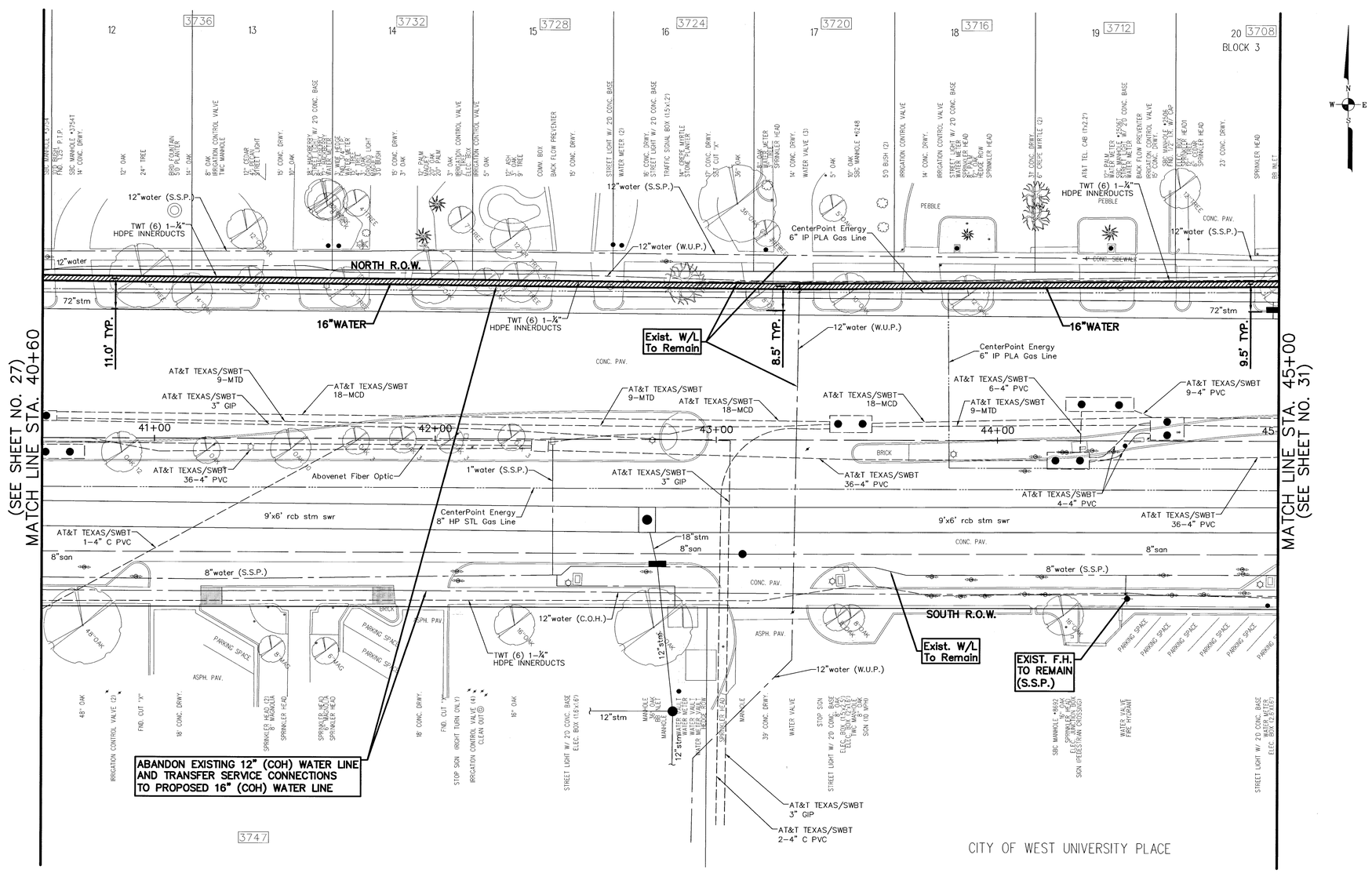
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 36+20.00 TO STA. 40+60.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 28 OF 59	

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #12
BELLAIRE BLVD., STA. 42+99.31, 1.16' LT ELEV.: 48.03'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies that underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PLAN
FROM STA. 40+60.00 TO STA. 45+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 29 OF 59	

54210

PLOTTED ON: Thursday, April 16, 2015 8:39:36 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches

PLOTTED ON: Thursday, April 16, 2015 8:39:46 AM
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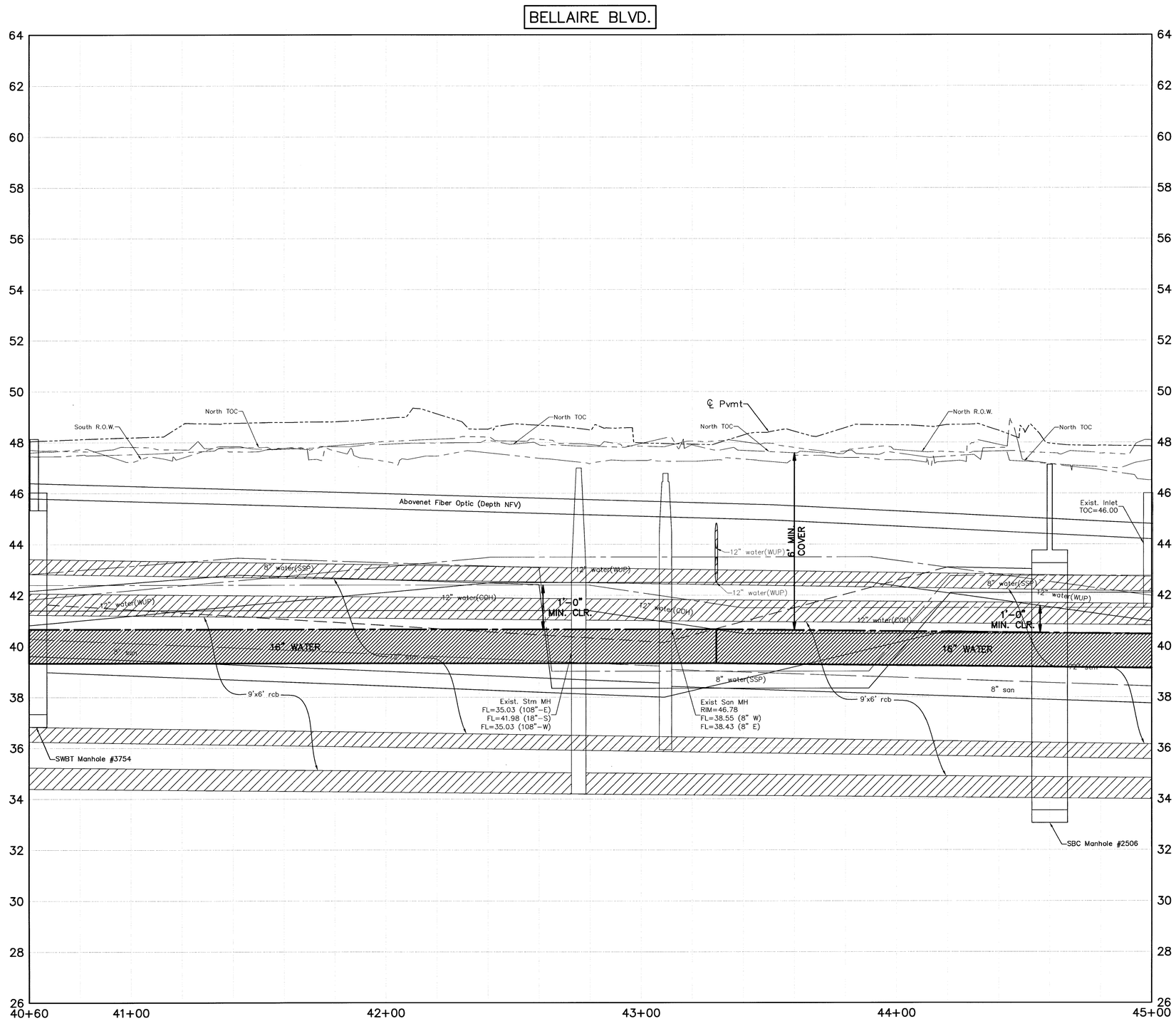

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #12
BELLAIRE BLVD., STA. 42+99.31, 1.16' LT ELEV.: 48.03'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

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VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
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(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16/15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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CONSULTING ENGINEERS, INC.
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
4/16/15
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

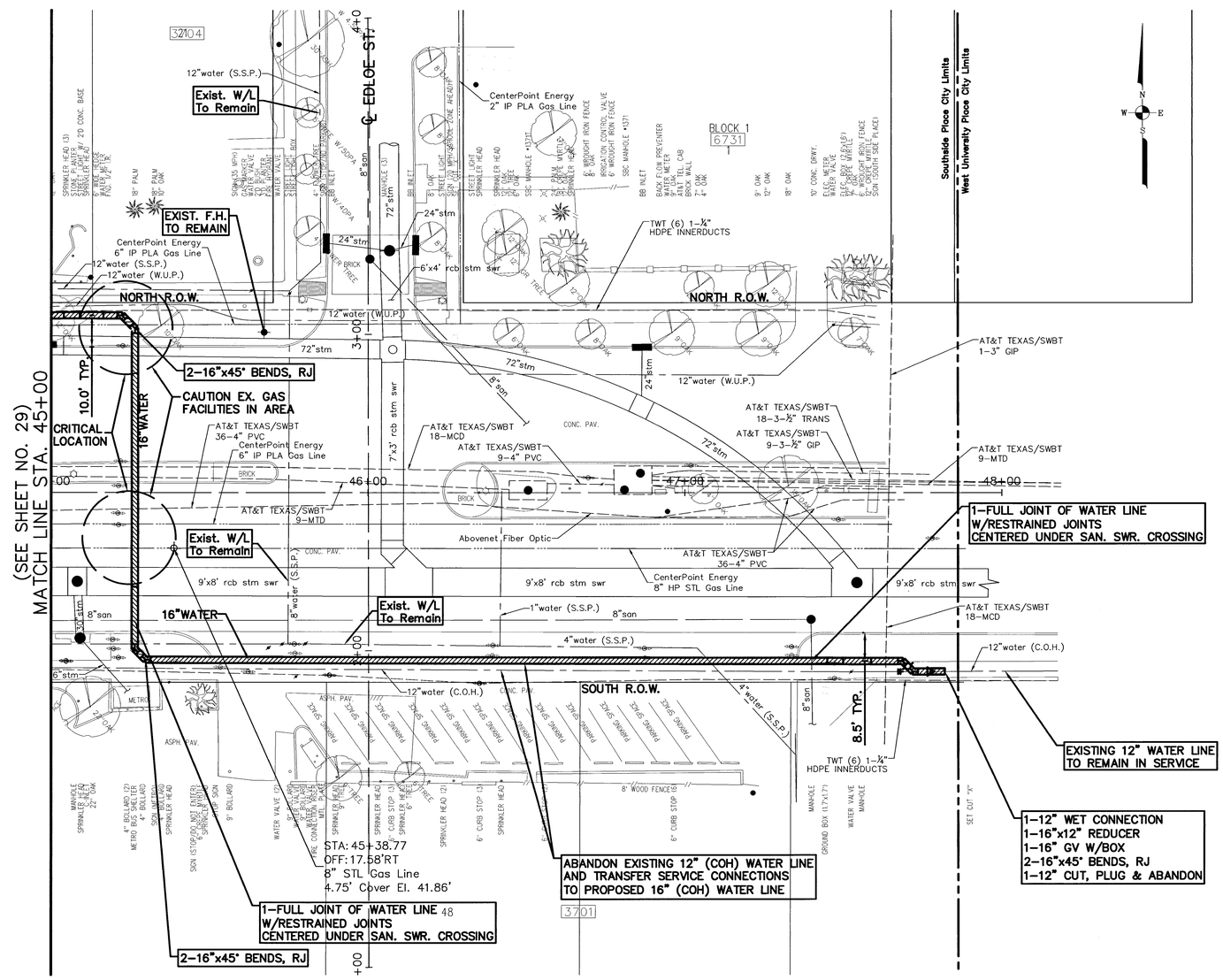
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BELLAIRE BLVD.

PROFILE
FROM STA. 40+60.00 TO STA. 45+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 30 OF 59	

FOR REDUCED PLANS original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #11
BELLAIRE BLVD., STA. 46+27.77, 0.76' LT ELEV.: 48.18'

TO AVOID FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature Valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS 4/16/2015 OMAR J. CORREDOR 47746 REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

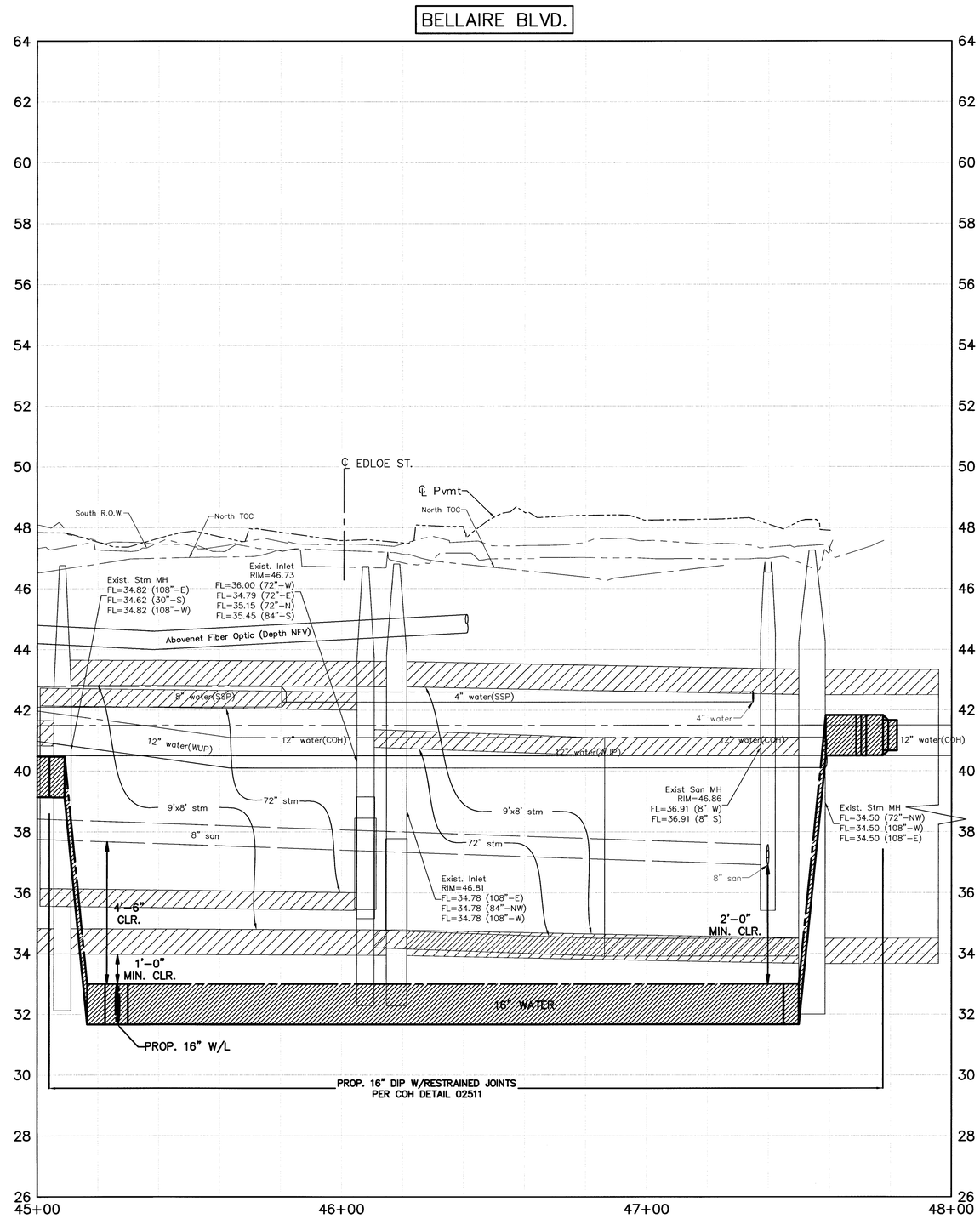
BELLAIRE BLVD.

PLAN
FROM STA. 45+00.00 TO STA. 47+00.00

WBS NUMBER	CITY DWG NO.
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 31 OF 59	

PLOTTED ON: Thursday, April 16, 2015 8:40:01 AM
FILE NAME: F:\ON-CALL WE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #11
BELLAIRE BLVD., STA. 46+27.77, 0.76' LT ELEV.: 48.18'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
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VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
Gas service lines are not shown.
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN

Date: 4/16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

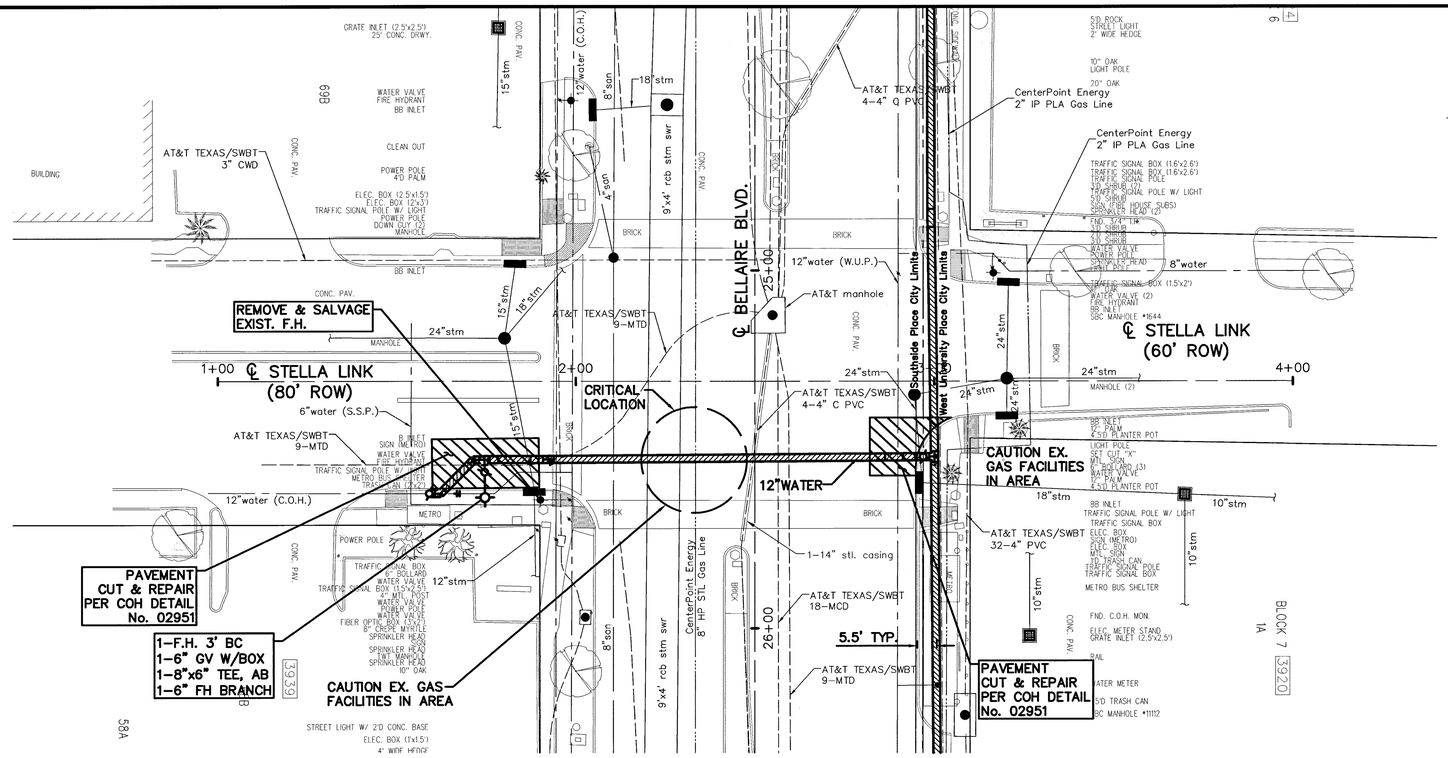
BELLAIRE BLVD.

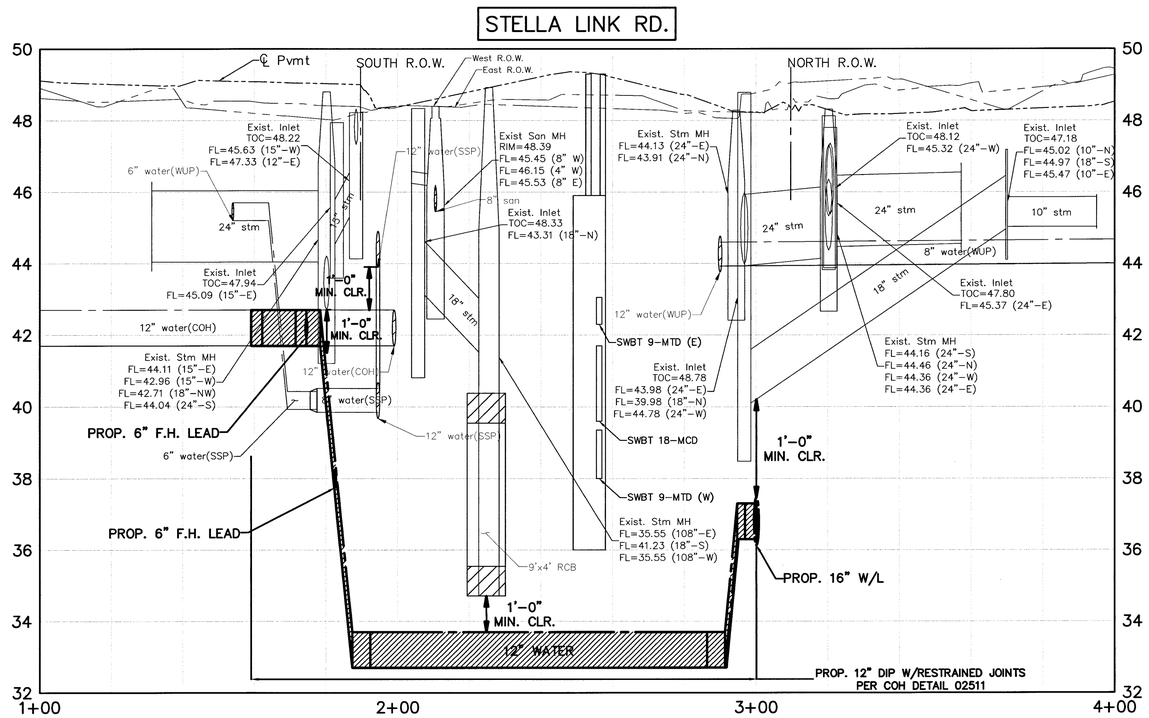
PROFILE
FROM STA. 45+00.00 TO STA. 47+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
HORIZ: 1"= 20' VERT: 1"=2'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 32 OF 59	

PLOTTED ON: Thursday, April 16, 2015 8:40:12 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS.DWG

FOR REDUCED PLANS
original scale in inches





LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
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- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #17
BELLAIRE BLVD., STA. 25+51.68, 57.25' LT ELEV.: 49.09'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
Signature valid for six months.

Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies existing underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UNDERGROUND LINES SHOWN.

Date: 4/16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE: Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS 4/16/15 OMAR J. CORREDOR 47746 REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

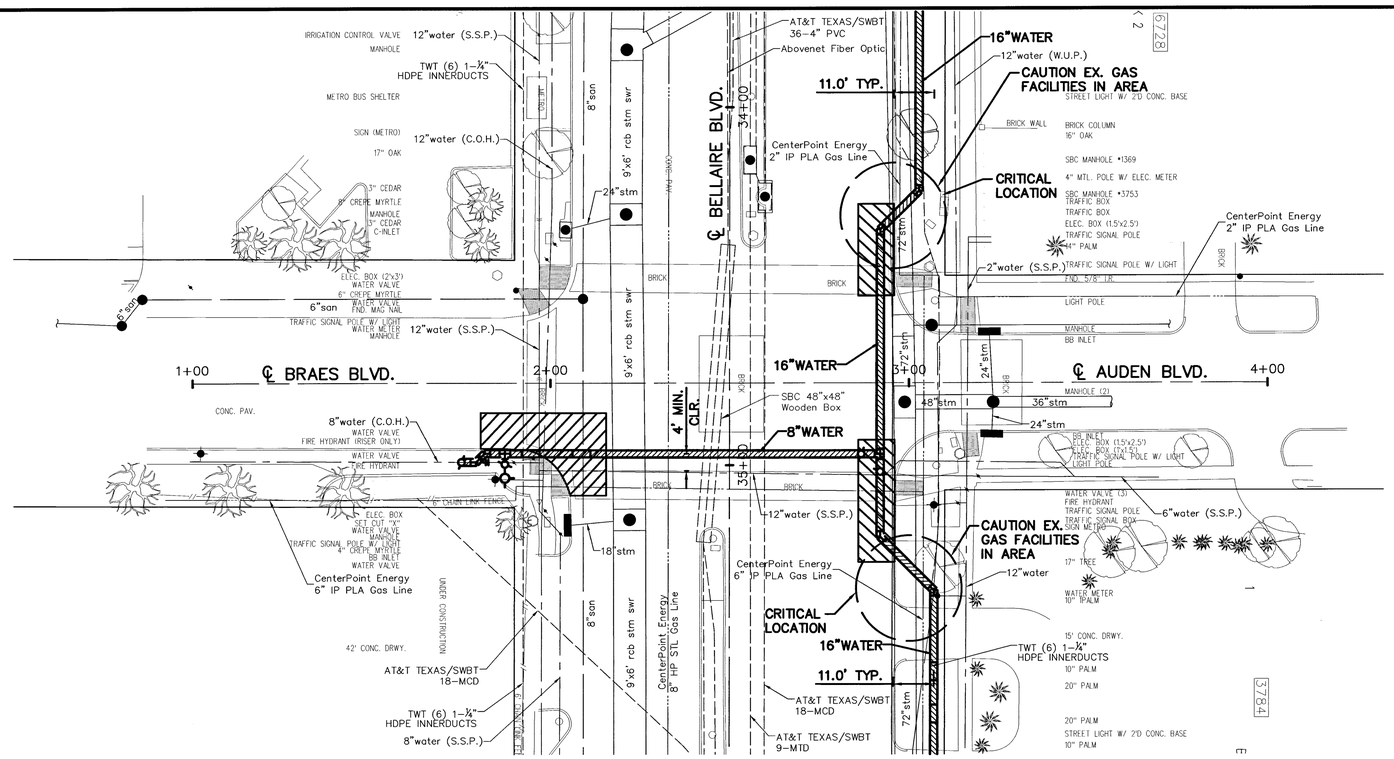
STELLA LINK @ BELLAIRE BLVD.

PLAN
FROM STA. 1+00.00 TO STA. 4+00.00

WBS NUMBER	CITY DWG NO.
S-000700-A017-3	54210
DRAWING SCALE	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 33 OF 59	

PLOTTED ON: Friday, April 17, 2015 9:04:38 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS V.DWG

FOR REDUCED PLANS
original scale in inches



LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App.

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #15
BELLAIRE BLVD., STA. 31+27.79, 0.65' LT ELEV.: 49.63'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

Date: 4/16/15
CenterPoint Energy/ Natural Gas Facilities Verification ONLY.
(This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.)
(Gas service lines are not shown.)
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Date: 4/16/15
CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY.
(This Signature verifies underground facilities-not to be used for conflict verification.)
Signature valid for six months.

AT&T TEXAS/SWBT UTILITY LINES SHOWN.

Date: 4-16-15
Approved for AT&T Texas/SWBT underground conduit facilities only.
Signature valid for one year.

Date:
CABLE Approved for underground conduit facilities only.

SES HORIZON
CONSULTING ENGINEERS, INC.
10101 Southwest Freeway, Suite 400 Houston, Texas 77074
(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

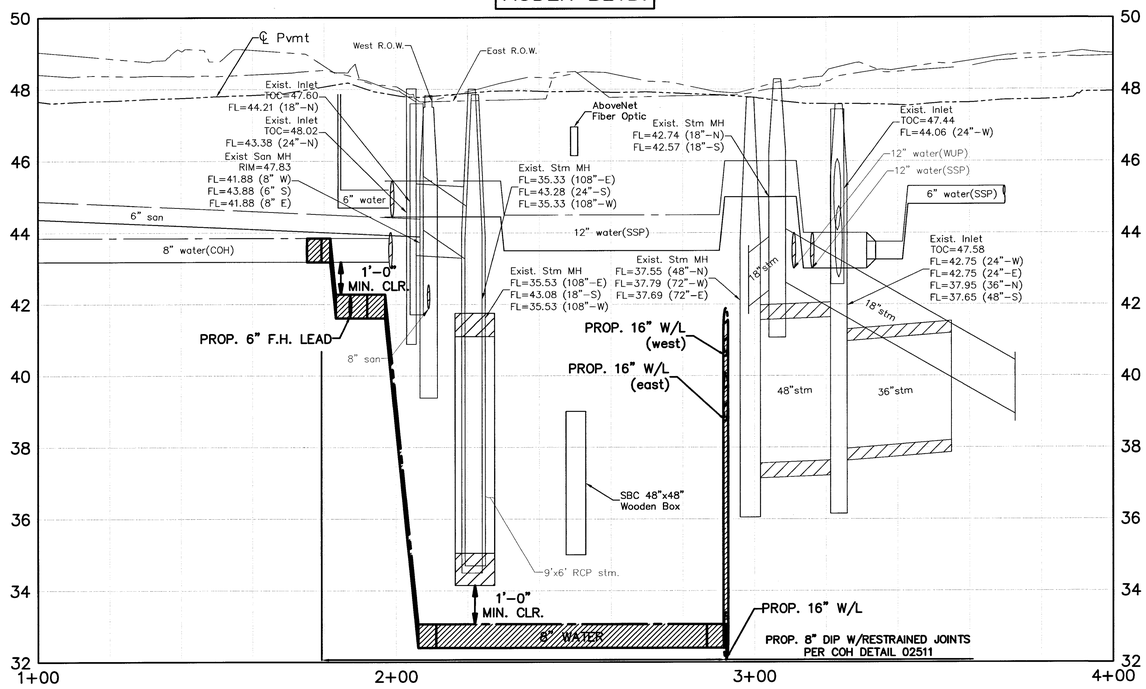
AUDEN BLVD. @ BELLAIRE BLVD.

PLAN
FROM STA. 1+00.00 TO STA. 4+00.00

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 34 OF 59	

ENGINEERING DRAWING NUMBER 54210

AUDEN BLVD.



PLOTTED ON: Thursday, April 16, 2015 10:34:00 AM
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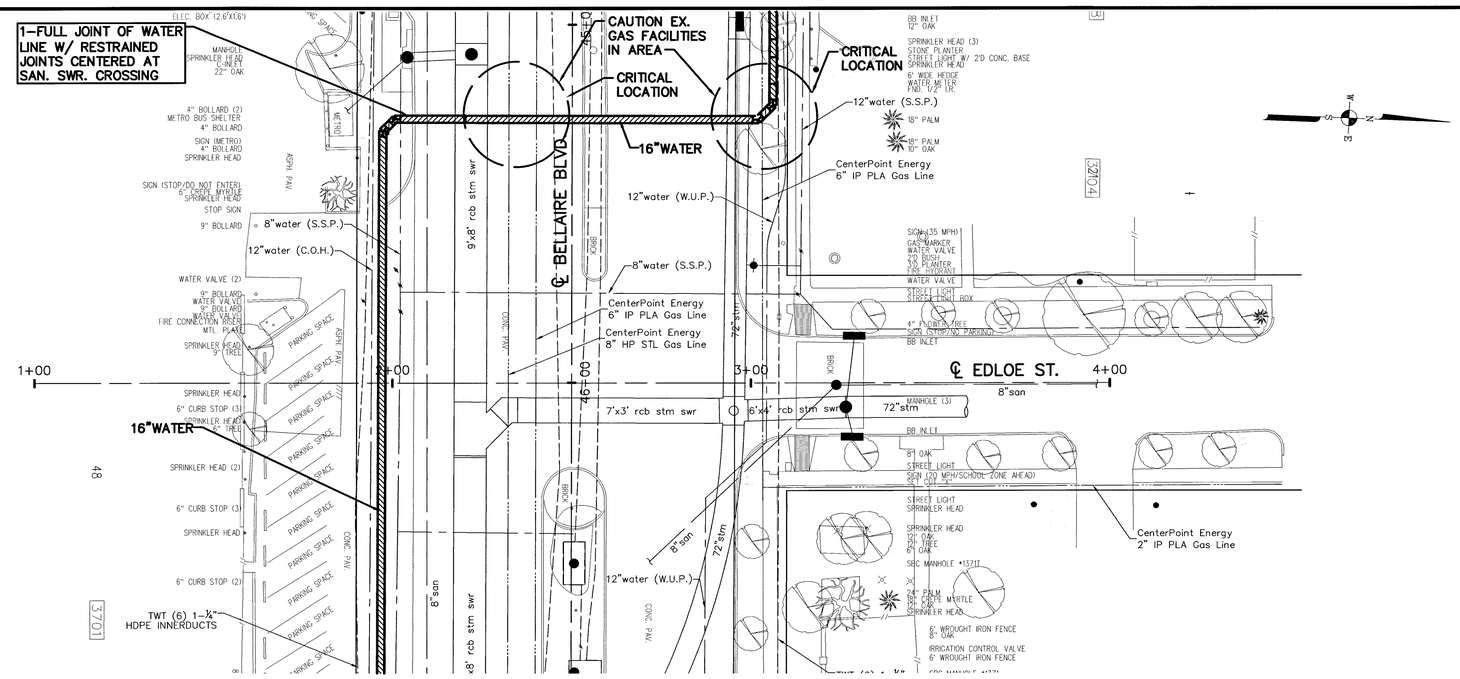

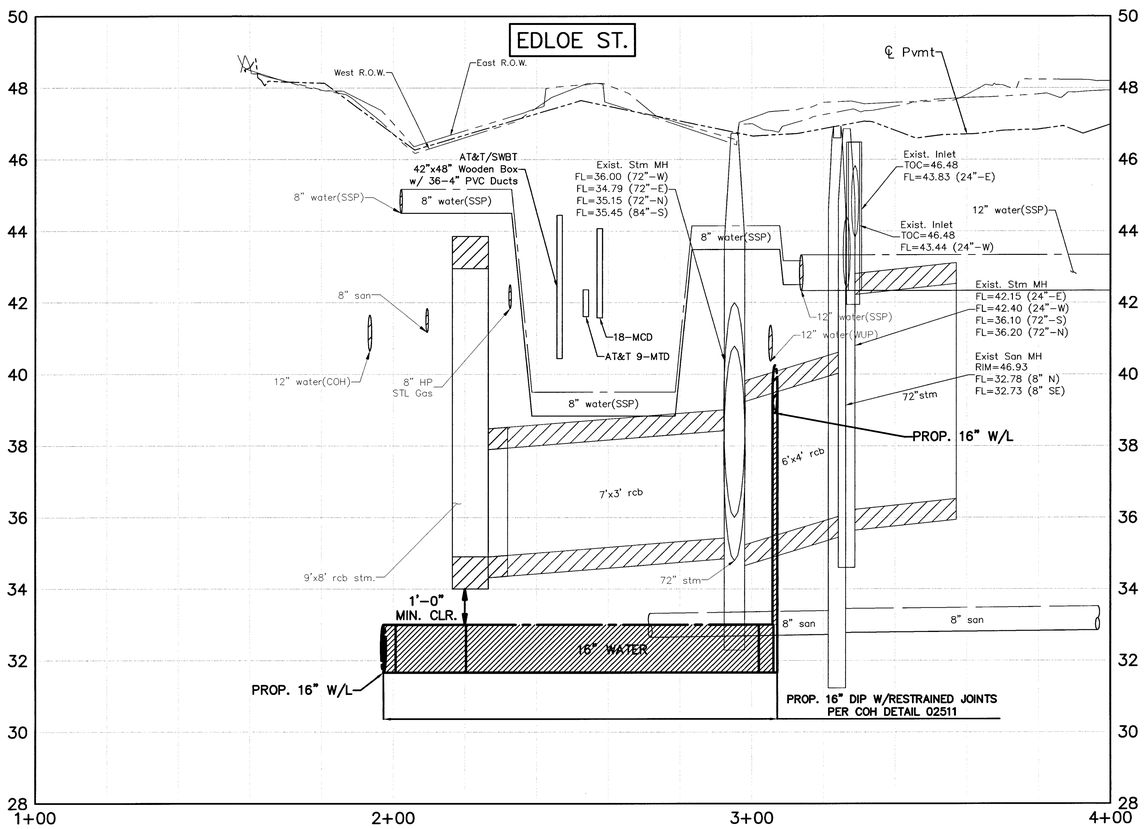

LEGEND

- EXIST. STORM SEWER
- EXIST. INLET
- EXIST. STORM M.H.
- EXIST. SANITARY SEWER
- EXIST SANITARY M.H.
- FLOW DIRECTION
- EXIST. WATER LINE
- EXIST. FIRE HYDRANT
- WATER METER
- WATER VALVE
- PROP. WATER LINE
- PROP. WATER LINE DUCTILE IRON W/RESTRAINED JOINTS
- PROP. WATER LINE W/RESTRAINED JOINTS
- PROP. WATER LINE W/O RESTRAINED JOINTS
- BORING LOG
- ENVIRONMENTAL BORING LOG
- CRITICAL LOCATION

NOTE: THIS PROJECT IS AN ALL AUGER JOB.

0 20' 40'

No.	Date	Revisions	App

PROJECT BENCHMARK
CITY OF HOUSTON SURVEY
MONUMENT NO. 5255-7704 ELEV.:48.88'

PROJECT T.B.M. #11
BELLAIRE BLVD., STA. 46+27.77, 0.76' LT ELEV.: 48.18'

TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL CENTERPOINT ENERGY AT 713-207-2222.

NOTICE:
FOR YOUR SAFETY, YOU ARE REQUIRED BY TEXAS LAW TO CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG, SO THAT UNDERGROUND LINE CAN BE MARKED. THIS VERIFICATION DOES NOT FULFILL YOUR OBLIGATION TO CALL 811.

VERIFICATION OF PRIVATE UTILITY LINES

CenterPoint Energy/ Natural Gas Facilities Verification ONLY. (This Signature verifies that you have shown CNP Natural Gas lines correctly-not to be used for conflict verification.) (Gas service lines are not shown.) Signature Valid for six months. Date: 4/16/15

CenterPoint Energy/ UNDERGROUND Electrical Facilities Verification ONLY. (This Signature verifies existing underground facilities-not to be used for conflict verification.) Signature Valid for six months. Date: 4/16/15

AT&T TEXAS/SWBT UTILITY LINES SHOWN Approved for AT&T Texas/SWBT underground conduit facilities only. Signature valid for one year. Date: 4-16-15

CABLE Approved for underground conduit facilities only. Date:

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SES HORIZON CONSULTING ENGINEERS, INC. TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS 47746 OMAR J. CORREDOR REGISTERED PROFESSIONAL ENGINEER 4/16/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

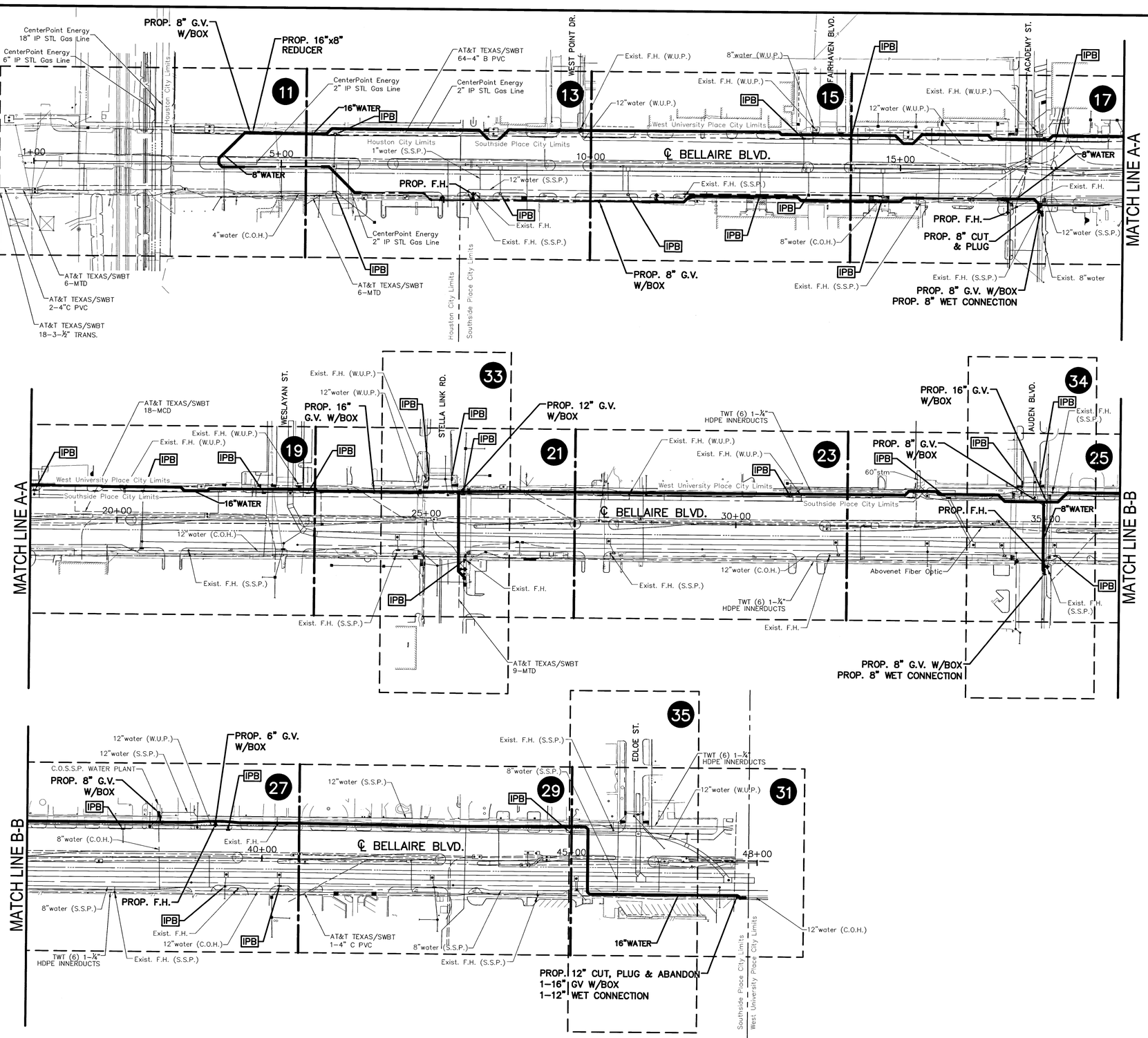
EDLOE ST. @ BELLAIRE BLVD.

PLAN
FROM STA. 1+00.00 TO STA. 4+00.00

WBS NUMBER	CITY DWG NO.
S-000700-A017-3	54210
DRAWING SCALE	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 35 OF 59	

FOR REDUCED PLANS original scale in inches

PLOTTED ON: Thursday, April 16, 2015 10:00:08 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\P&P'S\OCW-BELL-P&PS V.DWG



LEGEND

IPB	INLET PROTECTION BARRIER
X—RFB—X	REINFORCED FILTER FABRIC FENCE
X—FF—X	FILTER FABRIC FENCE
SC	STABILIZED CONSTRUCTION

0 80' 160'

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TEXAS REGISTERED ENGINEERING FIRM F-003922

OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

STORM WATER POLLUTION PREVENTION TYPICAL LAYOUT

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
1" = 80'	54210
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 36 OF 59	

FOR REDUCED PLANS original scale in inches

PLOTTED ON: Thursday, April 16, 2015 9:29:29 AM
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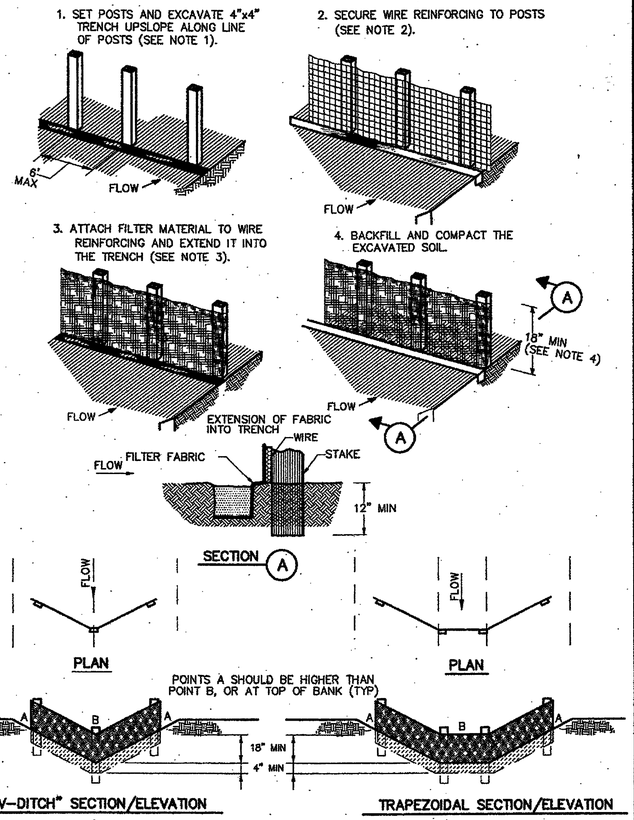
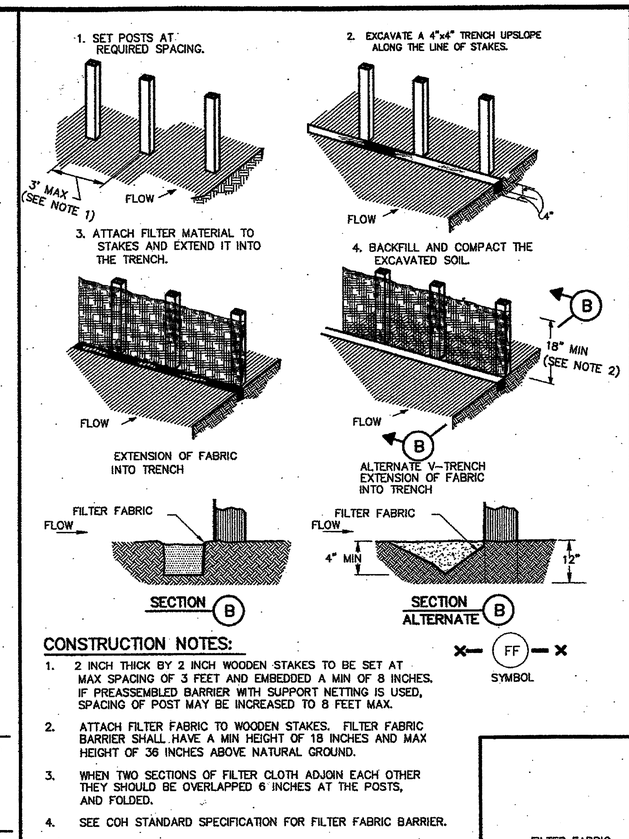


CONSTRUCTION NOTES:

1. SET 2 INCH BY 2 INCH WOODEN STAKES SPACED A MAX OF 6 FEET APART AND EMBEDDED A MIN OF 12 INCHES.
2. WOVEN WIRE REINFORCING TO BE FASTENED SECURELY TO BARRIER POSTS WITH STAPLES.
3. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE REINFORCING, WITH TIES SPACED EVERY 24 INCHES AT TOP AND MIDSECTION.
4. MINIMUM HEIGHT OF FILTER SHOULD BE 18 INCHES AND A MAXIMUM OF 36 INCHES ABOVE NATURAL GROUND.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED 6 INCHES AT THE POSTS, AND FOLDED.
6. SEE COH STANDARD SPECIFICATION FOR FILTER FABRIC BARRIER.

X— (RFB) —X
SYMBOL

REINFORCED FILTER FABRIC BARRIER

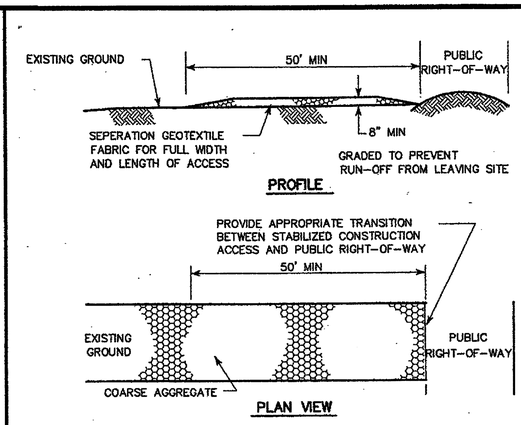


CONSTRUCTION NOTES:

1. 2 INCH THICK BY 2 INCH WOODEN STAKES TO BE SET AT MAX SPACING OF 3 FEET AND EMBEDDED A MIN OF 8 INCHES. IF PREASSEMBLED BARRIER WITH SUPPORT NETTING IS USED, SPACING OF POST MAY BE INCREASED TO 8 FEET MAX.
2. ATTACH FILTER FABRIC TO WOODEN STAKES. FILTER FABRIC BARRIER SHALL HAVE A MIN HEIGHT OF 18 INCHES AND MAX HEIGHT OF 36 INCHES ABOVE NATURAL GROUND.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHOULD BE OVERLAPPED 6 INCHES AT THE POSTS, AND FOLDED.
4. SEE COH STANDARD SPECIFICATION FOR FILTER FABRIC BARRIER.

X— (FF) —X
SYMBOL

FILTER FABRIC BARRIER

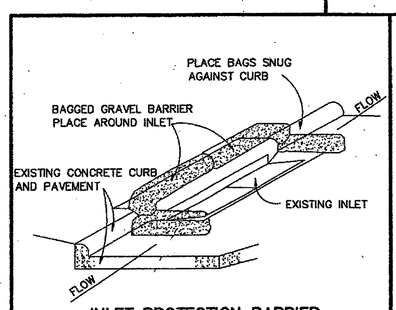


CONSTRUCTION NOTES:

1. LENGTH SHALL BE AS SHOWN ON THE CONSTRUCTION DRAWINGS, BUT NOT LESS THAN 50 FEET.
2. THICKNESS SHALL BE NOT LESS THAN 8 INCHES.
3. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
4. STABILIZATION FOR OTHER AREAS SHALL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION ACCESS, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMODATE A WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR THE WASHING AREA.
6. COH STANDARD SPECIFICATION FOR STABILIZED CONSTRUCTION ACCESS.
7. STABILIZED CONSTRUCTION ACCESS SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.

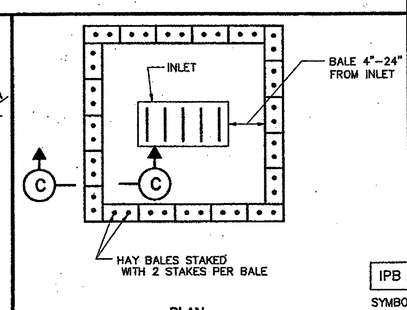
(SC)
SYMBOL

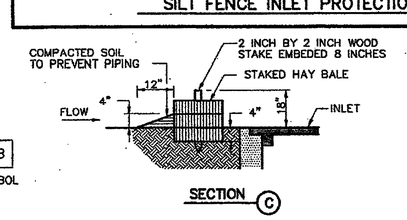
STABILIZED CONSTRUCTION ACCESS



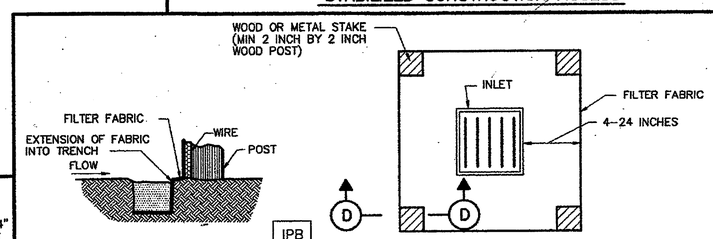
INLET PROTECTION BARRIER

(FOR STAGE II INLETS)
BAGGED GRAVEL BARRIER





HAY BALE INLET PROTECTION BARRIER



CONSTRUCTION NOTE:

1. SEE CONSTRUCTION NOTES FOR RFB.

SILT FENCE INLET PROTECTION BARRIER

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

STORM WATER POLLUTION PREVENTION PLAN DETAILS
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010
DWG NO: 01571-01

SES HORIZON
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TEXAS REGISTERED ENGINEERING FIRM F-003922

OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

STORM WATER POLLUTION PREVENTION PLAN DETAIL

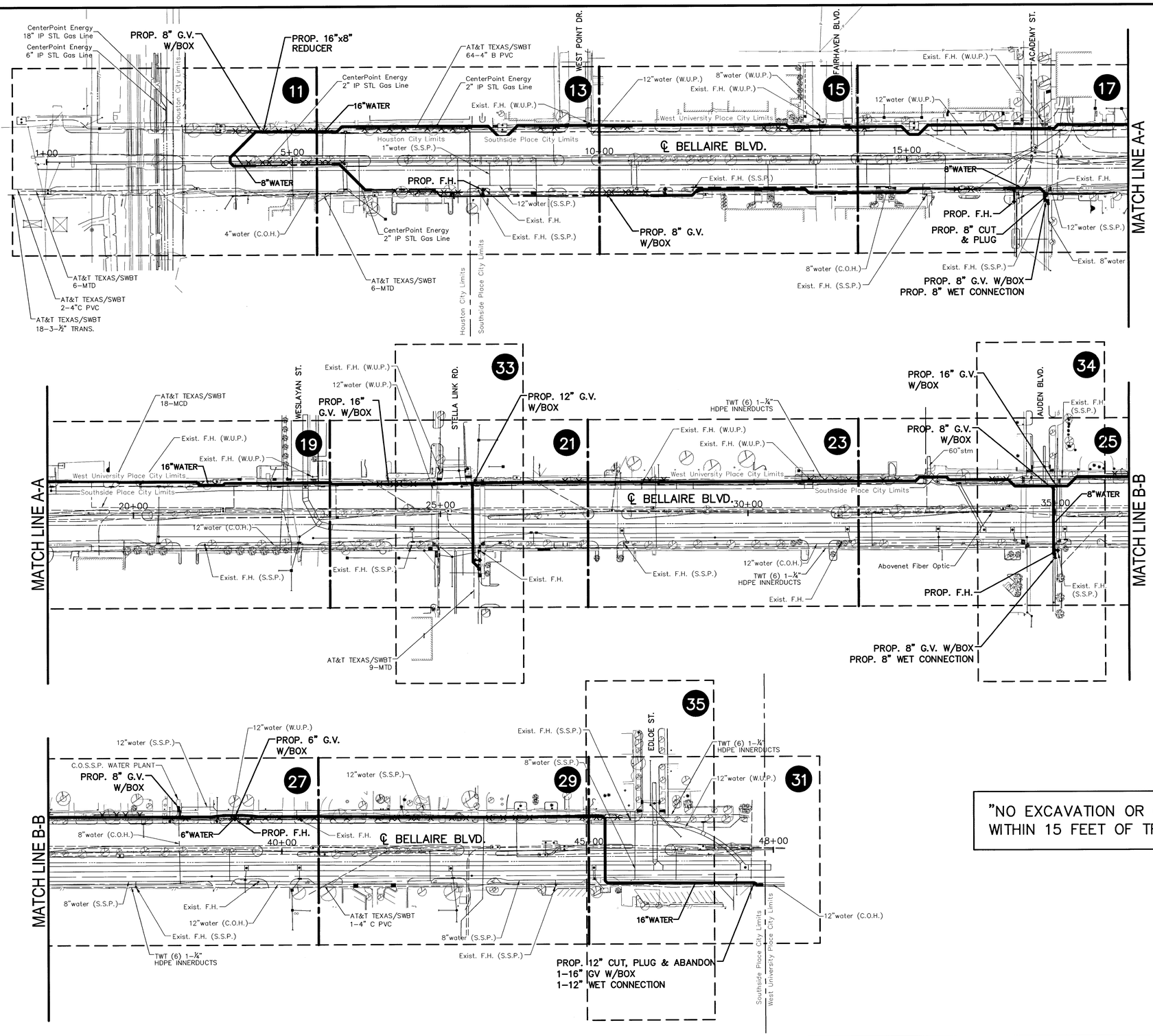
WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 37 OF 59	

54210
LICENSE NUMBER

No.	Date	Revisions	App.

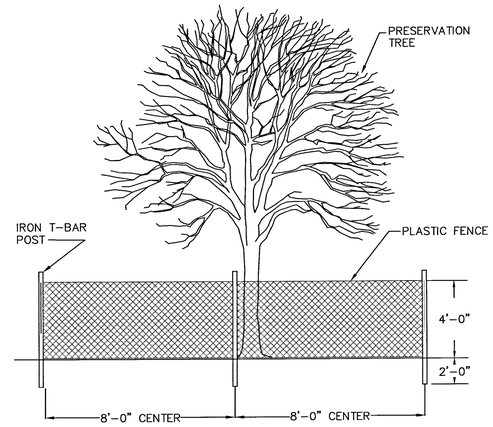
FOR REDUCED PLANS
original scale in inches

PLOTTED ON: Wednesday, April 15, 2015 4:02:00 PM
FILE NAME: F:\DN-CALL WLE\DCW-BELL\CAD\SW3P\DCW-BELL-SW3P.DWG



LEGEND

TREE PROTECTION FENCING (SEE DETAIL)



FRONT VIEW – TREE PROTECTION FENCING DETAIL

NOT TO SCALE

"NO EXCAVATION OR OPEN CUT WITHIN 15 FEET OF TREES."

0 80' 160'

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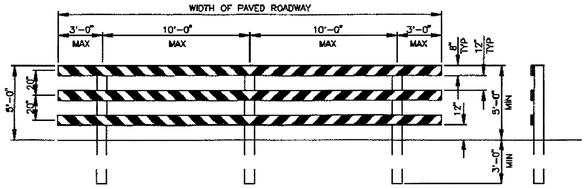
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TREE PRESERVATION LAYOUT

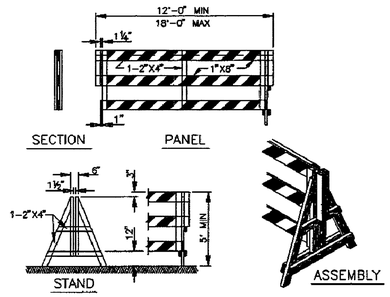
WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
1" = 80'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 38 OF 59	

PLOTTED ON: Thursday, April 16, 2015 9:30:27 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TPP\OCW-BELL-TREE LAYOUT.DWG



TYPE III BARRICADE FOR END OF ROAD

FOR TYPE III BARRICADE FOR END OF ROAD, THE THREE (3) RAILS SHALL BE REFLECTIVE RED AND REFLECTIVE WHITE STRIPES ON SIDE FACING TRAFFIC



DEMOUNTABLE TYPE III BARRICADE

BARRICADE NOTES

THE MOST RECENT EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AND IT'S REVISIONS, SHALL GOVERN THE CONSTRUCTION AND USE OF ALL ITEMS HEREIN DESCRIBED.

CHANNELIZATION DEVICES OTHER THAN BARRICADES SHOULD NORMALLY BE USED FOR CHANNELIZATION PURPOSES.

BARRICADES SHOULD NORMALLY BE PLACED PERPENDICULAR TO THE TRAFFIC FLOW. OTHER CHANNELIZING DEVICES, SUCH AS DRUMS, VERTICAL PANELS OR PORTABLE BARRIERS, SHOULD BE USED WHERE NEEDED TO SEPARATE TRAFFIC FROM THE WORK AREA. IN ALL CASES, THE BARRICADES SHOULD BE SO LOCATED AS TO MOST ADVANTAGEOUSLY WARN AND DIRECT TRAFFIC.

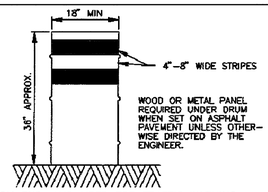
BARRICADES MAY BE DESIGNED AND CONSTRUCTED FROM WOOD OR ANY OTHER SUITABLE MATERIAL IN A MANNER APPROVED BY THE DEPARTMENT OF TRAFFIC AND TRANSPORTATION. THE CONSTRUCTION DETAILS SHOWN HEREON ARE TYPICAL AND ARE SUGGESTED DETAILS FOR WOOD SUPPORT SYSTEMS FOR BARRICADES. THE DETAILS OF RAIL WIDTH AND STRIPING, NUMBER AND SPACING OF RAILS, MINIMUM LENGTH AND HEIGHT (ABOVE PAVEMENT) OF RAILS MUST BE ADHERED TO WHEN ALTERNATE DESIGNS ARE USED.

BARRICADES ARE TO BE CONSTRUCTED OF CLEAN SOUND MATERIAL. ALL SURFACES ABOVE GROUND, WHICH ARE NOT STRIPED, SHALL BE WHITE EXCEPT THE UNPAINTED GALVANIZED METAL OR ALUMINUM COMPONENTS MAY BE USED.
COMPONENTS MADE OF LUMBER SHALL BE PAINTED WITH A MINIMUM OF TWO COATS OF AN APPROVED BRAND OF WHITE PAINT TO SECURE THOROUGH COVERAGE AND A UNIFORM WHITE COLOR.

THE REFLECTORIZED WHITE AND REFLECTORIZED ORANGE (REFLECTORIZED RED) STRIPES FOR BARRICADES, DRUMS AND VERTICAL PANELS SHALL BE CONSTRUCTED OF "HIGH INTESITY SHEETING AND SHALL BE MAINTAINED TO MEET THE APPEARANCE, COLOR AND REFLECTIVITY REQUIREMENTS SET BY DOTT.

THE CONTRACTOR SHALL MAINTAIN EACH BARRICADE IN A CLEAN AND GOOD CONDITION.

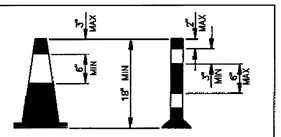
BARRICADES SHALL BE REMOVED UPON COMPLETION OF THE WORK AND/OR THE ELIMINATION OF THE HAZARD ON ANY SECTION.



DRUMS

DRUMS, SET ON END, AND USED FOR TRAFFIC WARNING OR CHANNELIZATION SHALL BE APPROX 36" IN HEIGHT AND A MIN OF 18" IN DIAMETER. THE CONTRACTOR, AT HIS OPTION, MAY USE DRUMS MADE FROM STEEL BARRELS OR BLACK POLYETHYLENE PLASTIC DRUM LINERS WEIGHING APPROX EIGHT POUNDS EACH. THE MARKINGS ON DRUMS SHALL BE HORIZONTAL, CIRCUMFERENTIAL, REFLECTORIZED ORANGE AND REFLECTORIZED WHITE STRIPES, 4 TO 8 INCHES WIDE. THE FIRST REFLECTORIZED STRIPE SHOULD START WITHIN TWO (2) INCHES OF THE TOP OF THE DRUM. THERE SHALL BE AT LEAST TWO ORANGE AND TWO WHITE STRIPES ON EACH DRUM. IF THERE ARE NON-REFLECTORIZED SPACES BETWEEN THE HORIZONTAL ORANGE AND WHITE STRIPES, THEY SHALL BE NO MORE THAN 2 INCHES WIDE. METAL DRUMS SHALL BE PAINTED BLACK OR ORANGE BEFORE REFLECTORIZED STRIPES ARE ADDED. ALL DRUMS ON PROJECT WILL BE THE SAME COLOR. WHEN DRUMS ARE PLACED IN THE ROADWAY, APPROPIATE WARNING SIGNS SHOULD BE USED. DURING HOURS OF DARKNESS, A FLASHING WARNING LIGHT SHOULD BE PLACED ON DRUMS USED SINGLY AS A WARNING DEVICE. STEADY BURN ELECTRIC LIGHTS OR DELINEATORS SHOULD BE PLACED ON DRUMS USED IN SERIES FOR TRAFFIC CHANNELIZATION. DRUMS SHALL BE WEIGHTED WITH SAND TO THE EXTENT INDICATED IN THE PLANS.

CWI-8 CHEVRON SIGNS, CWI-6A ARROW SIGNS OR VP-1 VERTICAL PANELS MOUNTED ABOVE DRUMS MAY BE USED AS SUPPLEMENTS TO DRUM DELINEATION.

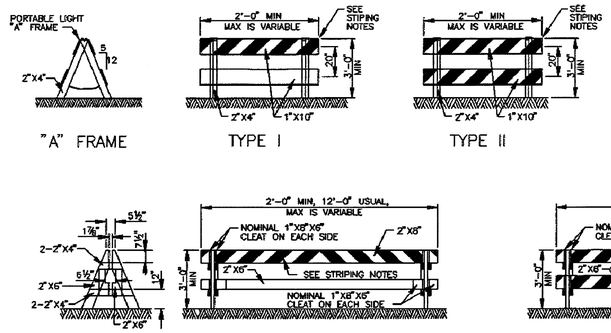


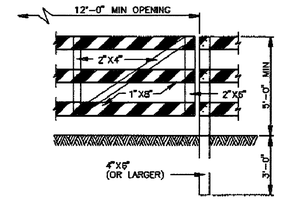
CONES

TRAFFIC CONES AND TUBULAR MARKERS SHALL BE A MIN OF 18" INCHES IN HEIGHT WITH A BROADENED BASE AND MAY BE MADE OF VARIOUS MATERIALS TO WITHSTAND IMPACT WITHOUT DAMAGE TO THEMSELVES OR TO VEHICLES. LARGER SIZES SHOULD BE USED ON FREEWAYS AND OTHER ROADWAYS WHERE SPEED ARE RELATIVELY HIGH OR WHERE EVER MORE CONSPICUOUS GUIDANCE IS NEEDED. ORANGE SHALL BE THE PREDOMINANT COLOR ON CONES AND TUBULAR MARKERS. THEY SHOULD BE KEPT CLEAN AND BRIGHT FOR MAX TARGET VALUE. FOR NIGHTTIME USE THEY SHALL BE REFLECTORIZED OR EQUIPPED WITH LIGHTING DEVICES FOR MAX VISIBILITY. REFLECTORIZED MATERIAL SHALL HAVE A SMOOTH, SEALED OUTER SURFACE WHICH WILL DISPLAY THE SAME APPROX COLOR DAY AND NIGHT.

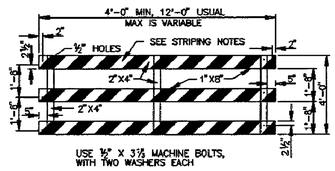
REFLECTORIZATION OF TUBULAR MARKERS SHALL BE A MIN OF TWO THREE-INCH BANDS PLACED A MAX OF 2" FROM THE TOP WITH A MAX OF 6" BETWEEN THE BANDS. REFLECTORIZATION OF CONES SHALL BE PROVIDED BY A MIN 6" BAND PLACED A MAX OF 3" FROM THE TOP.

CONES OR TUBULAR MARKERS ARE GENERALLY ONLY SUITABLE FOR TEMPORARY USAGE (UP TO 8 HOURS) WITH OTHER CHANNELIZATION DEVICES SUCH AS VERTICAL PANELS OR BARRICADES PREFERRED FOR LONGER TERM USAGE. CARE SHOULD BE TAKEN TO INSURE THAT THEY REMAIN IN THEIR PROPER LOCATION AND IN AN UPRIGHT POSITION.

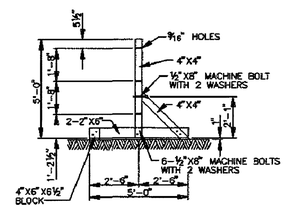




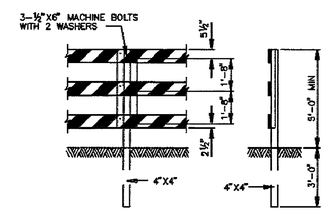
GATE FOR TYPE III BARRICADE



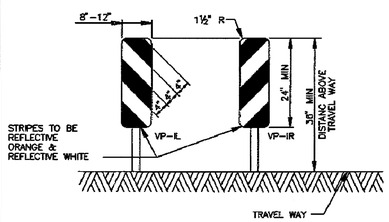
PANEL FOR TYPE III BARRICADE



STAND FOR TYPE III BARRICADE

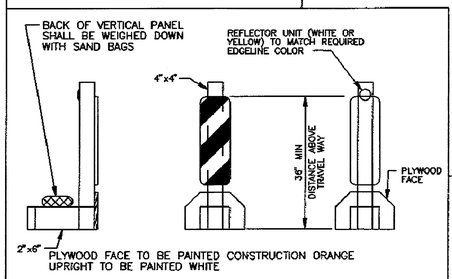


POST FOR TYPE III BARRICADE



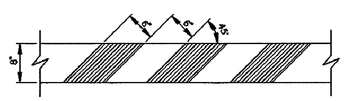
VERTICAL PANELS (VP)

VERTICAL PANELS ARE NORMALLY USED AS CHANNELIZING DEVICES TO INDICATE TANGENT OR NEARLY TANGENT ROADWAY ALIGNMENT WHERE GOOD TARGET VALUE OF A DEVICE IS NEEDED IN DAYTIME AS WELL AS THE NIGHTTIME. IN ADDITION, VERTICAL PANELS SHOULD BE USED AT THE EDGE OF SHOULDER DROP-OFFS AND OTHER SUCH AREAS AS LANE TRANSITIONS WHERE POSITIVE DAY AND NIGHT DELINEATION MAY BE REQUIRED. VERTICAL PANELS SHOULD BE MOUNTED BACK TO BACK IF USED AT THE EDGE OF CUTS ADJACENT TO TWO-WAY TWO LANE ROADWAYS. STRIPES SHOULD ALWAYS SLOPE DOWNWARD TOWARD THE TRAVELED WAY.



TYPICAL PORTABLE VERTICAL PANEL OR DELINEATOR

OTHER SIMILAR SUPPORTS MAY BE USED WHEN APPROVED OR DIRECTED BY THE COH DEPT OF TRAFFIC AND TRANSPORTATION



STRIPING FOR BARRICADE

FOR ALL TYPES OF BARRICADES WITH RAILS LESS THAN 3'-0" LONG, STRIPES 4" WIDE SHALL BE USED. IDENTIFICATION MARKINGS MAY BE SHOWN ONLY ON BACK SIDE OF BARRICADE RAILS.

STRIPING SHOULD COVER THE FULL WIDTH OF THE RAIL. STRIPING OF RAILS, PANELS, ETC. SHOULD SLOPE DOWNWARD AT AN ANGLE OF 45° DEGREES IN DIRECTIONS TRAFFIC IS TO PASS.

WHERE A BARRICADE EXTENDS ENTIRELY ACROSS A ROADWAY, IT IS DESIRABLE THAT THE STRIPES SLOPE DOWNWARD IN THE DIRECTION TOWARD WHICH TRAFFIC MUST TURN IN DETOURING. WHEN BOTH RIGHT AND LEFT TURNS ARE PROVIDED FOR, THE CHEVRON STRIPING MAY SLOPE DOWNWARD IN BOTH DIRECTIONS FROM THE CENTER OF THE BARRICADE.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

BARRICADE STANDARD

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002	DWG NO: 01580-01

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/15/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

BARRICADE STANDARDS

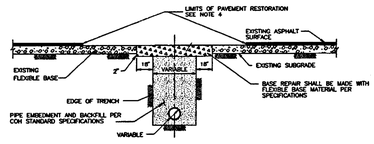
WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 39 OF 59	

LICENSED PROFESSIONAL ENGINEER 54210 LICENSING NUMBER

No.	Date	Revisions	App.

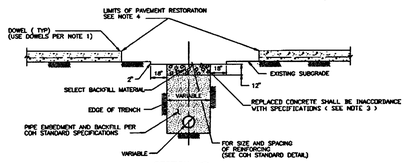
FOR REDUCED PLANS original scale in inches

PLOTTED ON: Wednesday, April 15, 2015 3:44:12 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\STDS\OCW-BELL-BARRICADE STANDARDS.DWG



SECTION (A)

REPAIR OF FLEXIBLE BASE PAVEMENT



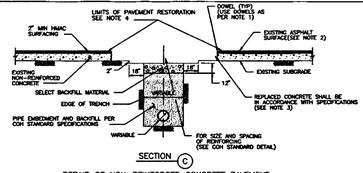
SECTION (B)

REPAIR OF REINFORCED CONCRETE PAVEMENT

NOTE:

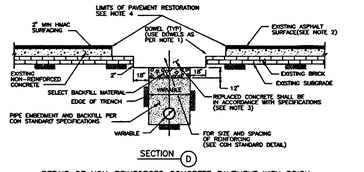
1. EXPOSE 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS.
   HORIZONTAL DOWELS SHALL BE # 6 BARS, 24" LONG, 24" C-C, DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB. WITH "PO ROC" OR EQUAL.
2. IF REINFORCED CONCRETE IS OVERLAYED WITH ASPHALT, REPLACE WITH 2" MIN HMAC SURFACING.
3. REFER TO STANDARD DETAIL 02751-01 FOR REINFORCING STEEL REQUIREMENTS
4. REFER TO STANDARD DETAIL 02951-01 FOR PAVEMENT RESTORATION LIMITS.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION	
PAVEMENT REPAIR DETAILS FOR STREET CUTS (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002	DWG NO: 02902-01



SECTION (C)

REPAIR OF NON-REINFORCED CONCRETE PAVEMENT



SECTION (D)

REPAIR OF NON-REINFORCED CONCRETE PAVEMENT WITH BRICK

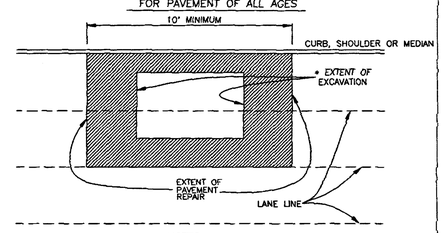
NOTE:

1. EXPOSE 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS.
   HORIZONTAL DOWELS SHALL BE # 6 BARS, 24" LONG, 24" C-C, DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB. WITH "PO ROC" OR EQUAL.
2. IF REINFORCED CONCRETE IS OVERLAYED REPLACE WITH SAME THICKNESS OF HMAC SURFACING.
3. REFER TO STANDARD DETAIL 02751-01 FOR REINFORCING STEEL REQUIREMENT
4. REFER TO STANDARD DETAIL 02951-01 FOR PAVEMENT RESTORATION LIMITS.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION	
PAVEMENT REPAIR DETAILS FOR STREET CUTS NON REINFORCED CONCRETE AND BRICK PAVEMENT (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002	DWG NO: 02902-02

ASPHALT PAVEMENT RESTORATION

FOR PAVEMENT OF ALL AGES



NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.

2. FLEXIBLE BASE:

   REPLACE BASE TO SAME THICKNESS PLUS TWO INCHES (2") FOR EXTENT OF EXCAVATION. USE APPROVED BASE MATERIAL TYPE. *

3. SURFACE COURSE:

A. WIDTH:
   SURFACE MILL AND OVERLAY FULL WIDTH OF LANE(S) TO NEAREST LANE DIVIDER BEYOND EDGE OF EXCAVATION.

B. LENGTH:
   MINIMUM LENGTH OF SURFACE MILL ALONG TRAVEL WAY IS 10'.

C. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATIONS 02764 & 02767.

ADDITIONAL REQUIREMENTS FOR ASPHALT OVERLAY ON CONCRETE PAVEMENT:

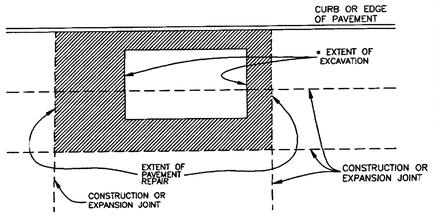
1. REPLACE CONCRETE FOR EXTENT OF EXCAVATION. REPLACE TO SAME THICKNESS PLUS TWO INCHES (2").
2. WIDTH:
   IF EXCAVATION EXTENDS MORE THAN HALF OF A LANE, REPLACE ENTIRE LANE OF CONCRETE. OTHERWISE USE STANDARD DETAIL 02902-01.
3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF CONCRETE REPLACEMENT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS PER SPECIFICATION SECTION 02902.
4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
5. MAINTAIN CONCRETE EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE APPROVED BY CITY ENGINEER.

* EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP	
Street Cut Pavement Replacement ASPHALT PAVEMENT FOR PAVEMENT OF ALL AGES (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUNE 2002	DWG NO: 02951-03

CONCRETE PAVEMENT RESTORATION

AGE OF PAVEMENT LESS THAN OR EQUAL TO 5 YEARS



NOTES:

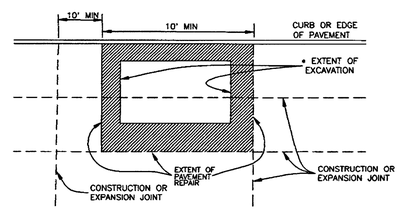
1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. REPLACE ENTIRE PANEL WIDTH AND LENGTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL WITHIN EXISTING PAVEMENT. PROVIDE HORIZONTAL DOWELS (PER SPECIFICATION SECTION 02902-01) IF EXISTING REINFORCING IS BROKEN OFF.
4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
5. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
6. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
7. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATIONS 02764 AND 02767.

* EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP	
Street Cut Pavement Replacement CONCRETE PAVEMENT LESS THAN 5 YRS IN AGE (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUNE 2002	DWG NO: 02951-01

CONCRETE PAVEMENT RESTORATION

AGE OF PAVEMENT GREATER THAN 5 YEARS



NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. WIDTH:
   REPLACE PANEL WIDTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. LENGTH:
   a. MINIMUM LENGTH OF PAVEMENT REPAIR ALONG TRAVEL WAY IS 10' FROM THE NEAREST JOINT.
   b. IF EDGE OF EXCAVATION IS LESS THAN 10' FROM EXISTING CONSTRUCTION OR EXPANSION JOINT, REPLACE PAVEMENT TO EXISTING JOINT.
4. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF PANEL REPLACEMENT. PROVIDE HORIZONTAL DOWELS (PER SPECIFICATION SECTION 02902-01) IF REINFORCING IS BROKEN OFF OR DOES NOT EXIST.
5. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
6. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
7. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
8. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATIONS 02764 AND 02767.

* EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP	
Street Cut Pavement Replacement CONCRETE PAVEMENT OVER 5 YRS IN AGE (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUNE 2002	DWG NO: 02951-02

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

STREET CUT DETAILS

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 40 OF 59	

DRAWING NUMBER

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Wednesday, April 15, 2015 3:44:23 PM
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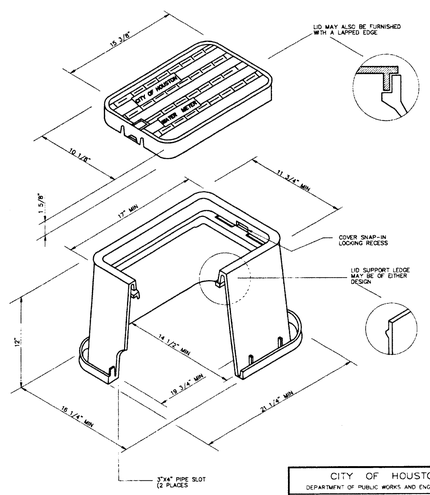


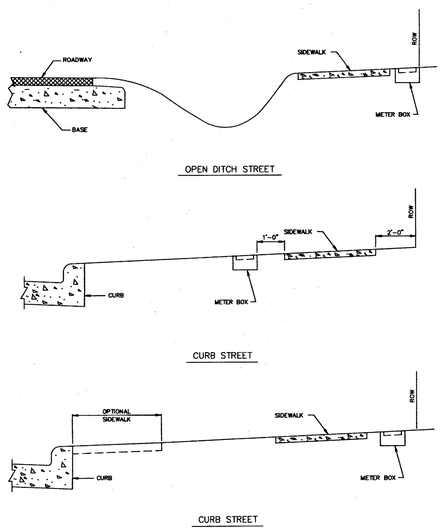
NOTE

1. LID MUST BE ABLE TO ACCEPT THE CITY'S AMR TRANSMITTING ENDPOINT.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

STANDARD PLASTIC METER BOX FOR ⅝" AND 1" METERS
(NOT TO SCALE)

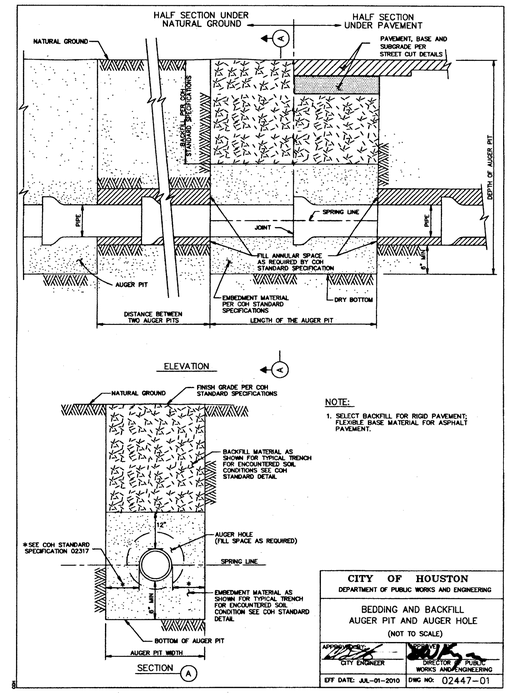
APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010 | DWG NO: 02085-01



CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

LOCATION OF WATER METER BOX FOR 2" DIAMETER AND LESS
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010 | DWG NO: 02085-02



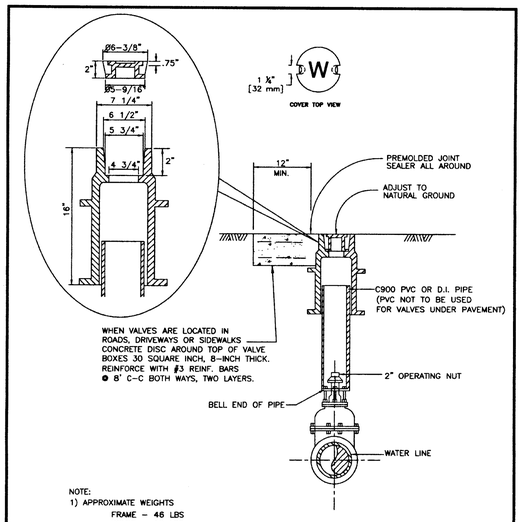
NOTE:

1. SELECT BACKFILL FOR RIGID PAVEMENT; FLEXIBLE BASE MATERIAL FOR ASPHALT PAVEMENT.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

BEDDING AND BACKFILL AUGER PIT AND AUGER HOLE
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010 | DWG NO: 02447-01



NOTE:

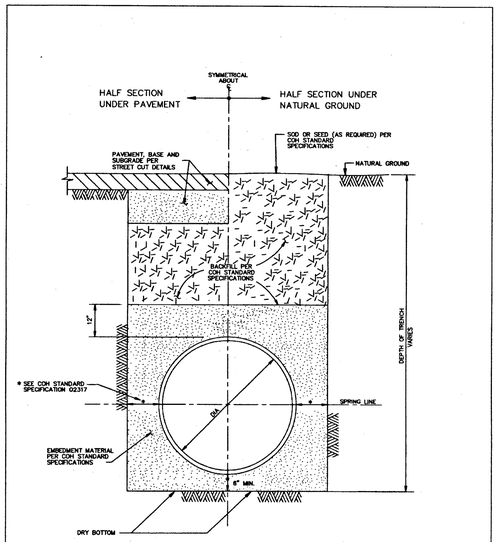
1) APPROXIMATE WEIGHTS
FRAME – 46 LBS
COVER – 10 LBS

2) MATERIAL – GRAY IRON ASTM A48 CL35B

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

VALVE BOX DETAIL
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF. DATE: JULY 01, 2010 | DWG. NO: 02085-03



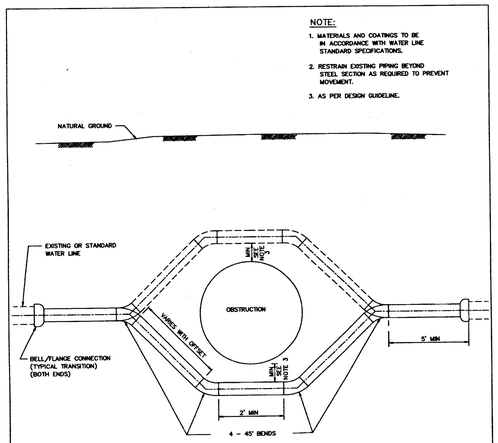
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER DISTRIBUTION MAIN BEDDING AND BACKFILL FOR OPEN CUT TRENCHES
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010 | DWG NO: 02317-04

NOTE:

1. MATERIALS AND COATINGS TO BE IN ACCORDANCE WITH WATER LINE STANDARD SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. AS PER DESIGN GUIDELINE.



PIPE OFFSET ALTERNATES

1. DUCTILE IRON PIPE PRESSURE 250 PSI WITH APPROVED RESTRAINED JOINTS.
2. PVC PIPE WITH INTEGRAL RESTRAINED JOINT SYSTEM, OR DUCTILE – IRON RESTRINED JOINT FITTINGS, EPOXY LINED AND COATED. USE 250 PSI AWWA C900 DR 14 FOR PVC RESTRAINED JOINTS.
3. PVC NOT ALLOWED FOR GREATER THAN 20 FT OF COVER OR FOR DIAMETER LARGER THAN 20 IN.
4. USE ONLY DUCTILE IRON AND PVC PRODUCTS LISTED ON DCE DIVISION APPROVED PRODUCTS LIST AND IN ACCORDANCE WITH CITY STANDARD SPECIFICATIONS.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TYPICAL STEEL PIPE OFFSET SECTION FOR WATER LINES
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010 | DWG NO: 02511-01

No.	Date	Revisions	App.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
STATE OF TEXAS
4-15-2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

WATER DETAILS

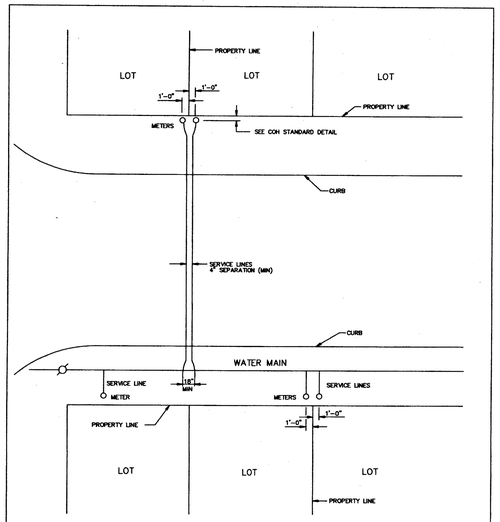
1 of 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 41 OF 59	

54210
DRAWING NUMBER

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Wednesday, April 15, 2015 3:56:50 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\STDS\OCW-BELL-WATER DETAILS.DWG



GENERAL NOTES:

1. TWO SERVICE LINES MAY BE INSTALLED IN SAME TRENCH PROVIDING 4" CLEARANCE IS MAINTAINED.
2. ONE METER PER SERVICE LINE

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TYPICAL 3/4" THROUGH 2" SERVICE ARRANGEMENTS

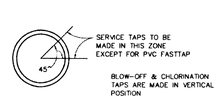
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2010 DWG NO: 02512-01

PIPE TAPPING SCHEDULE				
WATER MAIN TYPE AND DIAMETER	SERVICE SIZE			
	3/4"	1"	1 1/2"	2"
4" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
4" ASBESTOS (EXISTING) CEMENT	WBSS	WBSS	DSS, WBSS	DSS, WBSS
4" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" ASBESTOS (EXISTING) CEMENT	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" ASBESTOS (EXISTING) CEMENT	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16" AND UP CAST IRON OR DUCTILE IRON	DWBSS	DWBSS	DWBSS	DWBSS
16" AND UP ASBESTOS (EXISTING) CEMENT	DWBSS	DWBSS	DWBSS	DWBSS
16" AND UP PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS - DUAL STRAP SADDLES
WBSS - WIDE BAND STRAP SADDLES
DWBSS - DUAL WIDE BAND STRAP SADDLES



WIDE BAND SINGLE SADDLE OR DUAL SADDLES

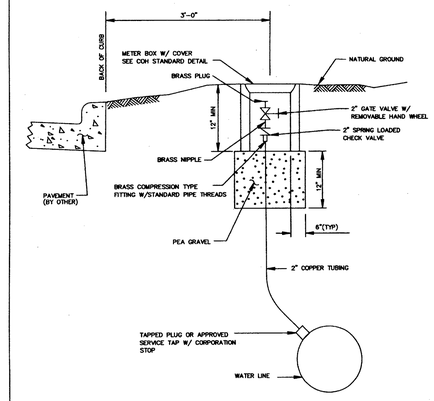
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

SERVICE TAPS

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2010 DWG NO: 02512-02



GENERAL NOTES:

1. PLACE GATE VALVE VERTICAL TO GROUND WITH END OF BRASS PLUG 3 INCHES FROM SURFACE
2. PLACE METER BOX CENTER AROUND GATE VALVE BOX WITH LONG SIDE PARALLEL TO VALVE.

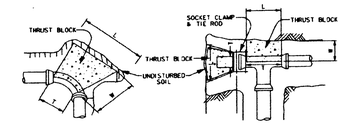
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

PERMANENT BLOW-OFF-DETAIL

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

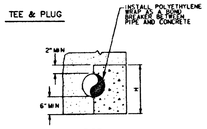
EFF DATE: JULY-01-2010 DWG NO: 02524-01



90° BEND

(45° BENDS SIMILAR)

TEE & PLUG



PIPE CROSS SECTION

MINIMUM BLOCKING DIMENSION IN INCHES															
PIPE SIZE	90° BEND				45° BEND				TEE/PLUG			
	W	H	L	T	W	H	L	T	W	H	L	T
4"	8	12	14	10	6	8	11	8	6	10	12	12
6"	8	14	26	12	8	14	14	12	8	14	19	19
8"	10	16	40	16	10	18	20	16	10	18	26	26
10"	12	24	42	18	12	22	25	18	12	24	30	30
12"	14	36	40	30	14	26	30	22	14	26	40	40

CORRECTION FACTORS		
SOIL TYPE	SOIL BEARING STRENGTH S_b (lb/ft²)	MULTIPLY "L" AND "H" BY
SOFT CLAY	1000	1.73
SILT	1500	1.41
SANDY SILT	3000	1.00
SAND	4000	0.87
SANDY CLAY	6000	0.71
HARD CLAY	9000	0.58

NOTES:

1. DEPTH "H" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE.
2. BLOCKING MUST BE PLACED AGAINST UNDISTURBED EARTH. WHERE THIS IS NOT POSSIBLE, THE FILL BETWEEN THE BEARING SURFACE AND UNDISTURBED SOIL MUST BE COMPACTED TO AT LEAST 90% STANDARD PROCTOR DENSITY.
3. PROVIDE CONCRETE IN ACCORDANCE WITH STANDARD SPECIFICATION SECTION 03315 - CONCRETE FOR UTILITY CONSTRUCTION.
4. BLOCKING DIMENSIONS SHOWN ARE BASED ON 3000 PSI SOIL BEARING STRENGTH AND 125 PSI INTERNAL WATER PRESSURE. FOR OTHER SOIL CONDITIONS, MULTIPLY DIMENSIONS "L" AND "H" BY THE APPROPRIATE CORRECTION FACTOR.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

THRUST BLOCK DETAIL FOR WATER LINES (4-INCH TO 12 INCH)

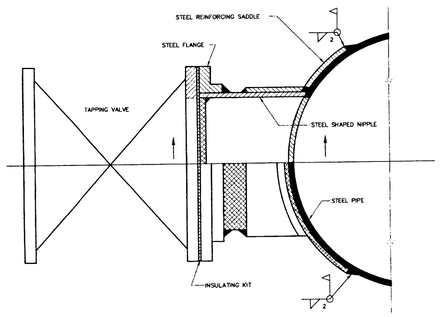
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2010 DWG NO: 02511-02

GENERAL NOTES:

1. PROVIDE STEEL TAPPING SLEEVE AS PER WATER MAIN SPECIFICATIONS.
2. WELDING SHALL BE AS NOTED IN WELD SYMBOLS.
3. INSULATING KIT IN ACCORDANCE WITH WATER MAIN SPECIFICATIONS.
4. REPAIR COATING AS PER WATER MAIN STANDARD SPECIFICATIONS.



CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

STANDARD TAP TO EXISTING STEEL MAIN

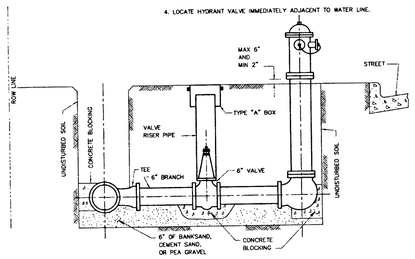
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2010 DWG NO: 02512-04

NOTES:

1. LOCATE FIRE HYDRANTS AT PCs OF THE INTERSECTION CURB RADIUS, 3 FEET BEHIND CURB OR PROJECTED FUTURE CURB.
2. ON OPEN-DITCH ROADWAYS, SET THE FIRE HYDRANTS WITH IN 5 FEET OF RIGHTS-OF-WAY LINES.
3. FIRE HYDRANT STEAMER NOZZLE SHALL FACE THE STREET.
4. LOCATE HYDRANT VALVE IMMEDIATELY ADJACENT TO WATER LINE.



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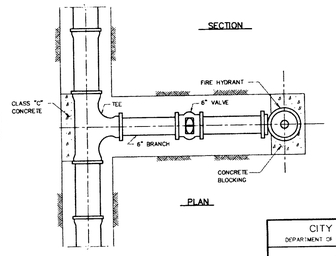


PLAN

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

STANDARD FIRE HYDRANT DETAIL

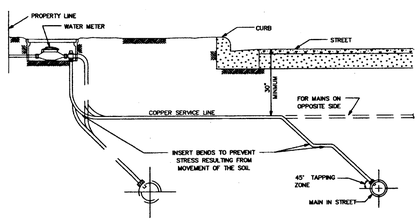
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

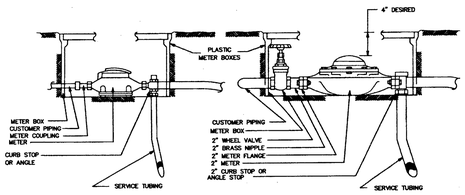
EFF DATE: JULY-01-2010 DWG NO: 02520-01

NOTES:

1 1/2" METER SET IS SAME AS 2" EXCEPT WHEEL VALVE IS NOT REQUIRED.



TYPICAL SECTION SERVICE LINE



5/8", 3/4" AND 1" METER SET

2" METER SET

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TYPICAL METER SETTINGS

(NOT TO SCALE)

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EFF DATE: JULY-01-2010 DWG NO: 02526-01

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS — OMAR J. CORREDOR — REG. P.E. 47746 — REGISTERED PROFESSIONAL ENGINEER — 4/15/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

WATER DETAILS

2 of 2

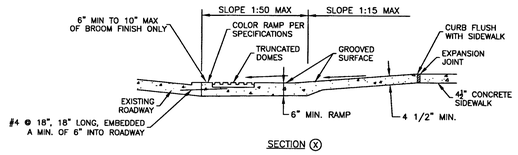
WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 42 OF 59	

ENGINEERING — APPROVED — 54210 — DRAWING NUMBER

No.	Date	Revisions	App.

FOR REDUCED PLANS original scale in inches: 0 1 2 3

PLOTTED ON: Wednesday, April 15, 2015 3:57:25 PM
FILE NAME: F:\ON-CALL WLE\OGW-BELL\CAD\STDS\OGW-BELL-WATER DETAILS.DWG



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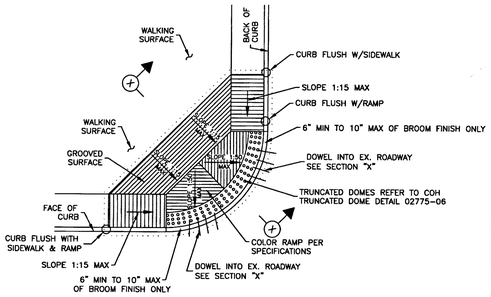


COMMERCIAL & HIGH DENSITY CONDITIONS
NTS

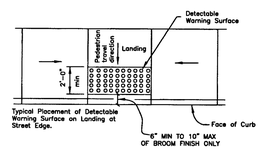
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

COMMERCIAL CURB RAMP DETAIL

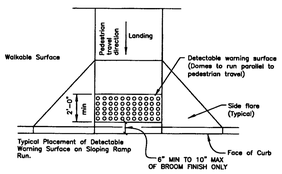
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — DIRECTOR OF PUBLIC WORKS AND ENGINEERING

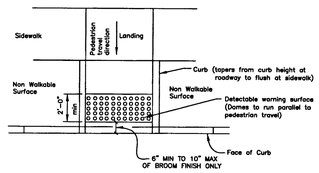
EFF DATE: JULY-01-2012 | DWG NO: 02775-05



Typical Placement of Detectable Warning Surface on Landing at Street Edge.



Typical Placement of Detectable Warning Surface on Sloping Ramp Run.



GENERAL NOTES FOR DETECTABLE WARNINGS

1. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES. THE SURFACE MUST CONTRAST VISUALLY WITH ADJOINING SURFACE, INCLUDING SURFACE WHICH FINISH DARK BROWN OR DARK RED DETECTABLE WARNING SURFACE ADJACENT TO UNCOLORED CONCRETE, UNLESS SPECIFIED ELSEWHERE IN THE PLANS.

2. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.

3. ALIGN TRUNCATED DOMES IN THE DIRECTION OF PEDESTRIAN TRAVEL WHEN ENTERING THE STREET.

4. OMIT

5. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24" IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL, AND EXTEND THE FULL WIDTH OF THE CURB RAMP OR LANDING WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.

6. DETECTABLE WARNING SURFACES SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS 6" MIN TO 10" MAX FROM THE EXTENSION OF THE FACE OF CURB. DETECTABLE WARNING SURFACES MAY BE CURVED ALONG THE CORNER RADIUS.

7. REFERENCE CURB RAMP DETAILS FOR RAMP GROOVED SURFACE.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

DETECTABLE WARNING CURB RAMP DETAILS

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2012 | DWG NO: 02775-06

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS — OMAR J. CORREDOR — 47746 — REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

SIDEWALK DETAILS

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	54210
MUMTAZ BAIG, P.E.	
SHEET NO. 43 OF 59	

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON:Wednesday, April 15, 2015 4:31:23 PM
FILE NAME: F:\ON-CALL MLE\OCM-BELL\CAD\STDS\OCM-BELL-SIDEWALK.DWG

GENERAL NOTES

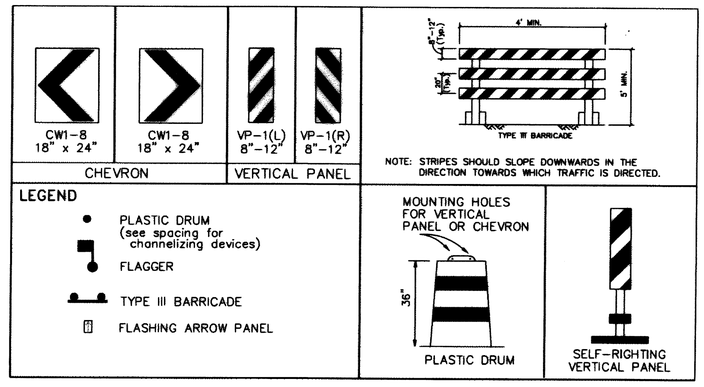
1. The Contractor shall provide and install traffic control devices in conformance with Part VI of Texas Manual on Uniform Traffic Control Devices (TMUTCD) latest edition with revisions during the entire construction period.
2. All signs and traffic control devices shall conform to the latest version of the TMUTCD.
3. No lanes shall be closed during the hours of 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM Monday thru Friday without approval of the City Traffic Engineer.
4. No work shall be performed in residential areas from 7:00 PM to 7:00 AM.
5. Contractor shall maintain approved number of thru lanes of traffic in each direction during construction working hours. Traffic control plans shall include one-way and/or detour plans.
6. Contractor shall maintain traffic lanes and detours according to traffic control plans during working hours.
7. Contractor shall cover open pavement excavations for minor utility work with anchored steel plates during non-working hours, and open lanes for normal traffic flow when feasible.
8. If the Contractor chooses to use a different method of "Traffic Control Plans" during the construction than what is outlined in the contract drawings, the Contractor shall be responsible to prepare and submit an alternate set of traffic control plans to the City of Houston Project Manager for approval ten working days prior to implementation. These plans shall be drawn to scale on reproducible mylars and shall be sealed by a Licensed Engineer in the State of Texas. Traffic Operations Division representative approval is required to accept the proposed changes.
9. Contractor shall secure lane/sidewalk closure permits from Traffic Operations Division (Mobility Permit Section at http://www.gims.houstontx.gov/portalWS/MainPortal.aspx) before implementing the traffic control plan. The application must be submitted at least ten business days prior to the implementation of the traffic control plan and/or beginning construction work. The contractor shall provide traffic control plans, construction sequencing, and schedule with the application.
10. Contractor shall have approved traffic control plan and permit at the job site for inspection at all times.
11. During pavement surface restoration projects; the Contractor shall not open closed lanes until the pavement surface has cured enough to allow vehicular traffic according to City of Houston Standard Specifications.
12. The Contractor is responsible for scheduling and coordinating all construction activities with stake holders in the vicinity including emergency response agencies such as Houston Police Department, Houston Fire Department, and Metropolitan Transit Authority.
13. Contractor shall be responsible for issuing all work directives to all sub-contractors, utility companies, and all other entities performing construction work associated with the project.
14. Nothing in these notes or plans shall relieve the Contractor of the responsibility for job site conditions during the course of construction of the project; including safety of all modes of transportation, persons, and property, and that this requirement shall apply continuously and not be limited to working hours.
15. The Traffic Operation Division (Mobility Permits Group) per the direction of the City Traffic Engineer have the right to demand the installation of additional traffic control devices or modifications to these plans and notes, as deemed necessary to promote the safe and orderly flow of traffic and pedestrians through the construction work zone. The Contractor shall comply with these additional requests or modifications with due diligence.
16. All existing traffic control signs and pavement markings shall be maintained in visible locations during construction unless prior written approval is obtained from City of Houston Project Manager. The Contractor shall restore or replace (at the discretion of the City Traffic Engineer) any pavement marking or signing damaged during construction operations, including Raised Pavement Markers (RPMs) and chip seal markers.
17. When entering or leaving roadways carrying public traffic, the Contractor's equipment, whether empty or loaded shall in all cases yield to public traffic with assistance by Contractor provided certified flagger/peace officer.
18. Access to driveways adjacent to the construction work zone shall be maintained at all times as much as possible. Additional cones delineators may be required to delineate the driveway access route through the construction work zone. A minimum of one travel lane shall be maintained across the driveways, unless prior written approval is obtained from City of Houston Project Manager.
19. Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by the Contractor.
20. The Contractor shall submit an application for temporary parking restrictions if there are parking meters located at the proposed lane closures from Parking Management Division (832-393-8690) at least ten business days before implementation of lane closures. In addition, temporary no parking signs shall be posted 24 hours prior to commencement of work.
21. Additional off duty police officers/flaggers may be requested to direct traffic when lanes are blocked at the discretion of the City Project Manager even if they are not specifically identified on the project plans.
22. The Contractor shall replace within 72 hours, all traffic signal loop detectors damaged during construction.
23. In general, a solar powered flashing arrow board shall be required on all major thoroughfare lane closures. Exceptions to flashing arrow boards and/or implementation on residential lane closures shall be approved by the City Traffic Engineer.
24. Approved traffic control plan shall be in place before starting any excavation.

SPACING FOR CHANNELIZING DEVICES

A. Plastic drums on merging taper @ 30' c - c with chevron sign @ 60' c - c and warning lights for overnight closure.
B. Plastic drums on downstream taper @ 30' c - c (return taper and barricade are optional and divided roadway section)
C. Plastic drums on radii @ 35' c -c.
D. Plastic drums on tangent @ 35' c - c with vertical panel at 70' c - c and approved warning light @ 70' c - c (for overnight closure).
E. Plastic drums in front of construction zone @ 20' c - c with vertical panel at 40' c - c and approved warning light @ 40' c - c (for overnight closure).
F. Concrete Traffic Barrier (CTB) or Low Profile Concrete Traffic Barrier (LPCTB) with approved reflectors @ 10' c - c if pavement drop is greater than 1 foot.
G. Plastic drums w/Guard rail mounted.
H. Self- Righting vertical panel spacing.
   - 4 lanes to 2 lanes undivided roadway section @ 20' c - c.
   - 4 lanes divided roadway to one side two way roadway @ 20' c - c.
   - Left lane and right lane storage bays @ 15' c - c.

I. Spacing shown on traffic control shall supersede the above spacing.
J. Spacing may be adjusted to provide driveways, intersections and /or median openings.

CHANNELIZATION AND BARRICADES



TYPICAL SIGN SPACING, TAPER LENGTHS, AND SUGGESTED SPACING OF CHANNELIZATION DEVICES

		Min. Desirable Taper Length "L"			Suggested Maximum Spacing Of Device	
Posted Speed (mph)	Sign Spacing "X"	10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	120'	150'	165'	180'	30'	60' – 75'
35	160'	205'	225'	245'	35'	70' – 90'
40	240'	265'	295'	320'	40'	80' – 100'
45	320'	450'	495'	540'	45'	90' – 110'
50	400'	500'	550'	600'	50'	100' – 125'
55	500'	550'	605'	660'	55'	110' – 140'

Length for Buffers	
Posted Speed (mph)	Length in Feet (B)
20	40
25	60
30	90
35	120
40	155
45	195
50	240
55	295
60	350
65	410
70	475

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP NOTES
CHANNELIZING DEVICES
AND BARRICADES
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2012 | DWG NO: 01512-01

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN & NOTES

TRAFFIC CONTROL NOTES
CHANNELIZING DEVICES & BARRICADES

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 44 OF 59	

FOR REDUCED PLANS
original scale in inches
0 1 2 3

PLOTTED ON: Wednesday, April 15, 2015 3:58:26 PM
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TRAFFIC CONTROL PHASES

CONSTRUCTION OF THIS PROJECT WHICH INCLUDES FOUR T INTERSECTIONS ON THE NORTH SIDE AND THREE CROSS INTERSECTIONS , CAN BE IMPLEMENTED IN FIVE PHASES.

PHASE I:

THIS PHASE CONSISTS OF THE INSTALLATION OF THE PROPOSED 8" WATERLINE ON THE SOUTH SIDE OF BELLAIRE BLVD. BETWEEN STA. 4+00 (EAST OF SOUTHERN PACIFIC RAIL ROAD TRACKS) AND STA. 17+30, ACADEMY STREET.

TO MINIMIZE TRAFFIC DISTURBANCES, IT IS RECOMMENDED TO START THE INSTALLATION AT ACADEMY ST. WHERE ONE-LANE DETOUR (RIGHT NORTH LANE) (SHEET NO.50) DWG. NO. 0512-05 IS REQUIRED AS WELL AS ONE-LANE CLOSURE (SHEET 49) DWG. N0. 0512-04, THE EASTBOUND OUTSIDE LANE OF BELLAIRE BLVD. BETWEEN ACADEMY ST. AND STA. 6+00 . THE INSTALLATION OF THE 8" WATERLINE WILL PROGRESS FROM EAST TO WEST, WHILE MAINTAINING ACCESS TO ALL ADJACENT PROPERTIES AT ALL TIMES. THAT MEANS THAT 10 DRIVEWAYS SHOULD BE MAINTAINED OPEN.

ONCE THE INSTALLATION REACHES STA. 6+00, THE PROPOSED WATERLINE CHANGES DIRECTION AND WILL BE BORED UNDER THE PAVEMENT TO THE MEDIAN AND CONTINUE TO THE WEST ALONG THE MEDIAN TO STA. 3+77. INSTALLING THE PROPOSED 8" WATERLINE ALONG THE MEDIAN REQUIRES ONE-LANE CLOSURE, THE EASTBOUND INSIDE LANE OF BELLAIRE BLVD. SINCE IT IS REQUIRED TO MAINTAIN 2 LANES OPEN TO TRAFFIC IN BELLAIRE BLVD. , CONTRACTOR NEEDS TO SWITCH TRAFFIC SIGNS ACCORDINGLY.

AT THIS POINT THE PROPOSED 8" WATERLINE CHANGES DIRECTION AGAIN TO THE NORTH-EAST AND WILL BE BORED UNDER THE PAVEMENT AND THEN TO THE EAST, CLOSE TO THE NORTH ROW OF BELLAIRE BLVD.

BORING UNDER THE WESTBOUND PAVEMENT TO CONTINUE WITH THE INSTALLATION OF PROPOSED 8" WATERLINE TO THE NORTH SIDE OF BELLAIRE BLVD. SHALL REQUIRE ONE-LANE CLOSURE OF THE INSIDE EASTBOUND LANE AS WELL AS THE OUTSIDE WESTBOUND LANE.

ONCE THIS OPERATION IS COMPLETED, ONE-LANE CLOSURE FOR THE EASTBOUND INSIDE LANE WILL BE REMOVED, WHILE THE WESTBOUND OUTSIDE LANE SHALL REMAIN CLOSED AND READY TO START PHASE II.

PHASE II:

THIS PHASE CONSISTS OF THE INSTALLATION OF THE PROPOSED 16" WATER LINE ON THE NORTH SIDE OF BELLAIRE BLVD. BETWEEN STA. 4+50 AND STA. 45+33, JUST WEST OF EDLOE ST. ON THIS PHASE A ONE-LANE CLOSURE (SHEET NO. 50) DWG. NO. 0512-04 OF THE WESTBOUND OUTSIDE LANE WILL BE REQUIRED AS THE PROGRESS OF THE INSTALLATION ADVANCES. THE LENGTH OF THIS WATERLINE ON THIS SIDE IS 4,083 FEET MOSTLY INSTALLED BY TRENCHLESS CONSTRUCTION , REQUIRES OPEN CUT AT 12 LOCATIONS DUE TO GRADE CHANGES NEEDED TO COMPLY WITH MINIMUM CLEARANCES WITH EXISTING UTILITIES AND 43 DRIVEWAYS SHALL BE MAINTAINED OPEN DURING THE CONSTRUCTION.

PHASE III:

THIS PHASE CONSISTS OF THE INSTALLATION OF A PROPOSED 12" WATERLINE AT STA.25+77 WHICH WILL CONNECT THE NEW 16" ON NORTH SIDE OF BELLAIRE WITH AN EXISTING 12" WATERLINE RUNNING SOUTH TO NORTH ON THE RIGHT SIDE OF STELLA LINK ROAD, SOUTH OF BELLAIRE BLVD. INSTALLATION OF THE PROPOSED 12" WATERLINE SHALL BE ACCOMPLISHED BY TRENCHLESS CONSTRUCTION.

HERE A TYPICAL ONE-LANE DETOUR (SHEET 50) DWG NO. 0512-05 WILL APPLY FOR THE NORTHBOUND TRAFFIC ON STELLA LINK (SOUTH OF BELLAIRE BLVD.) THIS PHASE CAN BE ACCOMPLISHED ONCE PHASE II REACHES THIS LOCATION.

PHASE IV:

THIS PHASE CONSISTS OF THE INSTALLATION OF A PROPOSED 8" WATERLINE AT STA. 34+97, WHICH CONNECTS THE NEW 16" WATERLINE ON THE NORTH SIDE OF BELLAIRE BLVD., TO AN EXISTING 8" WATERLINE RUNNING SOUTH TO NORTH ALONG THE RIGHT SIDE OF BRAES BLVD., ON THE SOUTH SIDE OF BELLAIRE BLVD. SIMILARLY, THIS PHASE CAN BE DONE BY TRENCHLESS CONSTRUCTION, AND WHEN PHASE II REACHES THIS LOCATION.

PHASE V:

THIS PHASE CONSISTS OF THE INSTALLATION BY TRENCHLESS CONSTRUCTION OF THE PROPOSED 16" WATERLINE AT STA. 45+33, WHERE THE WATERLINE CROSSES BELLAIRE BLVD FROM NORTH TO SOUTH, AND THEN GOES EAST TO CONNECT WITH AN EXISTING 12" WATERLINE. THIS INSTALLATION REQUIRES ALSO ONE-LANE CLOSURE OF THE EASTBOUND OUTSIDE LANE.

No.	Date	Revisions	App.

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

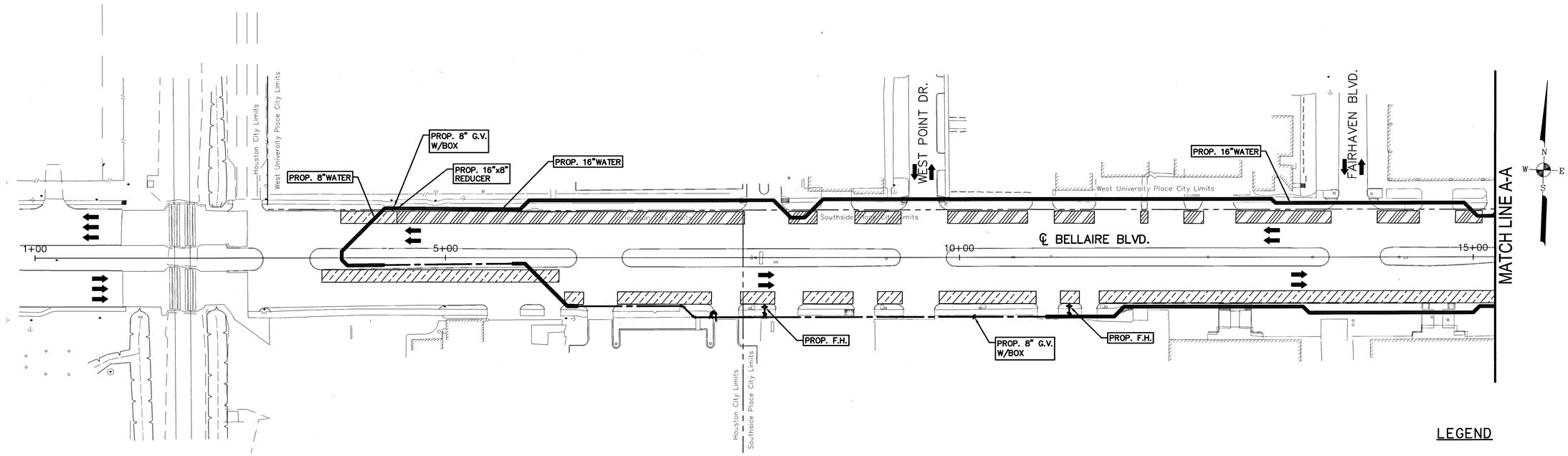
WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PHASES

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 45 OF 59	

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Wednesday, May 13, 2015 1:55:25 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-NOTES.DWG



NOTE:

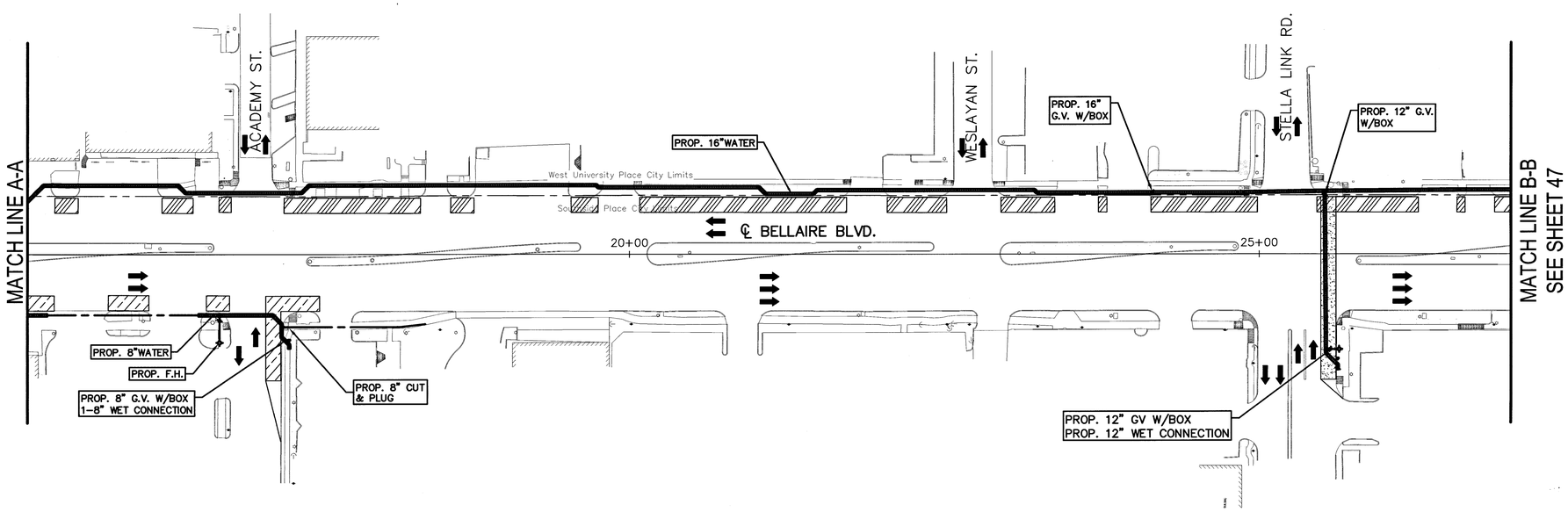
1. FOR APPLICATION OF DIFFERENT CONSTRUCTION PHASES, PLEASE REFER TO SHEET NO. 45, TRAFFIC CONTROL PHASES.

CONTRACTOR IS REQUIRED TO MAINTAIN AND KEEP TWO LANES OPEN ON BOTH EASTBOUND AND WESTBOUND TRAVELWAYS ON BELLAIRE BLVD. AT ALL TIMES.

LEGEND

- PHASE I
- PHASE II
- PHASE III
- PHASE IV
- PHASE V
- OPEN TRAFFIC LANE

0 80' 160'



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STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
5/21/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

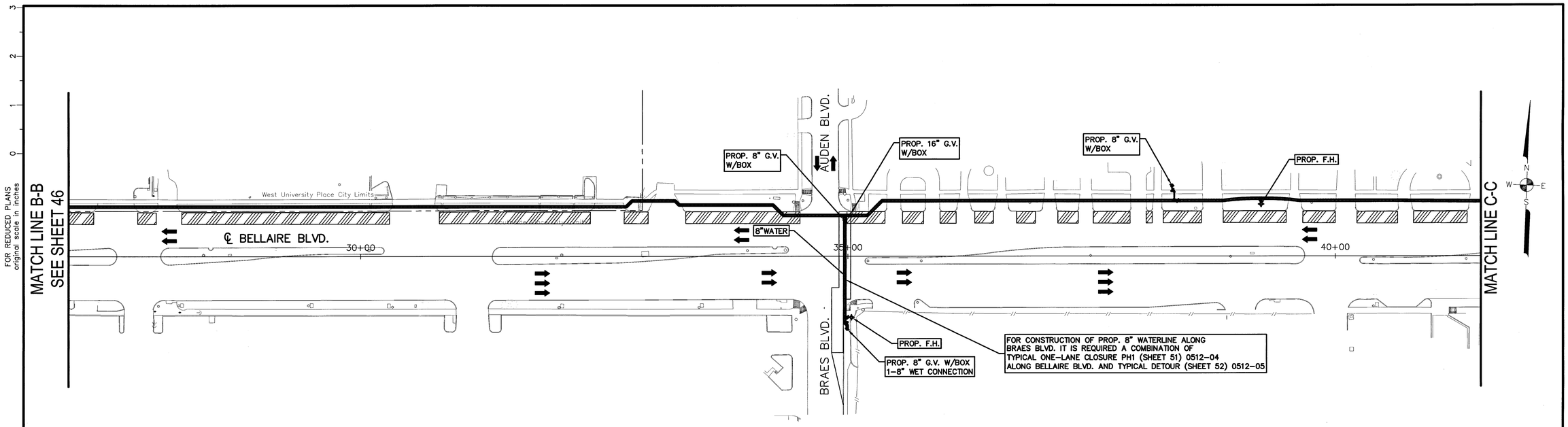
OVERALL TRAFFIC CONTROL PLAN

SHEET 1 OF 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
1" = 50'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 46 OF 59	

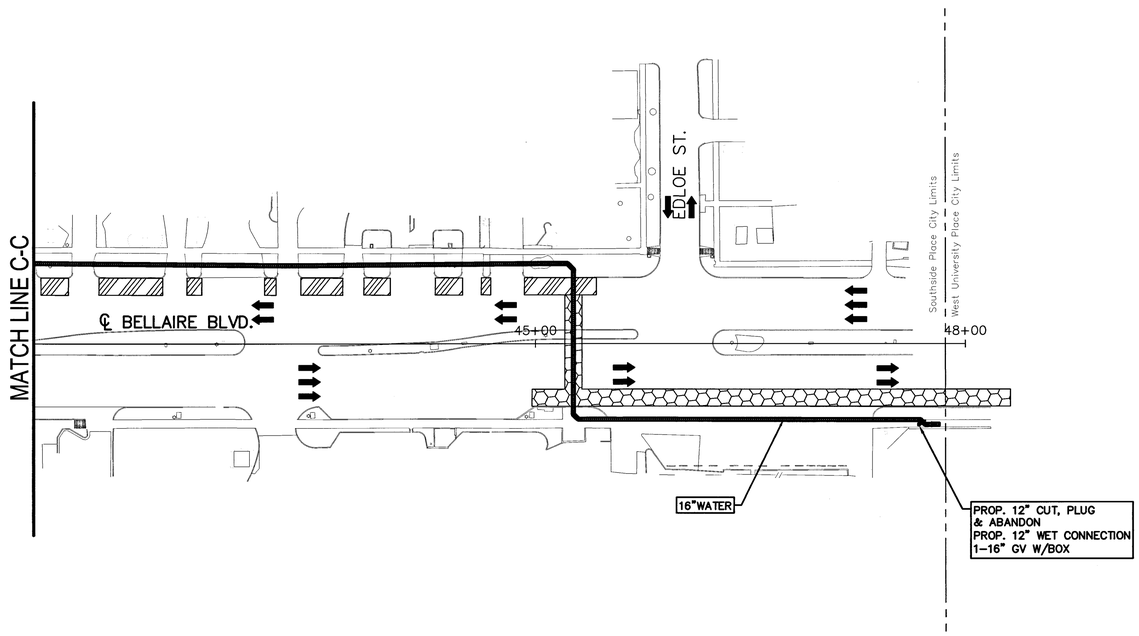
FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Thursday, May 21, 2015 9:35:24 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- OVERALL.DWG



NOTE:

1. FOR APPLICATION OF DIFFERENT CONSTRUCTION PHASES, PLEASE REFER TO SHEET NO. 45, TRAFFIC CONTROL PHASES.



LEGEND

- PHASE I
- PHASE II
- PHASE III
- PHASE IV
- PHASE V
- OPEN TRAFFIC LANE

0 80' 160'

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ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
5/13/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG
BELLAIRE BLVD

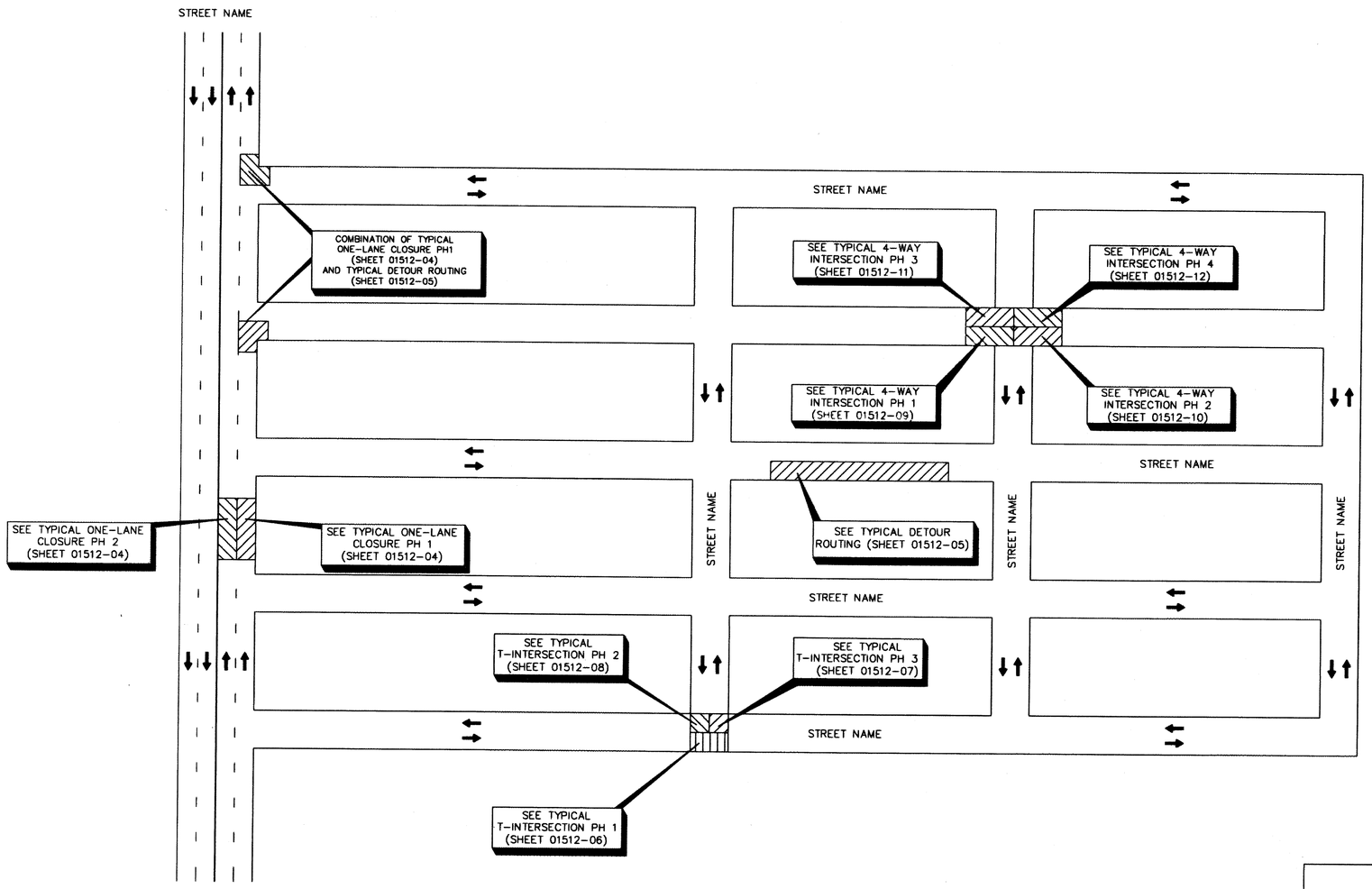
OVERALL TRAFFIC CONTROL PLAN

SHEET 2 OF 2

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
1" = 50'	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 47 OF 59	

PLOTTED ON: Wednesday, May 13, 2015 2:00:30 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- OVERALL.DWG

FOR REDUCED PLANS
original scale in inches



DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP OVERALL
TRAFFIC CONTROL LAYOUT

(NOT TO SCALE)

APPROVED BY:	
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-02

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

OVERALL TRAFFIC CONTROL LAYOUT

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 49 OF 59	

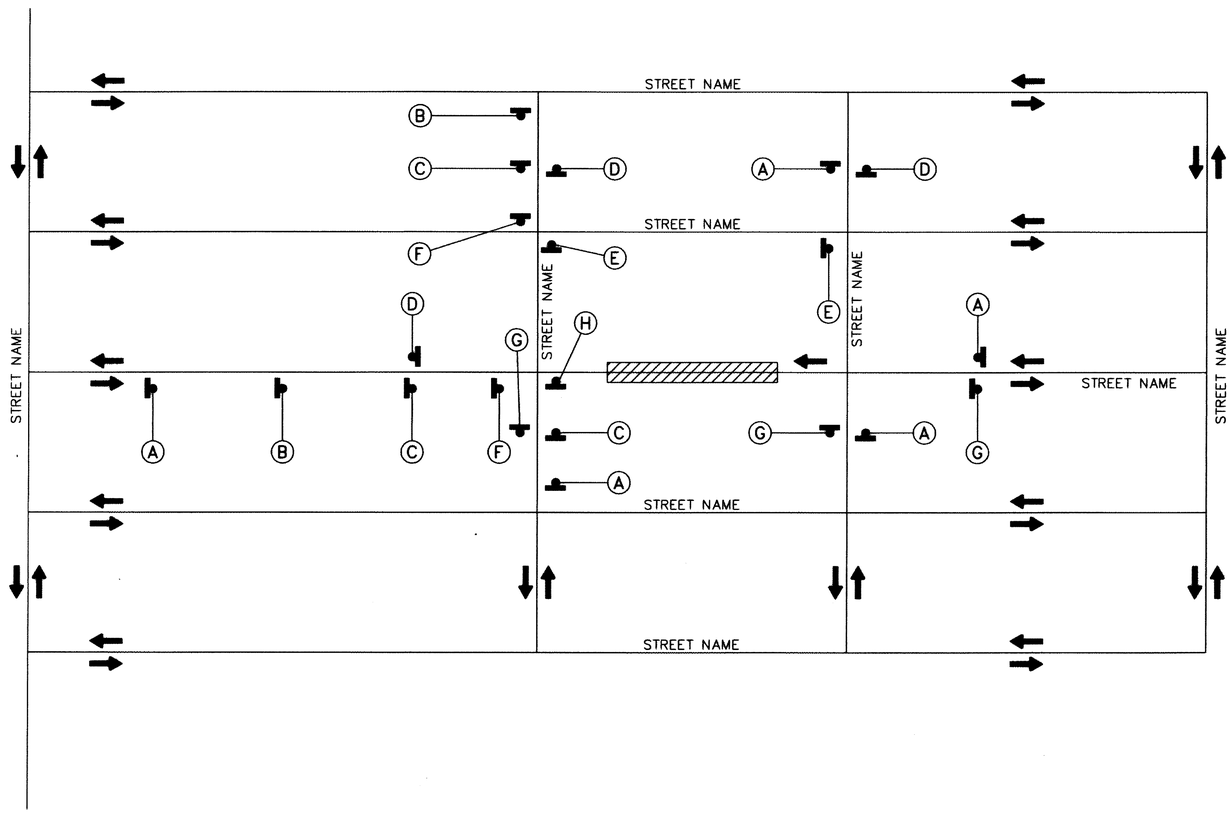
54210
DRAWING NUMBER

PLOTTED ON: Wednesday, April 15, 2015 11:09:52 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

A	B	C	D	E	F	G	H
ROAD WORK AHEAD	ONE LANE ROAD	DETOUR AHEAD	END ROAD WORK	STREET NAME DETOUR →	STREET NAME DETOUR ←	END DETOUR	STREET NAME DETOUR ↑
CW20-1	CW20-4	CW20-2	G20-2	M4-9R	M4-9L	M4-8a	M4-9T

LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- CONSTRUCTION AREA



DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TRAFFIC CONTROL LAYOUT

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER

APPROVED BY: DIRECTOR, DEPT. OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2012

DWG NO: 01512-03

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TRAFFIC CONTROL LAYOUT

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 50 OF 59	

FOR REDUCED PLANS original scale in inches

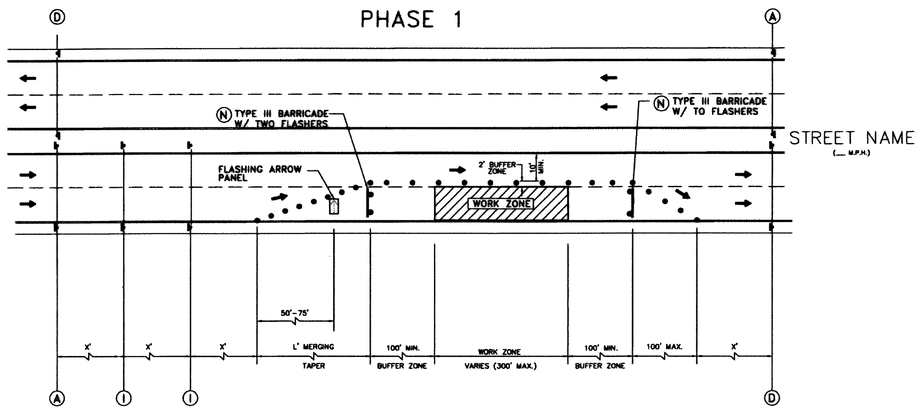
PLOTTED ON: Wednesday, April 15, 2015 11:10:23 AM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

A	D	I	J	N
ROAD WORK AHEAD	END ROAD WORK	RIGHT LANE CLOSED / AHEAD	LEFT LANE CLOSED / AHEAD	ROAD CLOSED
CW20-1	G20-2	CW20-5(2) CW16-3	CW20-5(1) CW16-3	R11-2

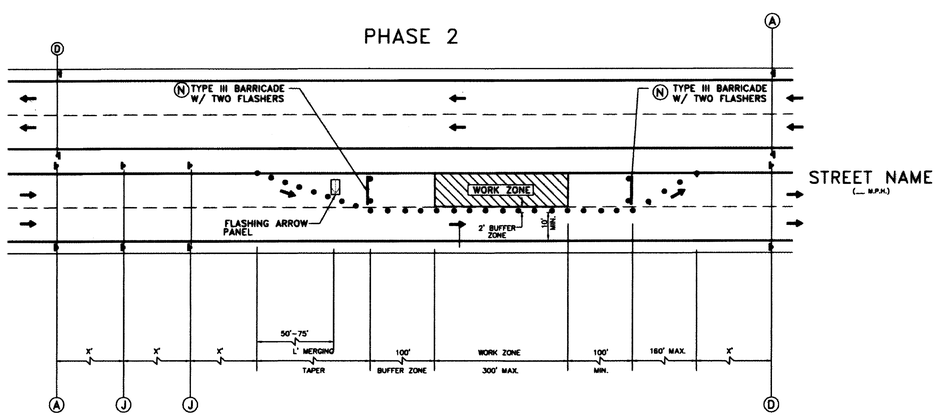
LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- CONSTRUCTION AREA

PHASE 1



PHASE 2



NOTE:

1. RETURN TAPERS AND DOWNSTREAM BARRICADES ARE OPTIONAL ON A DIVIDED ROADWAY SECTION.
2. DOUBLE SIGNS SHALL BE USED ONLY ON ROADWAYS WITH MEDIANS.
3. FOR DIMENSIONS REFER TO SHEET 01512-01.

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP ONE LANE CLOSURE
PHASE 1 & 2

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-04

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SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS — OMAR J. CORREDOR — 47746 — REGISTERED PROFESSIONAL ENGINEER — 4/09/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

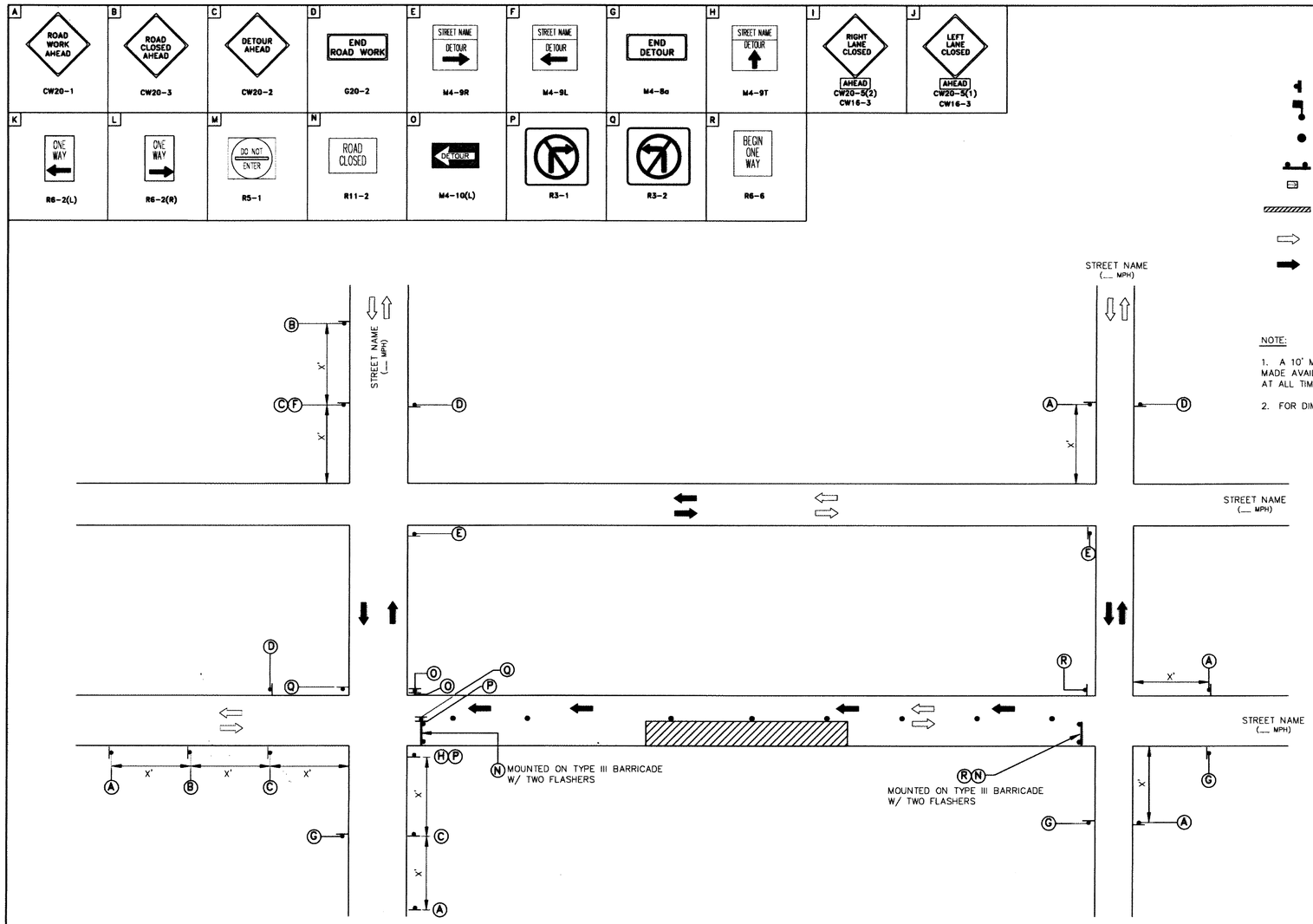
TRAFFIC CONTROL PLAN ONE LANE CLOSURE

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 51 OF 59	

No.	Date	Revisions	App.

FOR REDUCED PLANS original scale in inches 0 1 2 3

PLOTTED ON: Wednesday, April 15, 2015 11:30:24 AM
FILE NAME: F:\OW-CALL WLE\DCW-BELL\CAD\TCP\DCW-BELL-TCP ONE LANE CLOSURE PHASE 1 & 2.DWG



LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- BARRICADE
- FLASHING ARROW PANEL
- AREA UNDER CONSTRUCTION
- EXISTING TRAVELWAY
- TRAFFIC CONTROL PLAN DETOUR TRAVEL WAY

NOTE:

1. A 10' MINIMUM LANE WIDTH FOR EMERGENCY SHALL BE MADE AVAILABLE AND MAINTAINED BY THE CONTRACTOR AT ALL TIMES.
2. FOR DIMENSIONS REFER TO SHEET 01512-01.

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP ONE LANE CLOSURE

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-05

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS 4/15/2015 OMAR J. CORREDOR 47746 REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TCP ONE LANE CLOSURE

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 52 OF 59	

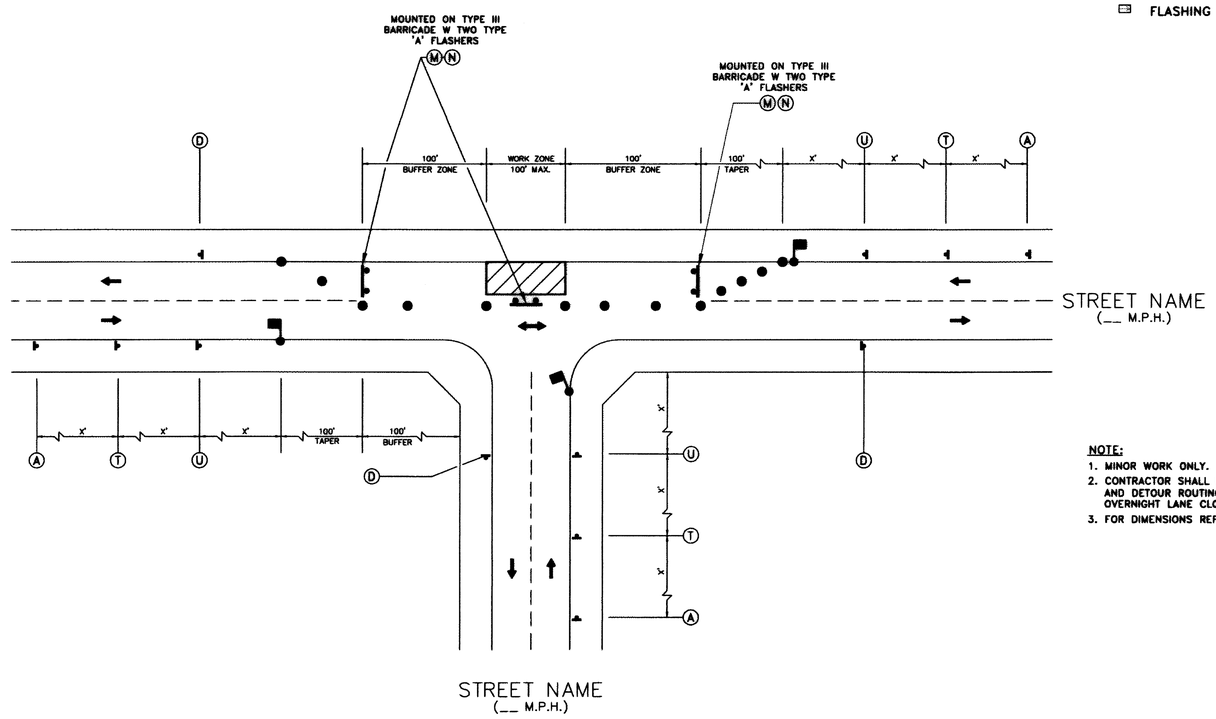
FOR REDUCED PLANS original scale in inches

PLOTTED ON: Wednesday, April 15, 2015 1:09:48 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

A	T	U	D	M	N
ROAD WORK AHEAD	ONE LANE ROAD		END ROAD WORK	DO NOT ENTER	ROAD CLOSED
CW20-1	CW20-4	CW20-7	G20-2	R5-1	R11-2

LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- BARRICADE
- FLASHING ARROW PANEL



NOTE:

1. MINOR WORK ONLY.
2. CONTRACTOR SHALL USE ONE-LANE ROAD CLOSURE AND DETOUR ROUTING FOR MAJOR OPERATIONS AND OVERNIGHT LANE CLOSURES.
3. FOR DIMENSIONS REFER TO SHEET 01512-01

PHASE 1 OF 3
TYPICAL CONSTRUCTION ZONE AT A T-INTERSECTION

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP TYPICAL 3-WAY INTERSECTION
PHASE 1 OF 3
(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-06

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 3-WAY INTERSECTION
PHASE 1 OF 3

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 53 OF 59	

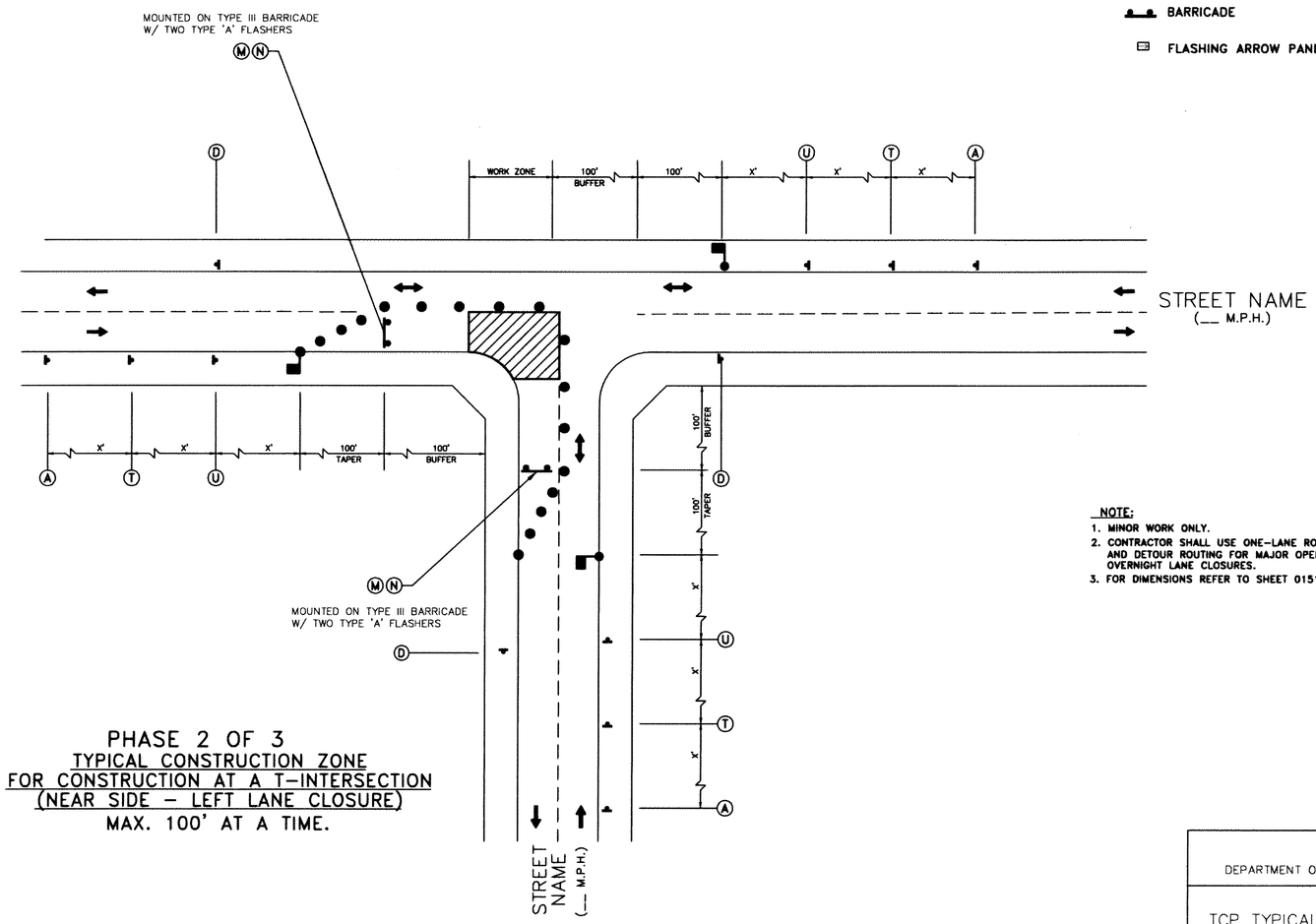
FOR REDUCED PLANS
original scale in inches
3 2 1 0

PLOTTED ON: Wednesday, April 15, 2015 1:10:15 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

A	T	U	D	M	N
ROAD WORK AHEAD	ONE LANE ROAD		END ROAD WORK	DO NOT ENTER	ROAD CLOSED
CW20-1	CW20-4	CW20-7	G20-2	R5-1	R11-2

LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- BARRICADE
- FLASHING ARROW PANEL



NOTE:

1. MINOR WORK ONLY.
2. CONTRACTOR SHALL USE ONE-LANE ROAD CLOSURE AND DETOUR ROUTING FOR MAJOR OPERATIONS AND OVERNIGHT LANE CLOSURES.
3. FOR DIMENSIONS REFER TO SHEET 01512-01

PHASE 2 OF 3
TYPICAL CONSTRUCTION ZONE
FOR CONSTRUCTION AT A T-INTERSECTION
(NEAR SIDE - LEFT LANE CLOSURE)
MAX. 100' AT A TIME.

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP TYPICAL 3-WAY INTERSECTION
PHASE 2 OF 3
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2012 | DWG NO: 01512-07

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 3-WAY INTERSECTION
PHASE 2 OF 3

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 54 OF 59	

54210

FOR REDUCED PLANS original scale in inches 0 1 2 3

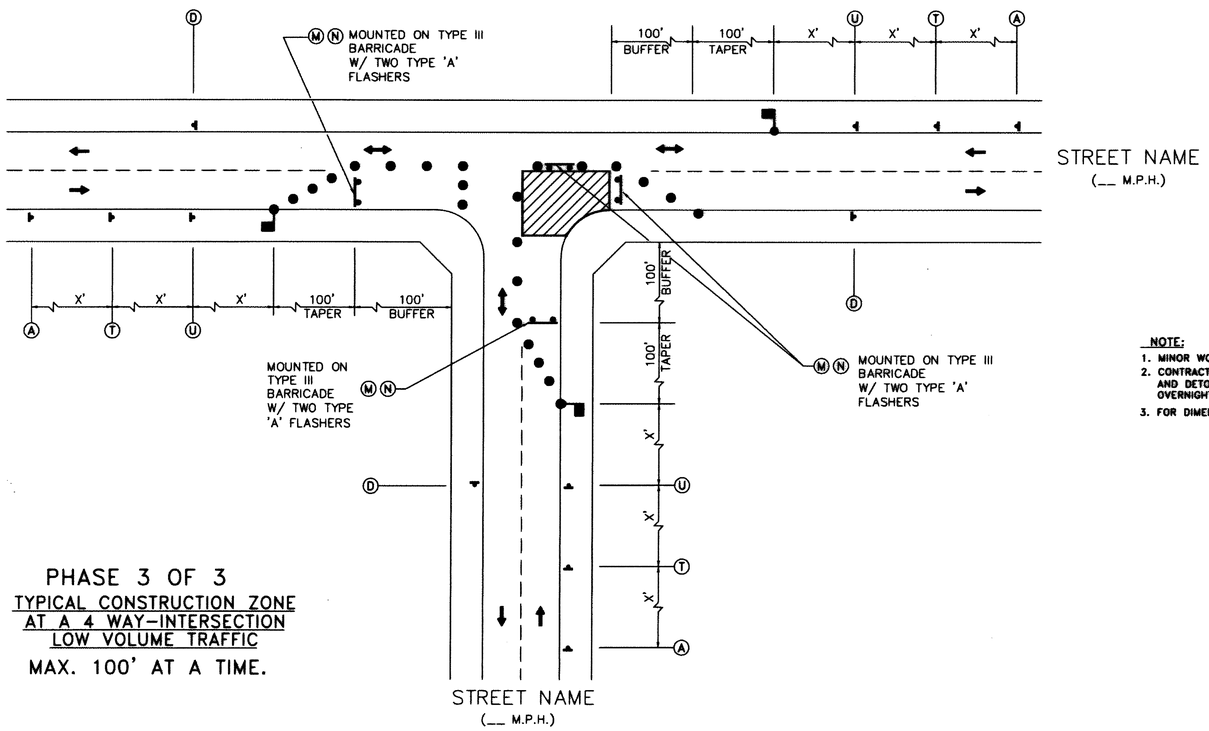
PLOTTED ON: Wednesday, April 15, 2015 1:55:43 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

FOR REDUCED PLANS
original scale in inches

A	T	U	D	M	N
ROAD WORK AHEAD	ONE LANE ROAD		END ROAD WORK	DO NOT ENTER	ROAD CLOSED
CW20-1	CW20-4	CW20-7	G20-2	R5-1	R11-2

LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- BARRICADE
- FLASHING ARROW PANEL



PHASE 3 OF 3

TYPICAL CONSTRUCTION ZONE
AT A 4 WAY-INTERSECTION
LOW VOLUME TRAFFIC

MAX. 100' AT A TIME.

NOTE:

1. MINOR WORK ONLY.
2. CONTRACTOR SHALL USE ONE-LANE ROAD CLOSURE AND DETOUR ROUTING FOR MAJOR OPERATIONS AND OVERNIGHT LANE CLOSURES.
3. FOR DIMENSIONS REFER TO SHEET 01512-01

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP TYPICAL 3-WAY INTERSECTION
PHASE 3 OF 3

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-08

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TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

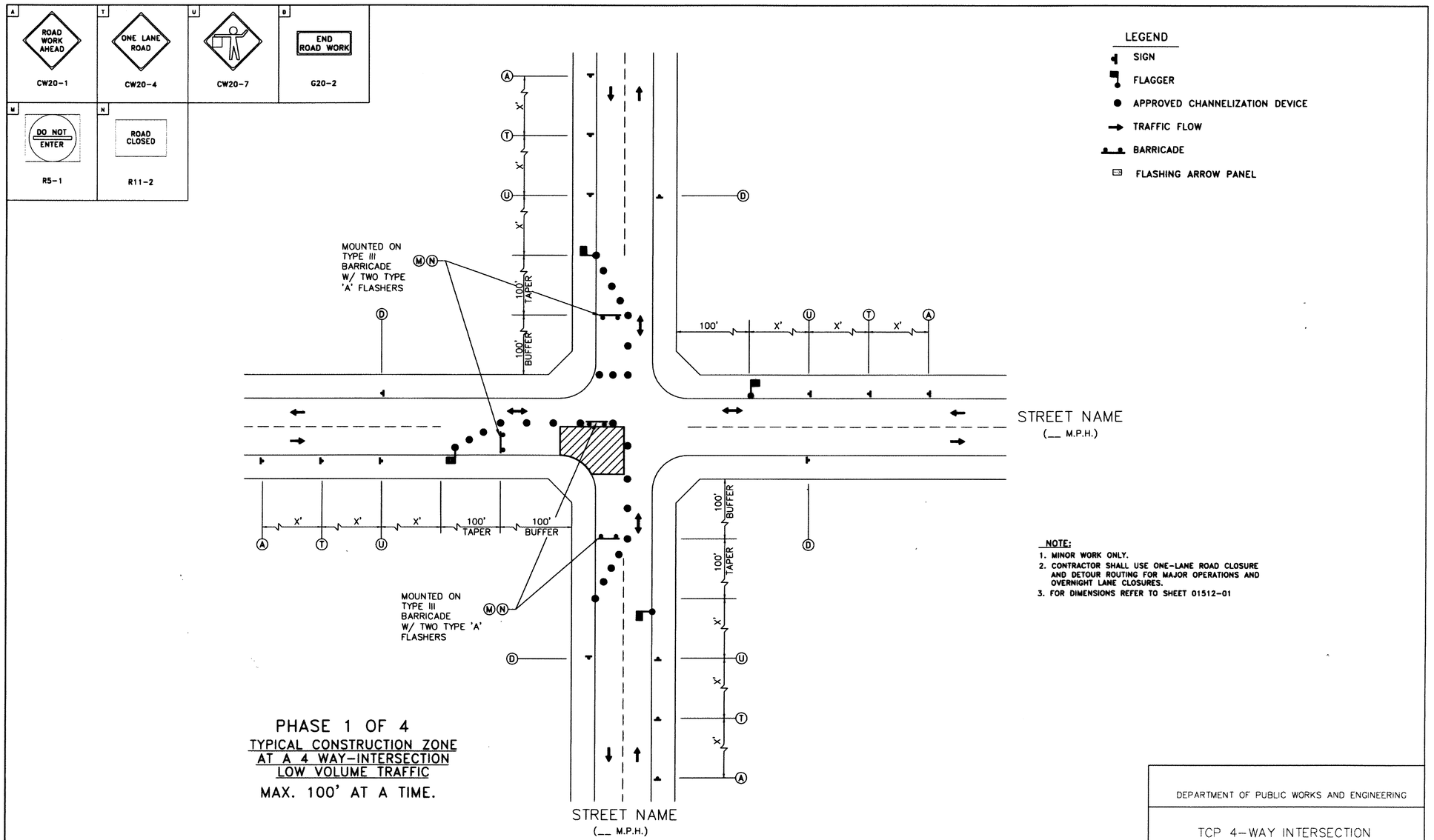
TYPICAL 3-WAY INTERSECTION
PHASE 3 OF 3

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 55 OF 59	

PLOTTED ON: Wednesday, April 15, 2015 1:56:11 PM
FILE NAME: F:\ON-CALL WLE\OCW-BELL\CAD\TCP\OCW-BELL-TCP- ALL SHEETS.DWG

C01

FOR REDUCED PLANS original scale in inches



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3. FOR DIMENSIONS REFER TO SHEET 01512-01

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP 4-WAY INTERSECTION
PHASE 1 OF 4
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-9

SES HORIZON CONSULTING ENGINEERS, INC.
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(713) 988-5504, Fax (713) 988-1441 www.seshorizon.com

SES HORIZON CONSULTING ENGINEERS, INC.
TEXAS REGISTERED ENGINEERING FIRM F-003922

STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 4-WAY INTERSECTION
PHASE 1 OF 4

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 56 OF 59	

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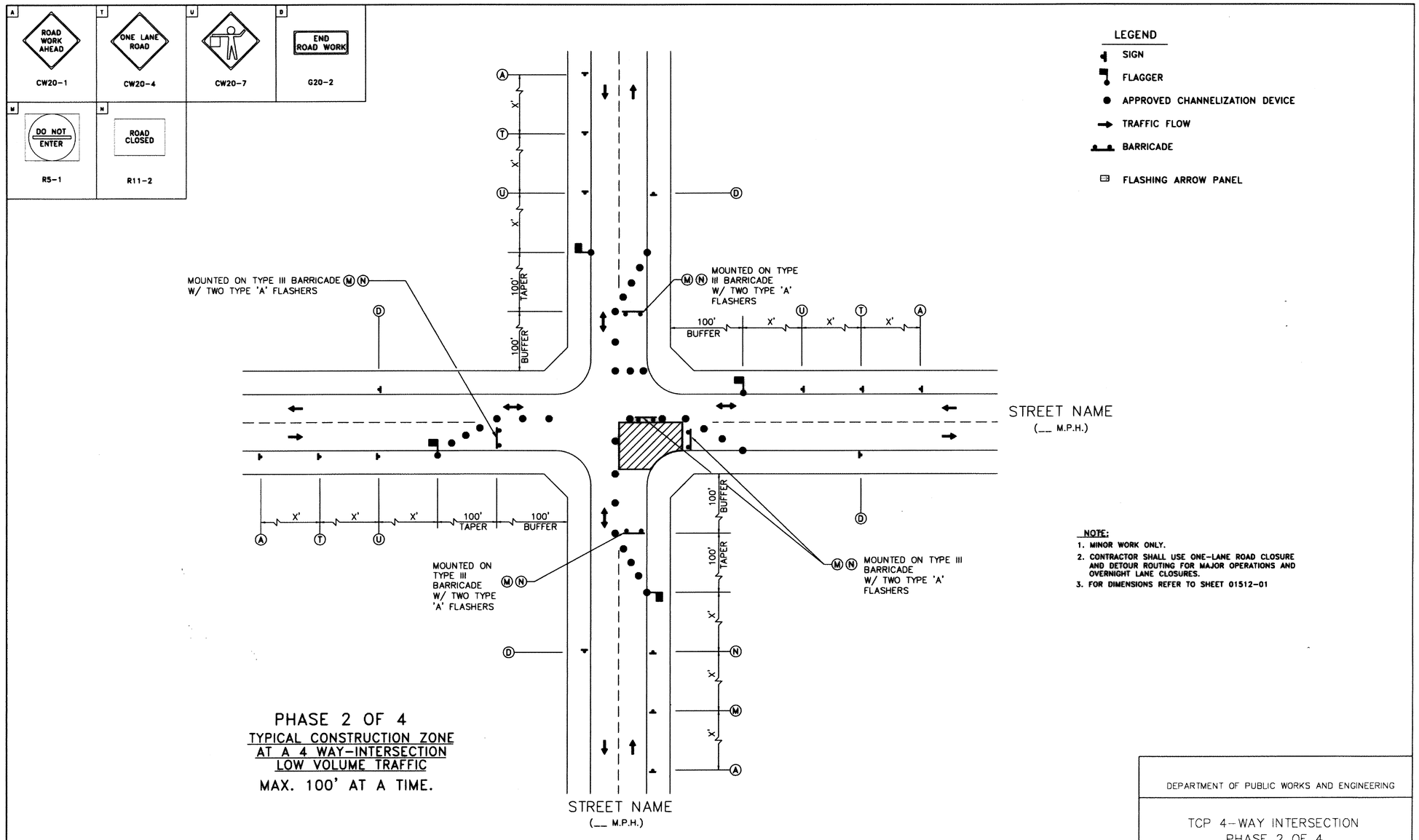

PHASE 2 OF 4

TYPICAL CONSTRUCTION ZONE
AT A 4 WAY-INTERSECTION
LOW VOLUME TRAFFIC

MAX. 100' AT A TIME.

NOTE:

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DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP 4-WAY INTERSECTION
PHASE 2 OF 4
(NOT TO SCALE)

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CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-10

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STATE OF TEXAS
4/15/15
OMAR J. CORREDOR
P.E. 47746
REGISTERED PROFESSIONAL ENGINEER

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO. : P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 4-WAY INTERSECTION
PHASE 2 OF 4

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 57 OF 59	

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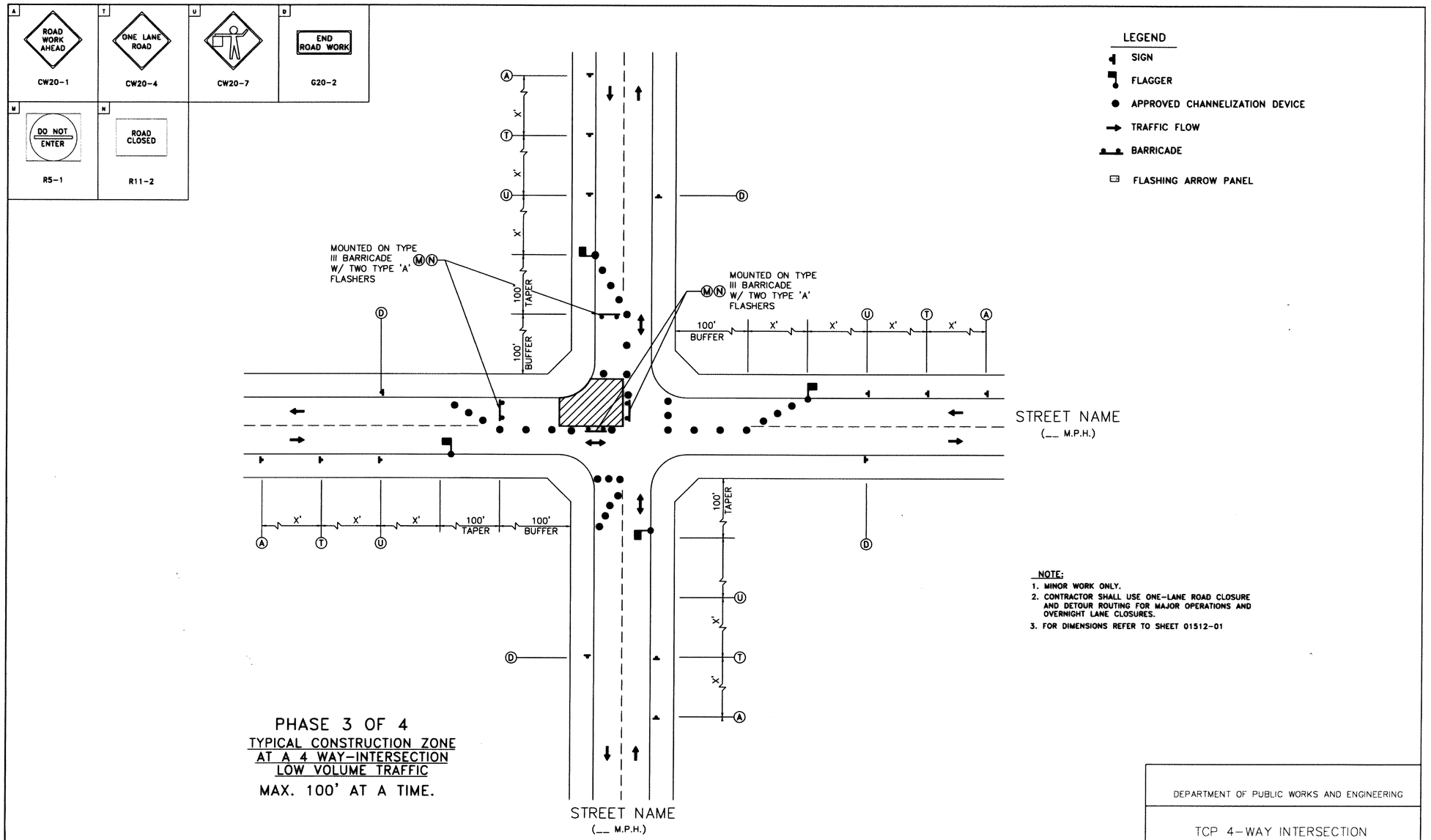

LEGEND

- SIGN
- FLAGGER
- APPROVED CHANNELIZATION DEVICE
- TRAFFIC FLOW
- BARRICADE
- FLASHING ARROW PANEL

NOTE:

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PHASE 3 OF 4

TYPICAL CONSTRUCTION ZONE AT A 4 WAY-INTERSECTION LOW VOLUME TRAFFIC

MAX. 100' AT A TIME.

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TCP 4-WAY INTERSECTION PHASE 3 OF 4

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-11

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STATE OF TEXAS
OMAR J. CORREDOR
47746
REGISTERED PROFESSIONAL ENGINEER
4/15/2015

SURVEYED BY:
JAG ENGINEERING, INC.
FB NO.: P-5864

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 4-WAY INTERSECTION PHASE 3 OF 4

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 58 OF 59	

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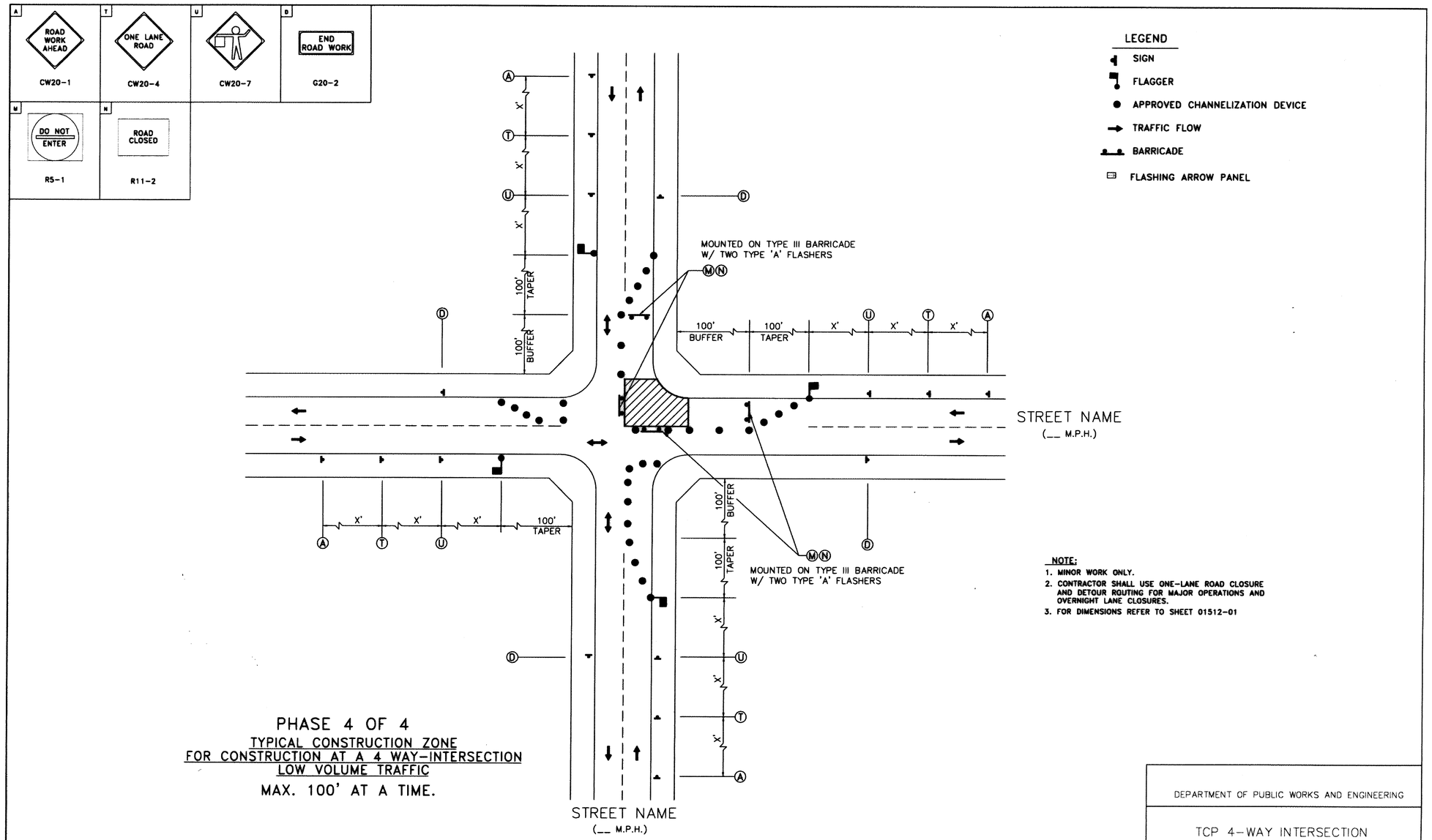

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PHASE 4 OF 4
TYPICAL CONSTRUCTION ZONE
FOR CONSTRUCTION AT A 4 WAY-INTERSECTION
LOW VOLUME TRAFFIC
MAX. 100' AT A TIME.

FOR REDUCED PLANS original scale in inches

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TCP 4-WAY INTERSECTION
PHASE 4 OF 4.
(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2012	DWG NO: 01512-12

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STATE OF TEXAS
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4/15/2015

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

WATER LINE REPLACEMENT ALONG BELLAIRE BLVD

TRAFFIC CONTROL PLAN

TYPICAL 4-WAY INTERSECTION
PHASE 4 OF 4

WBS NUMBER	CITY DWG NO.:
S-000700-A017-3	54210
DRAWING SCALE	
N.T.S.	
CITY OF HOUSTON PM	
MUMTAZ BAIG, P.E.	
SHEET NO. 59 OF 59	

06-0084 Geotechnical Report

GEOTECHNICAL STUDY
BELLAIRE BOULEVARD PROJECT
CITY OF SOUTHSIDE PLACE, TEXAS

Prepared for

CLAUNCH & MILLER, INC.
4635 SOUTHWEST FREEWAY, SUITE 1000
HOUSTON, TEXAS 77027

Prepared by

TOLUNAY-WONG ENGINEERS, INC.
10710 S. SAM HOUSTON PARKWAY W., SUITE 100
HOUSTON, TEXAS 77031
PROJECT NO.: 06.13.284
SEPTEMBER 2006

September 19, 2006
TWEI Project No:06.13.284

Claunch & Miller, Inc.
4635 Southwest Freeway, Suite 1000
Houston, Texas 77027

Attn.: Mr. Todd Calvin, P.E.

GEOTECHNICAL STUDY
BELLAIRE BOULEVARD PROJECT
CITY OF SOUTHSIDE PLACE, TEXAS

Presented herein is the report of our geotechnical study for the proposed Bellaire Boulevard project in the City of Southside place, Texas. This study was conducted in general accordance with our proposal dated June 29, 2006 (TWEI Proposal No. P06-G313) and was authorized by Mr. Todd Calvin, P.E. of Clunch & Miller, Inc. on August 9, 2006.

We appreciate this opportunity to be of service. Please call if you need additional information.

Sincerely,
TOLUNAY-WONG ENGINEERS, INC.

STATE OF TEXAS
JOHN D. BROWN
96185
LICENSED
PROFESSIONAL ENGINEER

M. Islam

Mohammed Islam, E.I.T.

John D. Brown

John D. Brown, P. E.

Copies Submitted: (3)

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SUMMARY

The principal findings and conclusions of the additional geotechnical study for the proposed storm sewer installation project in the City of Southside Place, Texas are summarized as follows:

1. Bellaire Boulevard consists of 8.5-in to 11.75-in thick concrete pavement with 2.0-in to 3.25-in. thick asphalt overlay. About 3-in. and 11.5-in. thick cement stabilized sand base material were observed in respective borings B-3 and B-5. The existing pavement thickness and base material encountered at boring locations are presented in the report text.

2. The generalized soil stratigraphy under the existing pavement or at the ground surface, as interpreted from borings B-1 through B-6, generally consists of a fill mantle composed of high plasticity fat clays and cohesionless silty sands, underlain by high plasticity fat clays, and to a lesser extent low to medium plasticity lean clays and sandy lean clays to the 10-ft depths in borings B-1 and B-2, and extending to the 20-ft explored depths in borings B-3 through B-6. We encountered cohesionless to semi-cohesive silty sands and clayey sands below 10-ft and 10.5-ft depths in borings B-1 and B-2 extending to the 20-ft termination depth. Fill soils were not observed below the existing pavement in borings B-1, B-2, and B-6.

3. Free water was encountered at 13-ft depth in borings B-1 and B-2 during drilling. Free water was not encountered in the remaining borings during drilling. The water level in the open borehole B-4 was measured at the 10.2-ft depth at the end of day with associated caving depth of 15.2-ft. Borings B-3, B-5 and B-6 remained dry during that observation period. Borings B-1 and B-2 were observed to be damp at their 12-ft caving depth during that time.

4. Excavations for storm sewer lines are anticipated to encounter primarily cohesive soils, except in the vicinity of borings B-1 and B-2 where silty sands and clayey sands were encountered below 10.5-ft and 10-ft depths, respectively. Water seepage or surface runoff within cohesive soils can probably be handled by pumping from sumps. However, mechanical dewatering may be necessary if excavations expose water bearing silty sand and clayey sand soils such as those encountered in borings B-1 and B-2.

5. Bedding and backfill for storm sewer should be constructed in accordance with the City of Houston Department of Public Works and Engineering Standards dated October 2002, or an

equivalent standard. In accordance with the current OSHA regulations, the observed soils in the project borings would be classified as "Type C".

6. Fill for grading purposes should preferably be select cohesive soil. Select cohesive fill should have a plasticity index between 7 and 20 and be free of organic matter and excessive silt. Fill for grade adjustments should be placed in lifts not exceeding 8-in. loose measure. All fill should be compacted to at least 95% of the maximum dry density at a moisture content within two percentage points of the optimum, as determined by the standard Proctor density test (ASTM D 698).

INTRODUCTION

This report presents the results of the geotechnical study for the proposed storm sewer installation project in the City of Southside Place, Texas. The purpose of the study was to evaluate the general soil and groundwater conditions throughout the site to formulate excavation guidelines and assess bedding and backfill requirements for a storm sewer line. A geologic fault study and assessment of regional land subsidence were not included in the scope of work for this project.

Project Description

It is planned to improve drainage in the City of Southside Place, Texas. The project consists of installation of 78-in. diameter storm sewer underneath Bellaire Boulevard from Weslayan to Poor Farm Ditch. According to Mr. Todd Calvin, P.E. of Claunch & Miller, Inc. the proposed storm sewer alignment will have maximum flow line depths of 13-ft to 14-ft. This proposal is prepared based on telephone conversation dated June 29, 2006. The project site locations are presented on Figures 1 and 2.

Scope of Study

The objectives of this study were to explore soil and groundwater conditions for developing geotechnical design recommendations for pavement sections, and to assess storm sewer line excavation and bedding and backfill requirements. The scope of the geotechnical study included the following work tasks.

- Drilling six (6) 20-ft deep borings along the proposed storm sewer alignments to explore soil and groundwater conditions and to obtain soil samples for laboratory testing.
- Performing laboratory tests on selected samples to evaluate the physical and engineering properties of the soils.
- Developing guidelines for storm sewer line excavation, bedding and backfill based on City of Houston specifications.

FIELD EXPLORATION

The field exploration consisted of drilling and sampling six (6) 20-ft deep soil borings (B-1 through B-6) along the project alignment to evaluate the subsurface conditions. The field exploration was performed on August 25, 2006. The project soil borings were drilled using a truck-mounted rig having hydraulic drawdown. The approximate boring locations are shown on Figures 1 and 2. The

borings were dry augered to their 20-ft explored depth in an attempt to evaluate the groundwater condition.

Pavement Description

The measured pavement types, thicknesses and the soil types immediately beneath the pavements are tabulated as follows:

Measured Pavement Structure Thicknesses

Boring	Street/Roadway	Pavement Thickness and Description	Subgrade Soil Below Pavement or @ Ground Surface
B-1	Bellaire Boulevard	2.5-in. Asphalt + 8.5-in. Concrete	Lean Clay (CL)
B-2	Bellaire Boulevard	3-in. Asphalt + 12.5-in. Concrete	Fat Clay (CH)
B-3	Bellaire Boulevard	2.25-in. Asphalt + 10-in. Concrete+3-in. stabilized sand base	Silty Sand "FILL"
B-4	Bellaire Boulevard	3.25-in. Asphalt + 11.75-in. Concrete	Fat Clay "FILL"
B-5	Bellaire Boulevard	2-in. Asphalt + 10.5-in. Concrete+11.5-in. stabilized sand base	Fat Clay "FILL"
B-6	Bellaire Boulevard	2.5-in. Asphalt + 8.5-in. Concrete	Fat Clay (CH)

Soil Sampling

Soil samples were generally obtained at 2-ft continual interval to 12-ft depth, at the 13-ft to 15-ft depth range and continuing at a 5-ft interval to the 20-ft scheduled depth.

Cohesive and semi-cohesive soils were sampled by hydraulically pushing a 3-in. diameter thin-walled tube in a single stroke (ASTM D 1587). Samples were extruded in the field, visually classified, and consistency estimates were obtained on the samples with a pocket penetrometer. Penetrometer readings are shown on the boring logs. A factor of 0.67, based on local experience, was applied to the penetrometer data to estimate soil consistency. Representative portions of the samples were wrapped in foil and sealed in plastic bags for transport to our laboratory.

Cohesionless soils were sampled using the Standard Penetration Test (SPT) 1 3/8-in. I.D. split-barrel sampler driven 18 in. by a 140-lb. hammer free falling 30 in. (ASTM D 1586). The number of blows required to advance the sampler three consecutive 6-in. depths are recorded on the

boring logs. The "N" value, in blows per foot, is obtained from the SPT by adding the last two blow count numbers. The samples obtained from the split-barrel were visually classified and sealed in plastic bags for transport to our laboratory.

Water-Level Measurements

The borings were dry augered to their full depths to observe the presence of perched or free-water condition. Water level observations were also made in the open boreholes at the end of the fieldwork day and one day after drilling completion. Water level observations in an open borehole may not accurately reflect a true (static) groundwater condition since caving and surface water infiltration can affect the water level, and it may be time dependent. Accurate determination of the static groundwater level is usually made with a standpipe piezometer. Installation of a piezometer to evaluate the long-term groundwater level was not included in the work scope.

Boring Logs

Our interpretations of the general soil and groundwater level conditions at the boring locations are included on the boring logs presented in Appendix A. The soil classifications and interpretations of the soil types throughout the boring depth and the locations of strata changes were based on test results and visual classifications during field sampling and during laboratory testing in accordance with ASTM D 2487, *"Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)"* and ASTM D 2488, *"Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)"*. A key to the terms and symbols used on the boring logs is included in Appendix A.

LABORATORY TESTING

Laboratory tests were performed on selected soil samples to measure moisture content, plasticity characteristics, unconfined compressive strength, and the amount of soils finer than the No. 200 sieve. Results of the soil tests are presented on the soil boring logs included in Appendix A. A brief description of the tests follows:

- **Water (Moisture) Content of Soil and Rock – ASTM D 2216**. The water content of a material, expressed as a percentage, is defined as the ratio of the mass of pore or free water in a given mass of material to the mass of the solid material particles.

- **Liquid Limit, Plastic Limit, and Plasticity Index of Soils – ASTM D 4318**. These soil properties are used to distinguish different soil types, and provide an indication of volume change potential when considered in conjunction with natural moisture content. The liquid

limit and plastic limit of soils, referred to as the Atterberg limits, distinguish the boundaries of the several consistency states of plastic soils. The plasticity index of the soil is the difference between the liquid limit and the plastic limit.

- **Unconfined Compressive Strength of Cohesive Soil - ASTM D 2166.** This test measures the unconfined compressive strength, using strain-controlled application of an axial load. The unconfined compressive strength of a cohesive soil sample is twice its undrained shear strength.

- **Unconsolidated-Undrained Triaxial Compression –ASTM D 2850** This compression test consists of placing a relatively undisturbed cylindrical specimen in a pressurized triaxial chamber and then loading it to failure, without allowing drainage, using strain-controlled application of the axial load. The compressive strength of a cohesive soil sample is twice its undrained shear strength.

- **Amount of Material in Soils Finer Than the No. 200 (75-µm) Sieve - ASTM D 1140.** This test determines the total amount of material in soils finer than the No. 200 sieve. The test result is presented as the percent of silt and clay sizes by weight in the sample and can provide an indication of the soil permeability.

Results of the soil tests are presented on the soil boring logs in Appendix A of this report.

SUBSURFACE CONDITIONS

Our interpretations of soil and groundwater conditions are based on information obtained at the boring locations only. The boring logs are presented in Appendix A. This information has been used as the basis for our conclusions and recommendations. Subsurface conditions could vary between soil boring locations. Significant variations at areas not explored by the project borings will require reevaluation of our recommendations.

Soil Stratigraphy

The generalized soil stratigraphy under the existing pavement or at the ground surface, as interpreted from borings B-1 through B-6, generally consists of a fill mantle composed of high plasticity fat clays and cohesionless silty sands, underlain by high plasticity fat clays, and to a lesser extent low to medium plasticity lean clays and sandy lean clays to the 10-ft depth in borings B-1 and B-2, and extending to the 20-ft explored depth in borings B-3 through B-6. We encountered cohesionless and semi-cohesive silty sands and clayey sands below 10.5-ft and 10-ft depths extending

to the 20-ft termination depth in respective borings B-1 and B-2. Fill soils were not observed below the existing pavement in borings B-1, B-2, and B-6. Ferrous & calcareous nodules, sand seams/pockets, silt pockets, shell, roots and slickensided substructure were observed within the cohesive soil matrix.

The upper 4-ft to 6-ft deep soils observed in borings B-3 through B-5 were classified as fill. The fill soils were comprised of cohesionless silty sands and high plasticity cohesive fat clays with sand and fat clays. It should be stressed that it is relatively difficult to accurately delineate fill from similar natural soils. Fill classifications are made based upon visual observations and require considerable judgement. The interpreted fill depths may vary somewhat from actual conditions.

Petroleum or hydrocarbon odors were detected in the soil samples recovered from the upper 10-ft depth in boring B-6. Detailed descriptions of the soils encountered are presented on the logs of borings included in Appendix A.

Soil Properties

The laboratory testing program was oriented towards measuring the physical and engineering properties of the sub-soils for storm sewer lines. The test results are presented on the boring logs in Appendix A.

We measured liquid limits ranging from 31% to 75% with corresponding plasticity indices ranging from 16 to 53 on thirteen (13) selected cohesive soil samples recovered from various depths in the project borings. The median liquid limit and plasticity index values were 63% and 42, respectively. The in situ moisture contents of the cohesive soil samples ranged from approximately one percentage point dry to fourteen percentage points wet of their corresponding plastic limits. The plasticity and moisture content of the cohesive soils indicate generally a low shrink/swell potential with moisture variations.

We measured fines contents of 74% and 83% on two (2) cohesive soil samples recovered from respective 2-ft and 4-ft depths in borings B-3 and B-4.

We measured undrained shear strengths ranging from 1000 psf to 1690 psf on seven (7) selected cohesive soil samples during unconfined compression and unconsolidated undrained triaxial testing. Total unit weights of eight (8) tested cohesive soil samples ranged from 115 pcf to 128 pcf. Based on the measured undrained shear strengths data and the calibrated pocket penetrometer readings, the cohesive soils encountered in the project borings are inferred to have stiff to very stiff-hard, but mostly stiff to very stiff consistencies.

SPT "N" values ranging from 5 to 23 blows per foot were measured within silty sand and clayey sand strata observed below 10-ft depth in borings B-1 and B-2. Considering the overburden correction, the blow count data are indicative of loose to medium dense relative densities. Cohesionless to semi-cohesive soil samples obtained from borings B-1 and B-2 yielded fines contents ranging from 36% to 43%.

Groundwater Conditions

The project borings were dry augered to scheduled termination depth. Groundwater level encountered during drilling and end of the day groundwater level are presented in the table below:

Boring	Boring Depth (ft)	Dry Augered Depth (ft)	Depth to Free water During Drilling (ft)	Groundwater Level		
				Depth to Groundwater (ft)	Caved Depth (ft)	Time Lapse Between Drilling & Water Level Reading
B-1	20	20	13	Damp	12	2.25 hours
B-2	20	20	13	Damp	12	2.75 hours
B-3	20	20	Dry	Dry	-	3.5 hours
B-4	20	20	Dry	10.2	15.2	4 hours
B-5	20	20	Dry	Dry	-	4.5 hours
B-6	20	20	Dry	Dry	-	5.5 hours

Water levels measured in open boreholes may not accurately reflect true (static) groundwater conditions since caving and surface water infiltration may impact areal ground water levels. It should be noted that fluctuations in groundwater levels may occur with changes in seasonal and climatic conditions, and should be verified prior to construction.

OPEN-CUT EXCAVATION RECOMMENDATIONS

We understand that the proposed storm sewer line will have maximum flow line depths of 13-ft to 14-ft. The recommendations presented in this report are based on an assessment of the observed subsurface conditions at the project borings. Excavation retention and construction dewatering are the responsibility of the contractor. The contractor should collect additional subsurface information as necessary to determine if the conditions reported herein are representative.

Trenching and Shoring

Vertical excavations deeper than 5-ft must be provided with a trench safety system in accordance with the current Occupational Safety and Health Administration (OSHA) standards

(29CFR, Part 1926, Subpart P). The OSHA standards include provisions for the design of sloping and/or benched trench excavations in single or multiple layer soil stratigraphy less than 20-ft deep, in lieu of bracing and shoring. For open-cut excavations within cohesive soils, temporary sideslopes of 1(V): 1(H) may be used. Temporary sideslopes of 1(V): 2(H) or flatter should be cut within cohesionless soils. Sloping or benching for excavations greater than 20-ft deep must be designed by a registered professional engineer. The regulations specify maximum slope declivities contingent on soil type. The cohesive soils with substructures such as calcareous and ferrous nodules and slickensides, and intermittent cohesionless soil layers, should be classified as "Type C". A trench shield (box), if used, should be designed to withstand lateral loads imposed by specific site soil conditions.

It should be noted that the soil stratigraphy and groundwater conditions encountered during excavations might vary from those observed in the project borings or characterized herein. The contractor should collect additional subsurface information, as he deems necessary, to determine if the conditions described in this report are representative on a station-by-station basis. It is also mandatory that all excavations and retaining structures be monitored on a continuous basis by experienced personnel who can make evaluations as to the appropriateness of the retention system used.

Utility Bedding and Backfill Criteria

Bedding and backfill for storm sewers should be constructed using the City of Houston Department of Public Works and Engineering *Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage, and Street Paving*, dated October 2002, or an equivalent standard. In accordance with these specifications, the backfill requirements should conform to Section 02317 – "Excavation and Backfill for Utilities," and Section 02320 – "Utility Backfill Material."

Storm Sewers. Bedding recommendations outlined on Drawing No. 02317-03 and Drawing No. 02317-05, dated October 1, 2002 are expected to be applicable for storm sewer lines bedded within dry stable soils. Bedding requirements outlined on Drawing No. 02317-02 and Drawing No. 02317-06 for unstable soils may be necessary if the excavation terminates within a stable trench achieved through dewatering or pressure-relieving of water bearing sands or silts.

Backfill Placement. Backfill placement should be in accordance with the City of Houston Standard Construction Specifications. Trench zone backfill placement and compaction requirements are provided in Section 02317, *Excavation and Backfill for Utilities*, and are summarized as follows.

Soil Type	Maximum Lift Thickness (compacted)	Minimum Compacted Density (ASTM D 698)	Compaction Moisture Content (ASTM D 698)
Bank Run Sand	9 inches	95%	±3 points
Cement-Stabilized Sand	12 inches	95% (1)	Less than optimum (1)
Select Fill	6 inches	95%	± 2 points
Random Fill (2)	9 inches (clay) 12 inches (sand)	90%	None

(1) As determined by ASTM D 558
(2) Random fill is to be used outside pavement areas.

We recommend a minimum 95% relative compaction for random fill. Backfill material specifications for bank run sand, select backfill, and random backfill are provided in the Specification Section 02320, *Utility Backfill Materials*. The City of Houston Standard Construction Specifications preclude the use of silt, organic clay, and peat as utility backfill materials. Cement-stabilized sand material specifications are provided in Section 02321, *Cement Stabilized Sand.*

The City of Houston Standard Construction Specifications require in-place density testing of pipe embedment and trench zone backfill at a minimum frequency of one test per 40 linear feet (embedment) and two tests per 40 linear feet (backfill), with a minimum of three density tests for each shift of work (Section 02317).

Groundwater Control

Construction dewatering and excavation retention are the contractor's responsibilities. We provide excavation planning comments and suggestions for informational purposes. These comments may be used to review the contractor's proposed excavation procedures.

Excavations for utilities are anticipated to encounter primarily cohesive soils, except in borings B-1 and B-2. We encountered silty sands and clayey sands below 10-ft depth in borings B-1 and B-2 and these cohesionless/semi-cohesive soils were observed to be water bearing below 13-ft depth. Seepage into excavations within cohesive strata due to surface runoff or perched water can probably be handled by pumping from sumps. Mechanical dewatering will be required if excavations encroach the water bearing cohesionless to semi-cohesive soils observed in borings B-1 and B-2. We recommend installation of piezometers prior to construction to monitor groundwater levels.

The groundwater level should be maintained to a depth of at least 3 ft below the bottom of the excavation level prior to excavation. Dewatering should be performed in a manner such that the strength of the foundation soils is preserved throughout construction. Moreover, dewatering should

not cause any instability of the open excavation. Excavation dewatering options for strata with high fines contents, such as silty sands, include closely spaced well points or eductors.

The condition of the bearing surface in the trench bottom should be carefully monitored during construction to check for possible bottom heave or other instabilities. Undercutting may be employed to achieve competent bearing conditions. In such cases, grade adjustments can be made by placing lean concrete, or backfilling to grade with cement-stabilized sand (one bag of cement per cubic yard of sand). If precast sections are used, we recommend using cement-stabilized sand for the bedding.

DESIGN REVIEW

Review of the design and construction plans as well as the specifications should be performed by Tolunay-Wong Engineers, Inc. (TWEI) before release. The review is aimed at determining if the geotechnical design recommendations and construction criteria presented in this report have been properly interpreted. Design review is not within the scope of work authorized in this study. Should you elect to retain TWEI to perform a design review, additional fees would be applicable.

CONSTRUCTION SURVEILLANCE

Surveillance of the site earthwork is recommended and has been assumed in preparing our recommendations. This field service is required to check for changed conditions that could result in modifications to our recommendations. The quality of the construction practices will affect sewer performance and should be monitored.

LIMITATIONS

This report has been prepared for the exclusive use of Claunch & Miller, Inc. and its design team for specific application to the construction of the referenced project at the aforementioned location in the City of Southside Place, Texas. Our report has been prepared in accordance with generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface exploration. The borings indicate subsurface conditions only at the specific locations and time, and only to the depths penetrated. The borings do not necessarily reflect strata variations that could exist between boring locations. The validity of the recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such

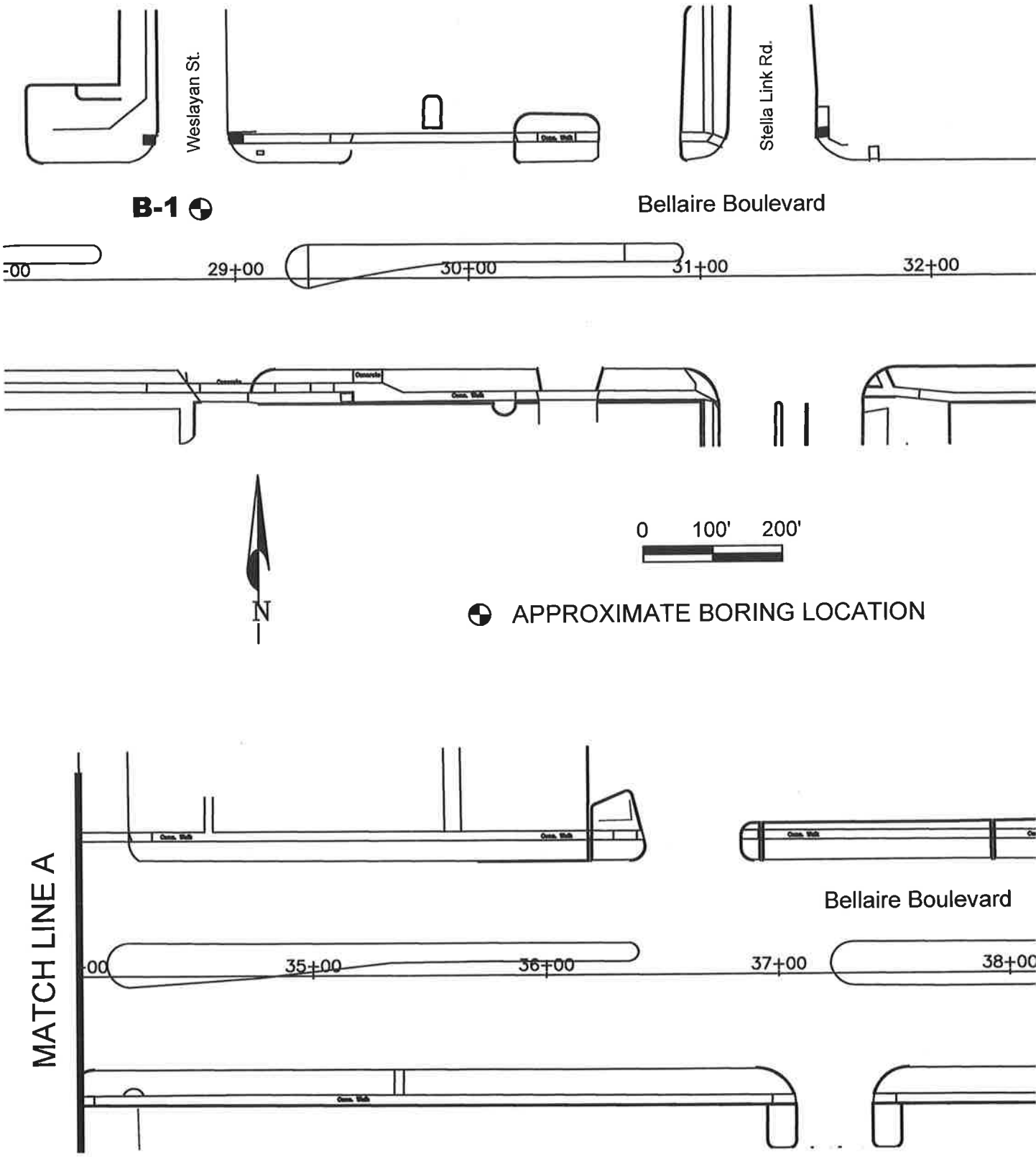
assumptions can be confirmed only during earthwork and construction. If subsurface conditions different from those described are noted during construction, the recommendations in this report must be reevaluated.

TWEI is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWEI.

CLOSING REMARKS

We appreciate the opportunity to be of service during planning of this project and look forward to continuing our services during the construction phase.

FIGURES



BELLAIRE BOULEVARD PROJECT
CITY OF SOUTHSIDE PLACE, TEXAS

CLAUNCH & MILLER, INC.
HOUSTON, TEXAS

LOG OF BORING B-1

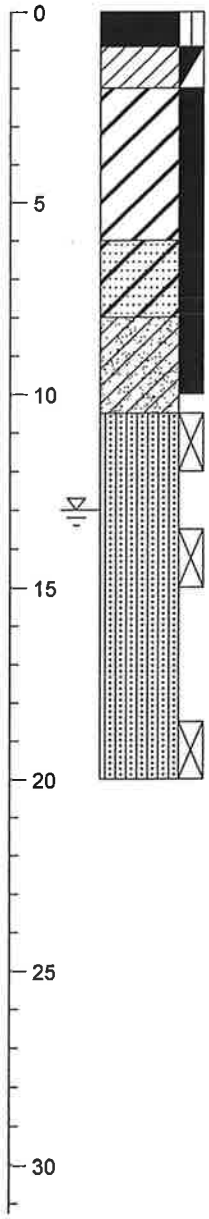
Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 13.0 ft
Water at: Damp after 2.25 hours

Caving at: 12.0 ft



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			2.5" Asphalt + 8.5" Concrete							
			Gray & tan LEAN CLAY (CL)	25				31	16	
		2.50	w/ sand seams & ferrous nodules	25						
			Stiff gray & light gray FAT CLAY (CH) w/ sand seams & ferrous nodules							
		3.00	-very stiff, gray & tan below 4'	22				53	32	
5										
		3.75	Very stiff gray & tan SANDY FAT CLAY (CH) w/ ferrous & calcareous nodules	18						
		3.25	Stiff gray & tan LEAN CLAY w/ SAND (CL) w/ traces of ferrous & calcareous nodules	19	107	1.54	9			
10		5/6 5/6 6/6	Medium dense tan & gray SILTY SAND (SM) w/clay pockets & seams, ferrous nodules	22						36
		2/6 2/6 4/6	-loose @ 13.5' - 15'	25						
15										
		7/6 9/6 14/6		25						
20			Boring terminated @ 20 ft							
25										
30										

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-2

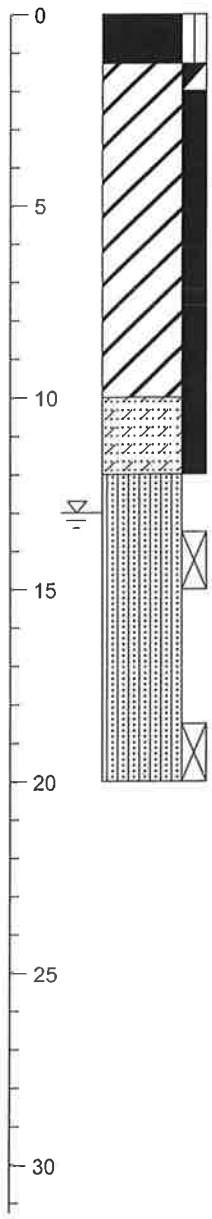
Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 13.0 ft
Water at: Damp after 2.75 hours

Caving at: 12.0 ft



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			3" Asphalt + 12.5" Concrete							
			Very stiff tan & gray FAT CLAY (CH)	26				52	32	
		3.00	w/ sand seams, ferrous & calcareous nodules	22						
			- gray & light gray @ 2' - 4'							
		2.50	-stiff below 4'	23						
5		1.75								
		2.50	-w/ traces of calcareous nodules	26	98	1.58	15	64	44	
10			Gray & tan CLAYEY SAND (SC)	21						43
			Loose tan & light gray SILTY SAND (SM)							
			w/ clay pockets & ferrous nodules							
		2/6 2/6 3/6		23						
15										
		4/6 5/6 4/6		20						40
20			Boring terminated @ 20 ft							
25										
30										

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-3

Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at: Dry after 3.5 hours

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			2.25" Asphalt + 10" Concrete							
			3" Tan & gray Cement Stabilized Sand	17						
		4.25	Tan, gray & red SILTY SAND "FILL" w/clay seams, roots & ferrous nodules	22						
5		4.50	Very stiff dark gray, tan & red FAT CLAY w/SAND "FILL" w/ sand seams & pockets, ferrous & calcareous nodules -very stiff-hard @ 4' - 6'	20				57	37	74
		4.25	Very stiff tan & gray FAT CLAY (CH) w/ sand seams, ferrous & calcareous nodules	23						
		4.50	- very stiff-hard @ 8'-10' - gray & reddish brown below 8'	23						
10		3.50		28				58	35	
		3.00	-stiff, reddish brown & light gray, slickensided @ 13' - 15'	27	96	1.38 (12)	5 *			
15										
		3.75		30						
20			Boring terminated @ 20 ft							
25										
30										

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-4

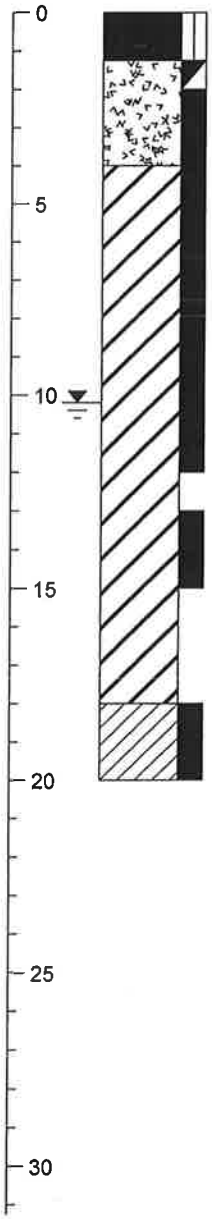
Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at: 10.2 ft after 4 hours

Caving at: 15.2 ft



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
			3.25" Asphalt + 11.75" Concrete							
		2.25	Stiff gray & reddish brown FAT CLAY w/ SAND "FILL" w/ sand seams, ferrous & calcareous nodules, roots - gray & tan w/ shells @ 2' - 4'	30 27				61	39	83
		2.50	Stiff gray & tan FAT CLAY (CH) w/ sand seams & ferrous nodules	31						
		2.75	-w/ calcareous nodules below 6'	29				63	42	
		1.50	- slickensided @ 8' - 10'	30	95	1.24	4 *			
		4.00	-gray & reddish brown @ 10' - 12' -very stiff below 10'	29						
		3.50		28	97					
		2.00	Stiff light gray & tan LEAN CLAY (CL) w/ sand seams & ferrous nodules	16						
			Boring terminated @ 20 ft							

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-5

Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at: Dry after 4.5 hours

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			2" Asphalt + 10.5" Concrete							
			Tan Cement Stabilized Sand	30						
		1.75	Stiff gray & tan FAT CLAY "FILL" w/ shells, sand seams, ferrous & calcareous nodules	32				71	47	
		1.50	Stiff gray & tan FAT CLAY (CH) w/ sand seams, ferrous & calcareous nodules	36				75	53	
5		2.25		33						
		2.50		30				66	43	
10		3.50	-very stiff, gray & reddish brown below 10'	28						
		3.25	-light gray & reddish brown, slickensided @ 13' - 15'	28	96	1.69	3 *			
15										
		4.50	-very stiff-hard @ 18' - 20'	25						
20			Boring terminated @ 20 ft							
25										
30										

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-6

Project: Bellaire Boulevard Project
City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 06.13.284
Date: 08-25-06
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at: Dry after 5.5 hours

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			2.5" Asphalt + 8.5" Concrete							
		1.75	Stiff dark gray & gray FAT CLAY (CH)	37						
		1.50	w/ sand pockets, ferrous nodules & petroleum odor	38						
		2.00		35				72	50	
5										
		1.50	Stiff light gray & tan FAT CLAY w/ SAND (CH)	36	84	1.00	3 *			
			w/ sand seams & ferrous nodules							
			-slickensided @ 6' - 8'							
		2.50	- w/ petroleum odor to 10'	36						
10		3.50	-very stiff @ 10'- 12'	31				69	47	
		2.75	Stiff reddish brown & light gray FAT CLAY	30	94	1.52	3 *			
			w/ ferrous nodules							
15			-slickensided @ 13' - 15'							
		4.50	-very stiff, hard w/ calcareous nodules below 18'	25						
20			Boring terminated @ 20 ft							
25										
30										

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

SYMBOLS AND TERMS USED ON BORING LOGS

Unified Soil Classifications System Symbols

- Fill
- Asphalt / Pavement
- Lean Clay (CL)
- Lean Clay w/ Sand (CL)
- Sandy Lean Clay (CL)
- Fat Clay (CH)
- Fat Clay w/ Sand (CH)
- Sandy Fat Clay (CH)
- Silty Clay (CL)
- Sandy Silty Clay (CL-ML)
- Silty Clayey Sand (SC-SM)
- Clayey Sand (SC)
- Clayey Silt (ML)
- Sandy Silt (ML)
- Silty Sand (SM)
- Silt w/ Sand (ML)
- Well Graded Sand (SW)
- Well Graded Sand w/ Gravel (SW-GM)
- Poorly Graded Sand (SP)
- Poorly Graded Sand w/ Silt (SP-SM)
- Silt (ML)
- Elastic Silt (MH)
- Elastic Silt w/ Sand (MH-SP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Gravel (GW)
- Well Graded Gravel w/ Sand (SP-GM)
- Poorly Graded Gravel (GP)
- Peat

Sampler Symbols	Meaning
■	Depth of thin - walled tube sample
☒	Depth of Standard Penetration Test (SPT)
◪	Depth of auger sample
⧄	Depth of sampling attempt with no recovery
⧗	TxDOT Cone Penetrometer Test

Field Test Data

2.50	Pocket penetrometer reading in tons per square foot
8/6"	Blow count per 6 - in. interval of the Standard Penetration Test
▽	Observed free water during drilling
▼	Observed static water level

Laboratory Test Data

Wc (%)	Moisture content in percent
Dens. (pcf)	Dry unit weight in pounds per cubic foot
Qu (tsf)	Unconfined compressive strength in tons per square foot
UU (tsf)	Compressive strength under confining pressure in tons per square foot
Str. (%)	Strain at failure in percent
LL	Liquid Limit in percent
PI	Plasticity Index
#200 (%)	Percent passing the No. 200 mesh sieve
( )	Confining pressure in pounds per square inch
*	Slickensided failure
**	Did not fail

RELATIVE DENSITY OF COHESIONLESS & SEMI-COHESIONLESS SOILS

The following descriptive terms for relative density apply to cohesionless soils such as gravels, silty sands, and sands as well as semi-cohesive and semi-cohesionless soils such as sandy silts, clayey silts, and clayey sands.

Relative Density	Typical SPT "N" Value Range*
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

* "N" is the number of blows from a 140-lb weight having a free fall of 30-in. required to penetrate the final 12-in. of an 18-in. sample interval. The density designations correspond to a SPT "N" value range based on an effective overburden pressure of 1 tsf. Density descriptors may be modified because of variations in the effective overburden pressure.

CONSISTENCY OF COHESIVE SOILS

The following descriptive terms for consistency apply to cohesive soils such as clays, sandy clays, and silty clays.

Pocket Penetrometer (tsf)	Typical Compressive Strength (tsf)	Consistency	Typical SPT "N" Value Range**
pp < 0.50	qu < 0.25	Very soft	≤ 2
0.50 ≤ pp < 0.75	0.25 ≤ qu < 0.50	Soft	3-4
0.75 ≤ pp < 1.50	0.50 ≤ qu < 1.00	Firm	5-8
1.50 ≤ pp < 3.00	1.00 ≤ qu < 2.00	Stiff	9-15
3.00 ≤ pp < 4.50	2.00 ≤ qu < 4.00	Very Stiff	16-30
pp ≥ 4.50	qu ≥ 4.00	Hard	≥ 31

** An "N" value of 31 or greater corresponds to a hard consistency. The correlation of consistency with a typical SPT "N" value range is approximate.

GEOTECHNICAL EVALUATION
POOR FARM CHANNEL (HCFCD D111-00-00)
CHANNEL TRANSITION & BOX CULVERT INSTALLATIONS
AT BELLAIRE BOULEVARD
CITY OF SOUTHSIDE PLACE, TEXAS

Prepared for

Harris County Flood Control District
c/o Claunch & Miller, Inc.
4635 Southwest Freeway, Suite 1000
Houston, Texas 77027

Prepared by

Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Pkwy W., Suite 100
Houston, Texas 77031

February 2007

TWEI Project No.: 06.13. 400

February 2, 2007
TWEI Project No: 06.13.400

Harris County Flood Control District
c/o Claunch & Miller, Inc.
4635 Southwest Freeway, Suite 1000
Houston, Texas 77027

Attn.: Mr. Todd A. Calvin, P.E.

GEOTECHNICAL EVALUATION
POOR FARM CHANNEL (HCFCD D111-00-00)
CHANNEL TRANSITION AND BOX CULVERT INSTALLATIONS
AT BELLAIRE BOULEVARD
CITY OF SOUTHSIDE PLACE, TEXAS

Presented here is the report of our Geotechnical Evaluation for the proposed Bellaire Boulevard crossing of Poor Farm Ditch (HCFCD ID# D111-00-00). This study was performed in general accordance with the Harris County Flood Control District (HCFCD) October 2004 "Geotechnical Investigation Guidelines" and our proposal (TWEI Proposal P06-G354.Rev3) dated September 12, 2006. Mr. Todd A. Calvin, P.E. of Claunch & Miller, Inc. (CMI) authorized this study on December 4, 2006.

TWEI previously performed a geotechnical study for the proposed Poor Farm channel improvements north of Bellaire Boulevard (TWEI Project No. 02-G665) and issued a report titled, "*Draft Report, Geotechnical Evaluation, Poor Farm (HCFCD D111-00-00), Kilmarnock (HCFCD D113-00-00) Channel Improvements, Cities of Houston, West University, Southside Place and Bellaire, Texas*" and dated January 31, 2003. TWEI used the soil and groundwater data from this report to perform engineering analyses for the proposed box culverts installations and transition area.

We appreciate this opportunity to participate in this phase of the project. Should you have any questions regarding this report or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,
TOLUNAY-WONG ENGINEERS, INC.

Mohammed Islam, E.I.T.

John D. Brown, P.E.

Copies Submitted – 4 (GBC Bound)
MI/JDB

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Figure

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APPENDICES

Appendix

Supplemental Boring Log CB-8 (TWEI Project No.: 02-G665) ..... **A**

Slope Stability Analyses Results for Concrete-Lined Slope, 2H: 1V Slope Inclination, and Soil Profile Consisting of All Clay, Boring CB-8, Gstable7 Version 2 Computer Code Output ..... **B**

EXECUTIVE SUMMARY

The principal findings and conclusions of the geotechnical evaluation for the proposed channel transition and box culvert installations are summarized as follows:

1. The subsurface soil stratigraphy near Bellaire Boulevard crossing of Poor Farm channel (based on supplemental boring CB-8) generally consists of medium plasticity, stiff to very stiff, sandy lean clay to 4-ft, underlain by high plasticity, stiff to very stiff fat clay to 20-ft, followed by high plasticity, very stiff lean clay to the 26-ft boring termination depth.

2. Free water was not encountered in boring CB-8 during drilling. The ground water level in open borehole was measured at the depth of 9.9-ft below grade about 22 hours after completion of drilling.

3. Slope stability analyses for the proposed transition zone were performed to evaluate the concrete-lined 2(horizontal): 1(vertical) side slope. The proposed transition zone is located on upstream side of the Bellaire Boulevard crossing of Poor Farm ditch (HCFCD ID# D111-00-00). The slope stability analyses for the proposed transition zone are provided on Plates 2 through 5 and in Appendix B.

4. Bedding and backfill for the box culvert may be constructed using the City of Houston Department of Public Works and Engineering Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage and Street Paving, dated October 2002 or equivalent. Based on these specifications, the backfill requirements should conform to Section 02317 "Excavation and Backfill for Utilities" and Section 02320 "Utility Backfill Material". In accordance with the City of Houston Specification, Drawings No. 02317-05 may be applicable for box culvert sewers. If the excavation terminates within a stable wet trench minimum bedding as outlined in Drawing No. 02317-06 may be necessary for box culvert sewers.

5. Excavations for the box culvert are expected to encounter primarily cohesive soils near Bellaire Boulevard crossing of Poor Farm channel (HCFCD ID# D111-00-00). If seepage into these excavations occur as a result of surface influx or perched water conditions, it can probably be handled by pumping from sumps. In accordance with the current OSHA regulations, the observed soils in the project borings would be classified as "Type C".

1 INTRODUCTION

This report presents the results of our geotechnical evaluation for the proposed Bellaire Boulevard crossing of Poor Farm Ditch (HCFCD ID # D111-00-00). The project includes a transition zone on the upstream side of the box culverts. The purpose of the study is to analyze the stability of the transition zone and to formulate excavation guidelines and assess bedding and backfill requirements for the proposed box culverts.

2 PURPOSE AND SCOPE OF WORK

2.1 Project Description

The project consists of conducting geotechnical evaluations for the proposed Bellaire Boulevard crossing of Poor Farm Ditch (HCFCD ID # D111-00-00). The project includes a transition zone on the upstream side of the box culverts. A transition area is necessary because the existing channel flow line will be shifted eastward during installation of the box culverts. Mr. Todd A. Calvin, P.E. of CMI provided project details verbally and in a drawing transmittal received August 11, 2006. The drawings included plan and profile sheets for the slope stabilization project on the west bank of Poor Farm Channel, immediately north of Bellaire Boulevard. Mr. David Jorgensen of CMI provided the cross sections of existing Poor Farm Channel, immediately north of Bellaire Boulevard by electronic transmittal on January 8, 2007. The site layout is shown on Figure 1. The channel profile at the transition area is presented on Figure 2.

2.2 Scope of Study

The objectives of this study were to review previously a performed geotechnical investigation for soil and ground water conditions at the project site, and to provide design and construction recommendations for the box culverts and concrete liner slope in the transition zone area. The scope of the geotechnical study included the following work tasks.

- Reviewing the geotechnical investigation conducted by Tolunay-Wong Engineers, Inc. for the Poor Farm channel (TWEI Project No. 02-G665, dated January 31, 2003).
- Using the field and laboratory data from this geotechnical evaluation and the results of the previous investigations to establish the site soil properties and ground water levels.
- Developing guidelines for box culvert excavation, and bedding and backfill based on City of Houston specifications.

reflect true (static) ground water conditions since caving, surface water infiltration, etc., may impact areal ground water levels. Accurate determination of the static ground water level is usually made from open standpipe piezometers.

4 ENGINEERING ANALYSES AND RECOMMENDATIONS

The proposed transition zone on the upstream side of Bellaire Boulevard and Poor Farm channel (HCFCD Unit D111-00-00) consists of widening and re-grading the existing channel eastward using a concrete-lined slope.

Slope stability analyses for the Poor Farm channel transition zone was performed to evaluate concrete-lined 2(horizontal): 1(vertical) (2H: 1V) side slope. The Poor Farm Channel transition area is about 12-ft deep (Please refer to Figure 2). TWEI selected the slope profile that was judged to be representative of the channel transition zone. The soil profile behind the slope consisted of stiff to very stiff sandy lean clay, lean clay and fat clay from the channel top bank to the 26-ft explored depth.

4.1 Slope Stability Analyses

Slope stability analyses were performed for the most critical section based on soil stratigraphy near boring CB-8 to evaluate the proposed concrete lined channel slope. The slope stability analyses were performed using the computer program *GSTABL7 version 2.004 (Ref. GSTABL7© with STEDwin© Program by Garry H. Gregory, P.E. and Harald W. Van Aller, P.E.)* and the Modified Bishop slope stability analysis procedures. The computer code searches for the critical slope failure plane and computes the minimum safety factor for a given slope geometry and subsurface soil and ground water conditions.

Total stress cohesion (C_T) and total stress angle of internal friction ($Ø_T$) for the clay soils for the short term condition were based upon unconfined compression test results, unconsolidated undrained triaxial test results and TWEI's personnel experience with similar soils. Total stress cohesion (C_T) and total stress angle of internal friction ($Ø_T$) for the clay soils for the intermediate term (rapid drawdown) condition were based upon Consolidated Undrained (CU) Triaxial With Pore Pressure Measurements test results, and TWEI's personnel experience with similar soils. Effective stress cohesion (C') and effective stress angle of internal friction ($Ø'$) for the clay soils for the long term condition were based upon CU tests and TWEI's personnel experience with similar soils.

Slope stability analyses were performed for the selected soil profile. The soil profile was selected from boring CB-8 which consisted of a cohesive stratigraphy. Slope stability analyses for concrete lined critical section and all cohesive soil profile were performed for the following three design conditions:

- Short Term (End of Construction). The end-of-construction condition models the initial undrained condition of the soil. For this analysis, unconfined compression (UC) and unconsolidated-undrained (UU) test soil parameters were used. The channel piezometric level was assumed at the depth of 10-ft below proposed top of bank near boring CB-8, and that water exited the toe of the slope.

- Intermediate Term (Rapid Drawdown) Condition. Total stress shear strength parameters from CU tests with pore pressure measurements were used for analysis. Rapid drawdown case models the condition where high flood waters saturate and piezometrically "load" a slope, and then quickly recede, leaving a large unbalanced piezometric head in the slope. The unbalanced head significantly increases shear stresses in the slope. The stresses relax as the unbalanced piezometric head drains out of the slope with time. For analyses near boring CB-8, the high water was placed at the top-of-bank, along face of the slope, and down to about 2-ft above the toe for the slope.

- Long Term Condition. Effective stress shear strength parameters from CU tests with pore pressure measurements were used for analysis. The water level for the channel embankment was set at the same depth of the short-term condition. Long-term case represents steady state piezometric and stress conditions. Unlike the rapid drawdown design case, which relies on mobilization of the undrained shear strength of the soil, the long-term models a case in which the slope soils rely on their available drained shear strength for long-term stability.

Soil parameters used in the concrete lined transition area slope stability analyses using selected critical soil profile section from boring CB-8 are summarized in the following table and are presented on Plate 3 through 6.

Table 1
Soil Parameters from boring CB-8 (2H: 1V Slope with 4-in. Concrete Liner)

Stratum	Depth (ft)	Description	Unit Weight		ST		RD		LT	
			γ_t (pcf)	γ_{sat} (pcf)	c_{uu} (psf)	ϕ_{uu} (deg)	c_{cu} (psf)	ϕ_{cu} (deg)	c' (psf)	ϕ' (deg)
1	0-4	Sandy Lean Clay (CL)	131	132	1200	0	210	23	120	28
2	-	Concrete Liner	150	150	2000	0	2000	0	2000	0
3	4 - 20	Fat Clay (CH)	124	125	1200	0	180	13.9	140	19.5
4	20-25	Lean Clay (CL)	130	132	2100	0	210	23	120	28

Where:

ST: Short Term Condition
RD: Rapid Drawdown Condition
LT: Long Term Condition (Drained Condition)
γ_t: Moist Unit Weight of Soil
γ_{sat}: Saturated Unit Weight of Soil
c_{uu}: Unconsolidated Undrained Cohesion
ϕ_{uu} Unconsolidated Undrained Friction Angle
c_{cu}: Consolidated Undrained Cohesion
ϕ_{cu} Consolidated Undrained Friction Angle
c': Consolidated Drained Cohesion
ϕ': Consolidated Drained Friction Angle

4.2 Results and Conclusions of Slope Stability Analyses

The computed minimum factors of safety against a slope failure for the critical section at transition zone are presented on Plates 3 through 6 and in Appendix B, and are as follows:

Table 2 - Factor of Safety for Concrete Lined Slope

Conditions Analyzed		2H: 1V Concrete Lined Slope
		Boring CB-8
Short Term		4.82
Intermediate (Rapid Drawdown)	Undrained	1.35
	Drained	1.38
Long Term		1.76

Typical minimum factors of safety against slope stability failures, which are used for design purposes, are:

Table 3 - Typical Minimum Factor of safety

Condition	Factor of Safety
Short Term (end of construction) condition	1.3
Intermediate (rapid drawdown) condition	1.25
Long term condition	1.5

Results of the slope stability analyses indicate that the proposed concrete lined transition with 2H: 1V slope or flatter will have adequate factors of safety against a global failure for the short term (end of construction), rapid drawdown, and long term conditions.

5 CONSTRUCTION OF THE CHANNEL SLOPES

Channel slopes at the proposed transition zone of Bellaire Boulevard crossing and Poor Farm Channel (HCFCD D111-00-00) site should be designed/constructed as discussed in the subsections below.

Construction of the channel embankments should comply with the HCFCD 2000 Standard Specifications Book, Section 02316 entitled "Structural Excavating and Backfilling". Care should be taken to assure that the surface of the existing ground surface is benched or stepped prior to fill placement so that the embankment fill is keyed into the existing ground surface. Fill should be placed in eight inches thick loose lifts and compacted to an in-place dry density equal to at least 95 percent of the maximum standard dry density (ASTM D 698). The fill moisture content during compaction should be at the optimum moisture content or within plus or minus 2 percent of the optimum moisture content.

The embankment slope faces at the bridge site should be paved with concrete slope paving as specified in the HCFCD 2000 Standard Specifications Book, Section 02376 entitled "Concrete Channel Lining".

sandy lean clay, lean clay and fat clay soils to the 26-ft explored depth.

Pressure diagrams and methodology for developing earth pressures for shoring and open cut excavations are presented in Figure 7. Figure 7 presents pressure diagrams for the case of cohesive soil type. The forces on walls and bracing can be determined at any point by adding the earth, groundwater, and surcharge pressures. These pressures apply to excavation bracing where soils move a very small amount. If there is not a relatively tight fit between the soil and bracing, significant movement in association with rapid drying and opening of old fractures could result in sudden failure. The pressures diagrams presented in Figure 7 do not include a safety factor.

For trench box(es) or shields, there must be sufficient space between the excavation face and the shield to allow shield installation and removal; usually a space on the order of 3 to 6 inches. However, trench boxes should not be utilized in such a manner that the face of the excavation is greater than 12 inches from the trench box.

To avoid surcharging the excavation walls, the stockpiling of excavated materials immediately adjacent to the excavation wall should be prohibited. We recommend that stockpile materials be placed away from the excavation with a minimum distance of 6-ft from the excavation crest. In addition, the stockpile should not be placed higher than 4-ft. Construction equipment working near the trench may also induce excessive surcharge loads. We recommend shoring the trench in areas adjacent to working equipment.

The soil stratigraphy and groundwater conditions encountered during the excavations may vary from those observed in the previous project boring or characterized herein. The contractor should collect additional subsurface information, as he deems necessary, to determine if the existing conditions are representative of those described in this report. All excavations and retaining structures should be monitored on a continuous basis by experienced personnel as to the performance of the retention system being used.

The lateral earth pressures may be calculated by multiplying the equivalent fluid density for the backfill type by the depth below the ground surface. The equivalent fluid densities for various backfill materials and compactive efforts are outlined in the following table. The equivalent fluid densities outlined for the higher compactive effort should be used for level backfill with surcharge.

SOIL TYPE	COMPACTIVE EFFORT	EQUIVALENT FLUID DENSITIES (pcf)	
		Above the water table	Below the water table*
Select cohesive backfill (7 < PI ≤ 20)	88 to 92	65	95
	93 to 98	85	103
On site cohesive backfill (PI>20)	88 to 92	75	105
	93 to 98	100	113
Bank Sand (Fines content <25%)	88 to 92	55	88
	93 to 98	75	96
* These magnitudes include a water component, if applicable.			

The weights of equivalent fluid shown above do not include a safety factor. Surcharge loads adjacent to open-cut excavations should also be considered. Local surcharge loads adjacent to the edge of the excavation walls, if present, should be incorporated into the pressure diagrams. A surcharge load, q, will typically result in a lateral load equal to 0.4q to 0.5q. As a factor of safety the surcharge loads should be multiplied by a factor of 1.5.

Box Culvert Bedding and Backfill Details The City of Houston *Standard Construction Details* outlines bedding and backfill specifications for storm sewers bedded within dry soils (based on the size and type of utility line) in list of Standard Details. Based on these specifications, the backfill requirements should conform to Section 02317 "Excavation and Backfill for Utilities" and Section 02320 "Utility Backfill Material". In accordance with the City of Houston Specification Drawing No. 02317-05 may be applicable for box culvert sewers. If the excavation terminates within a stable wet trench minimum bedding as outlined in Drawing No. 02317-06 may be necessary for box culvert sewers.

The box culvert recommendations presented in this report are based on an assessment of the observed subsurface conditions near supplemental boring CB-8. Excavation retention and construction dewatering are the responsibility of the contractor. The contractor should collect additional subsurface information as necessary to determine if the conditions reported herein are representative of the actual soil conditions.

High plasticity clay soils, such as those encountered in the project boring, may be used as backfill in the trench zone. Compaction by water jetting methods should not be permitted.

Trench backfill has a tendency to shrink and settle after installation. The shrinkage and settlement can adversely affect surface construction of sidewalks and roadways over the trench. Increasing compaction levels for all backfill to at least 95% of ASTM D 698 is one response to reduce shrinkage and settlement. Compacting the backfill at a moisture content two to five percentage points greater than the optimum as determined by ASTM D 698 may also help to reduce shrinkage and settlement. The most conservative detail calls for use of compacted cement-stabilized sand for all backfill beneath new construction.

6.2 Excavation and Groundwater Control

Excavations for the box culvert are expected to encounter primarily cohesive soils at the Poor Farm channel near boring CB-8. If seepage into these excavations occur as a result of surface influx or perched water conditions, it can probably be handled by pumping from sumps. Construction dewatering, if required, and excavation retention are the contractor's responsibilities. Our excavation comments and suggestions contained in this report are for informational purposes. These comments may be used to review the contractor's proposed excavation procedures.

The contractor is responsible for assessing the need for groundwater control at the site and for developing appropriate dewatering procedures. The contractor should pre-plan dewatering efforts. Observation wells or piezometers should be installed as part of the dewatering systems before excavation.

The condition of the bearing surface should be carefully monitored during construction to check for possible bottom heave or other instabilities. Undercutting may be employed to achieve competent bearing conditions. In such cases, grade adjustments can be made by placing lean concrete, or backfilling to grade with cement-stabilized sand (one bag of cement per cubic yard of sand). If precast sections are used, we recommend using cement-stabilized sand for the bedding.

7 DESIGN REVIEW

Review of the design and construction plans as well as the specifications should be performed by TWEI before release. The review is aimed at determining if the geotechnical design recommendations and construction criteria presented in this report have been properly interpreted. Design review is not within the scope of work authorized in this study.

8 CONSTRUCTION SURVEILLANCE

Surveillance of the site preparation work and embankment construction are recommended and have been assumed in preparing our recommendations. These field services are required to check for changed conditions that may result in modifications to our recommendations. The quality of the construction practices will affect channel and box culvert performance and should be monitored.

9 LIMITATIONS

This report has been prepared for the exclusive use of Claunch & Miller Inc., the Harris County Flood Control District and their design teams for specific application to the construction of the referenced project at the aforementioned location in the City of Southside Place, Texas. Our report has been prepared in accordance with generally accepted geotechnical engineering practice common to the local area. No other warranty, expressed or implied, is made.

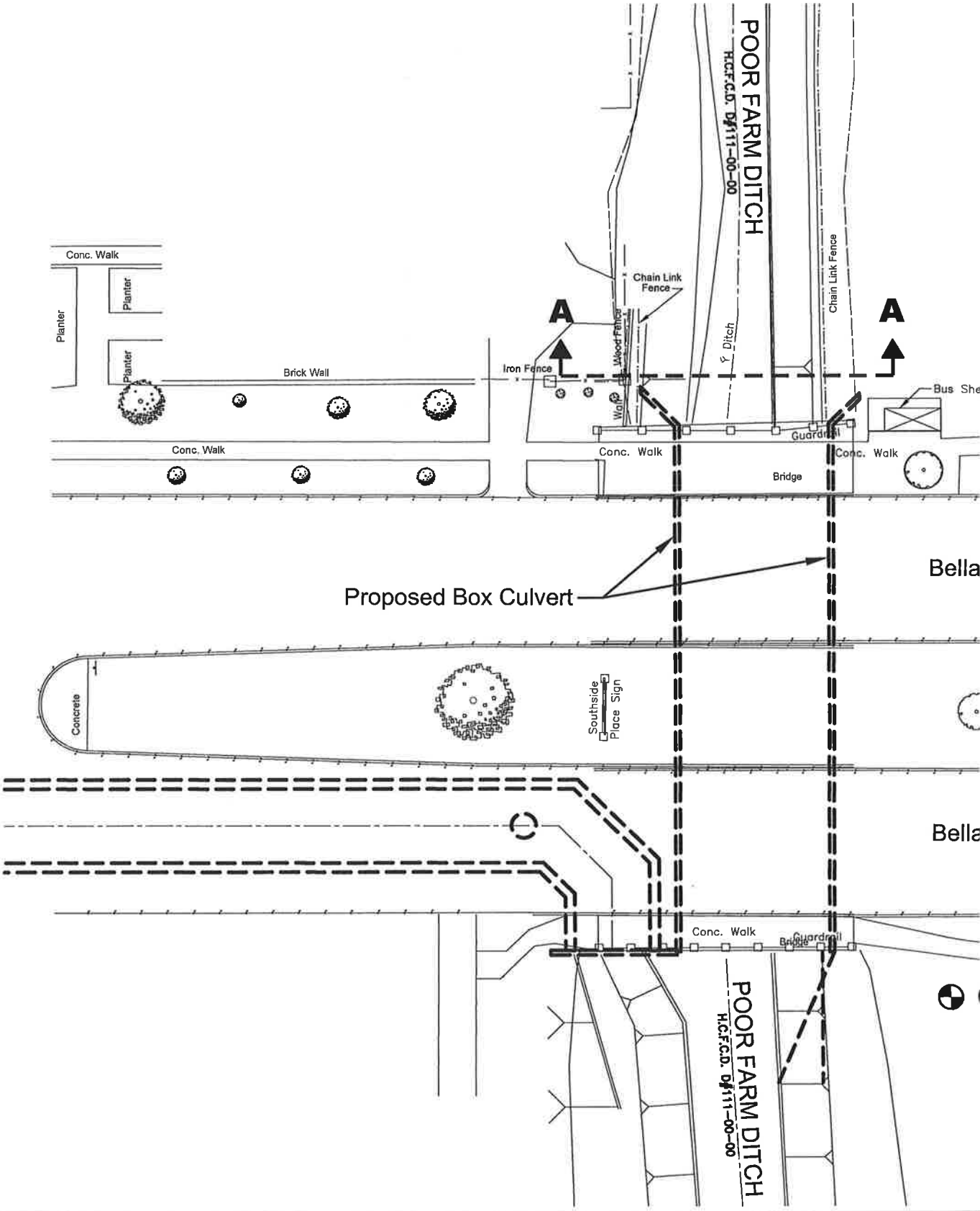
The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface exploration. The boring log used in this report indicated subsurface conditions only at the specific location of the boring and at the time the boring was drilled, and only to the depth penetrated. The boring does not necessarily reflect strata variations that may exist between boring locations. The validity of the recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such assumptions may be confirmed only during earthwork and bridge foundation construction. If subsurface conditions different from those described are noted during construction, recommendations in this report must be re-evaluated.

If any changes in the nature, design, or location of the proposed project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are modified or verified in writing by TWEI. TWEI is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWEI.

10 CLOSING REMARKS

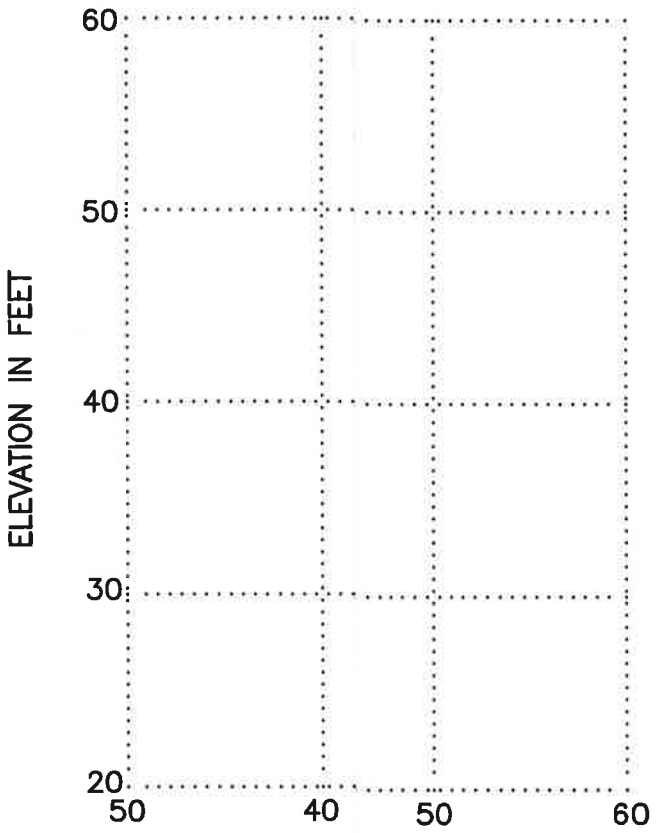
We appreciate the opportunity to be of service during planning of this project and look forward to continuing our services during the construction phase and on future projects.

FIGURES



POOR FARM CHANNEL (HCFCD D111-00-00)
CHANNEL TRANSITION & BOX CULVERT INSTALLATIONS @ BELLAIRE BLVD.
CITY OF SOUTHSIDE PLACE, TEXAS

CLAUNCH & MILLER, INC.
HOUSTON, TEXAS



POOR FARM CHANNEL (HCF CHANNEL TRANSITION & BOX CULVERT INS CITY OF SOUTHSIDE PL	CROSS-SECTION OF DITCH SECTION A - A	
CLAUNCH & MILLE HOUSTON, TEX	NO.: 06.13.400	FIGURE 2

Poor Farm Channel (HCFCD D111-00-00), Short Term Condition, 2H:1V Slope w/ Concrete Liner, Boring CB-8

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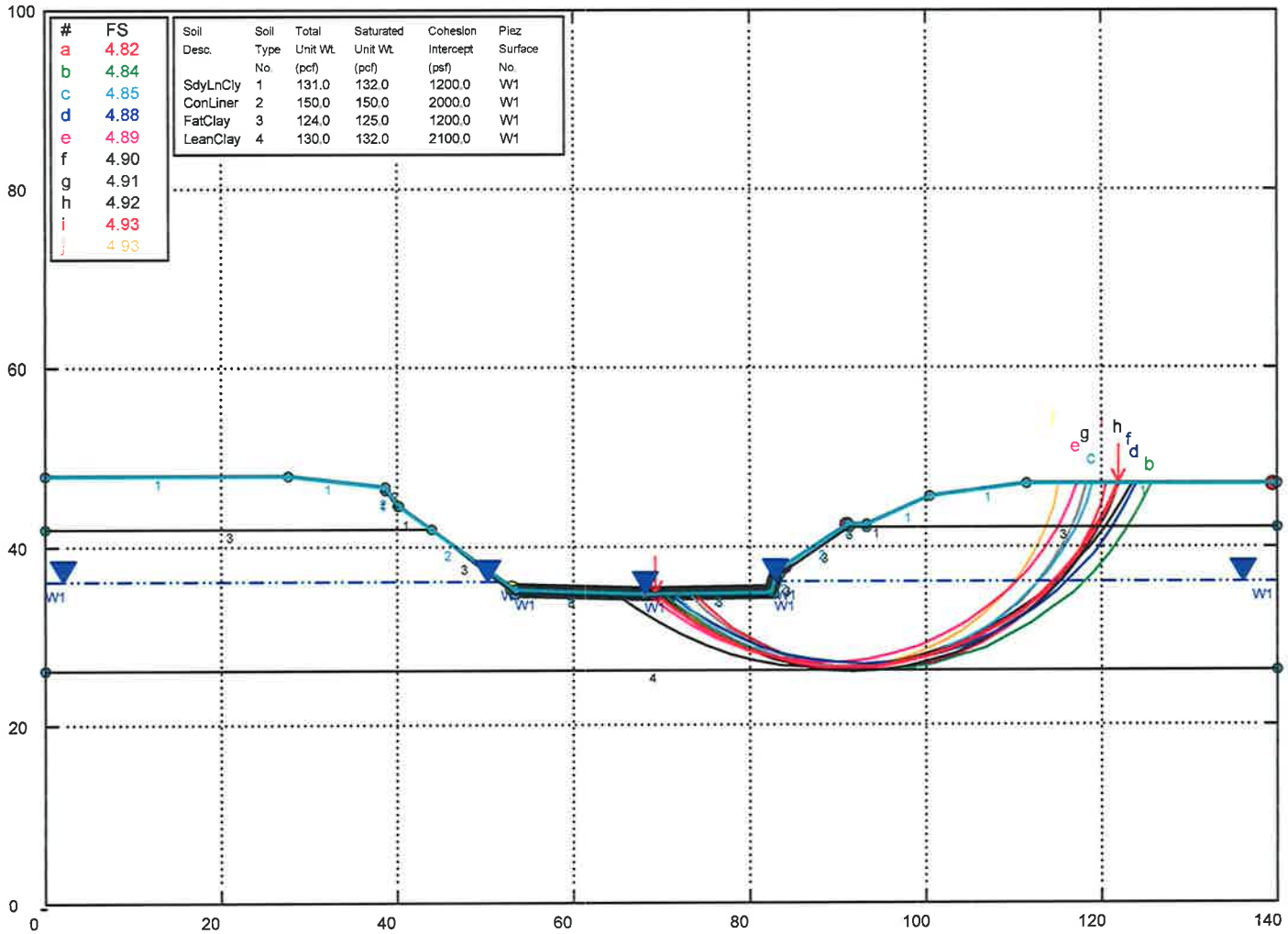

GSTABL7 v.2 FSmin=4.82

Safety Factors Are Calculated By The Modified Bishop Method

POOR FARM CHANNEL (HCFCD D111-00-00) CHANNEL TRANSITION & BOX CULVERT INSTALLATIONS @ BELLAIRE BLVD. CITY OF SOUTHSIDE PLACE, TEXAS	Tolunay-Wong Engineers, Inc. Houston, Texas	SLOPE STABILITY ANALYSIS
CLAUNCH & MILLER, INC. HOUSTON, TEXAS		PROJECT NO.: 06.13.400 / FIGURE 3

Poor Farm Channel (HCFCD D111-00-00), Rapid Drawdown Condition, 2H:1V Slope w/ Concrete Liner, Boring CB-8

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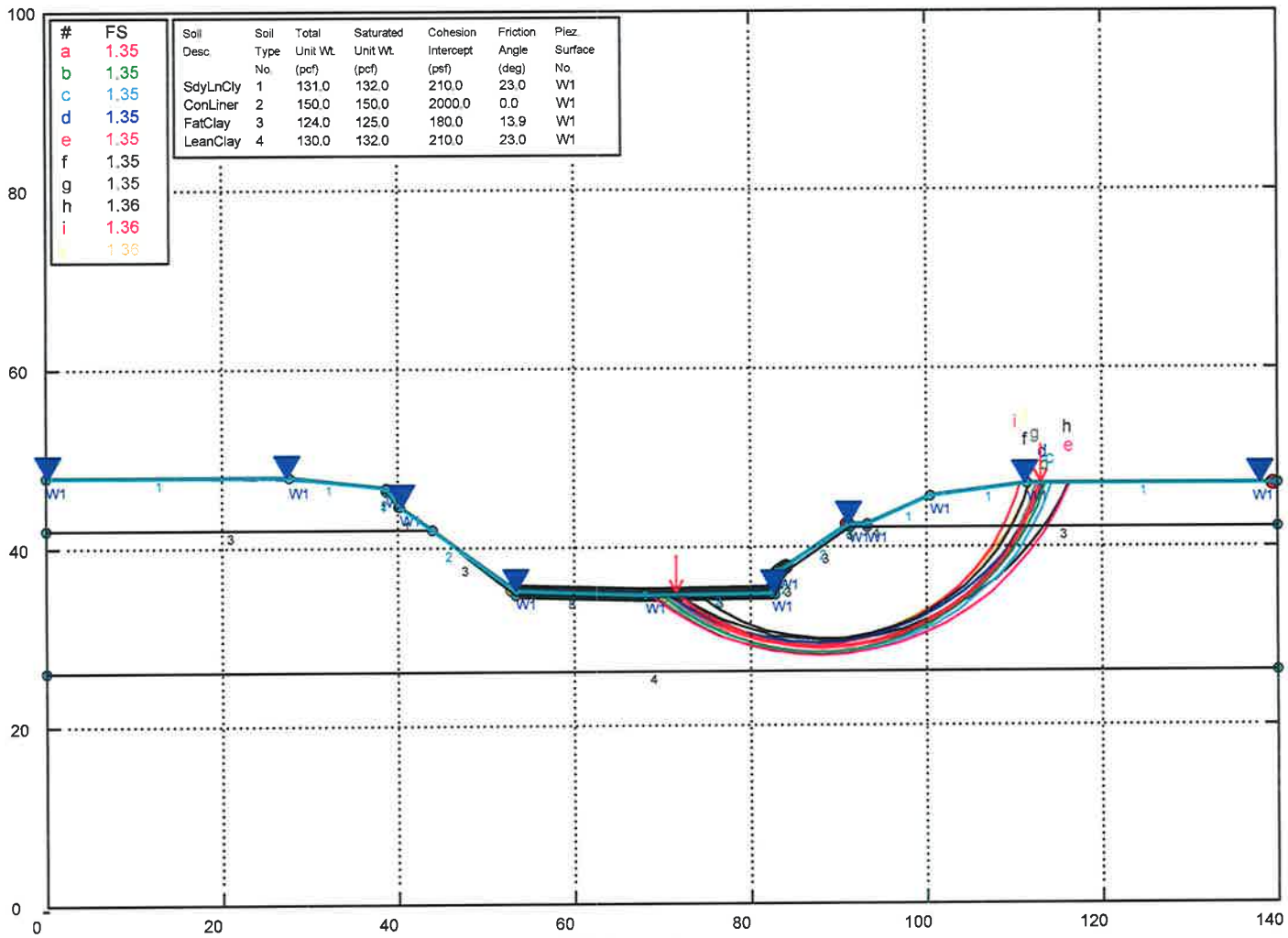

GSTABL7 v.2 FSmin=1.35

Safety Factors Are Calculated By The Modified Bishop Method

POOR FARM CHANNEL (HCFCD D111-00-00) CHANNEL TRANSITION & BOX CULVERT INSTALLATIONS @ BELLAIRE BLVD. CITY OF SOUTHSIDE PLACE, TEXAS	Tolunay-Wong Engineers, Inc. Houston, Texas	SLOPE STABILITY ANALYSIS	
CLAUNCH & MILLER, INC. HOUSTON, TEXAS		PROJECT NO.: 06.13.400	FIGURE 4

Poor Farm Channel (HCFCD D111-00-00), Long Term Condition, 2H:1V Slope w/ Concrete Liner, Boring CB-8

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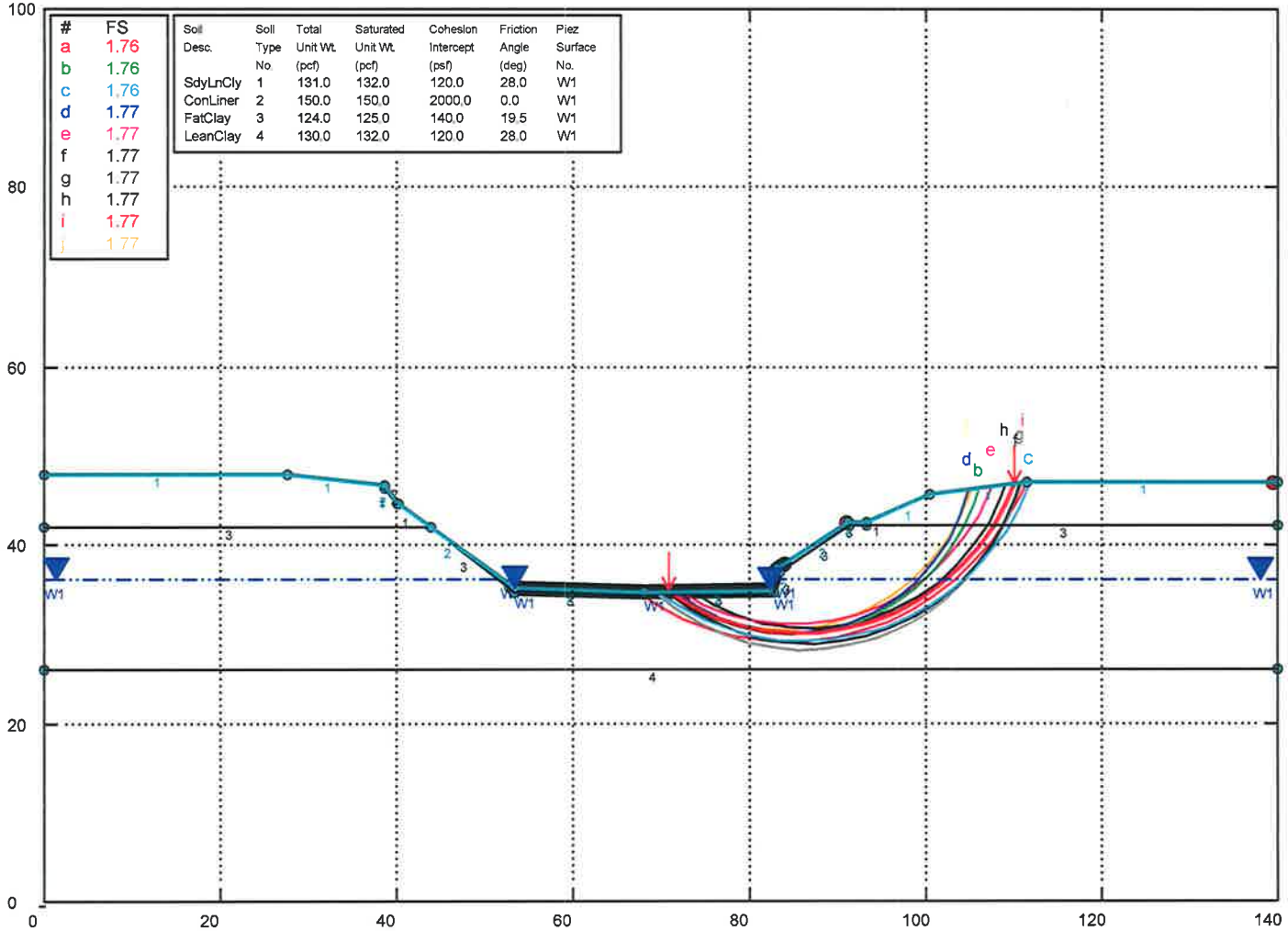
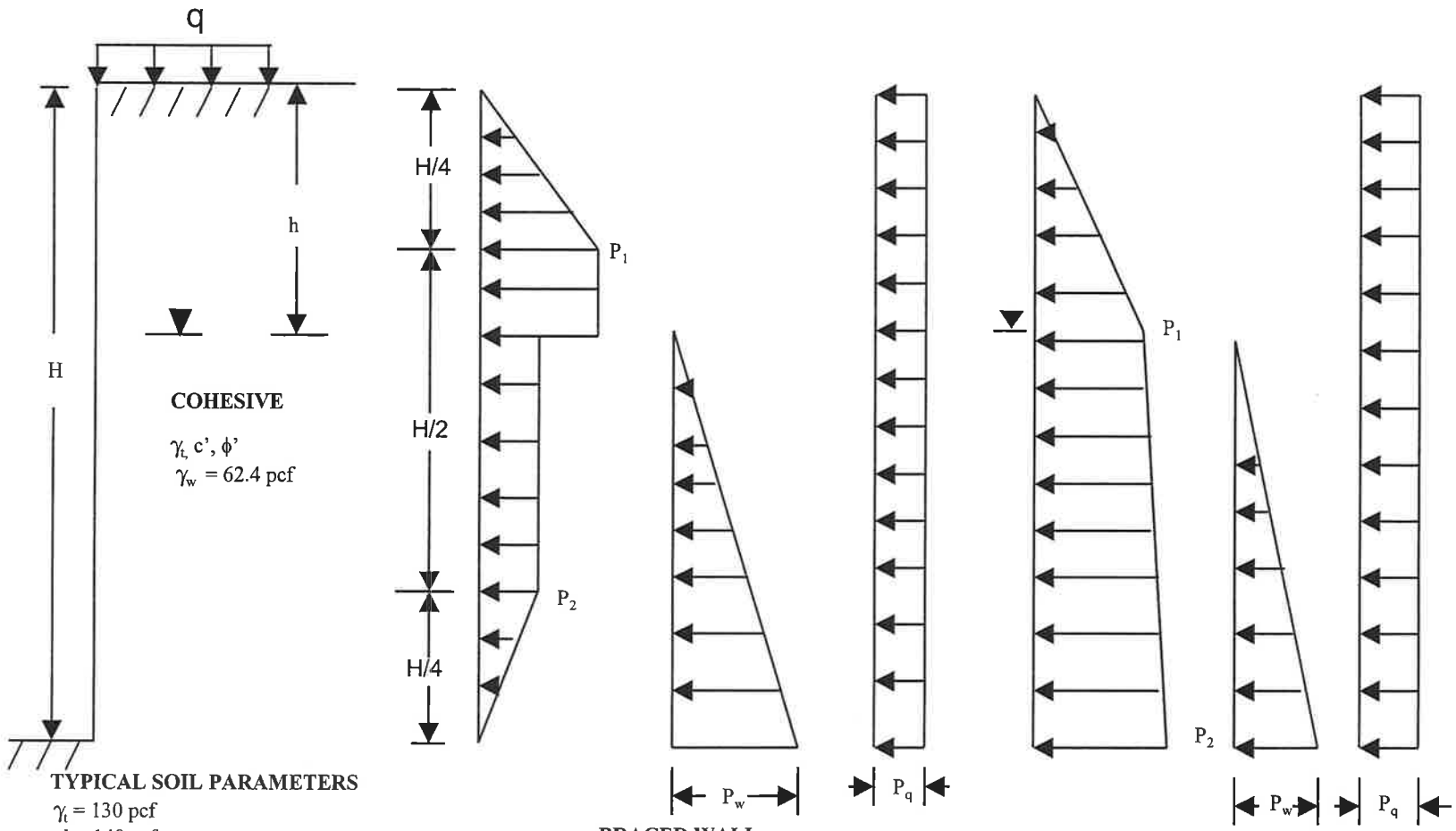


GSTABL7 v.2 FSmin=1.76

Safety Factors Are Calculated By The Modified Bishop Method

POOR FARM CHANNEL (HCFCD D111-00-00) CHANNEL TRANSITION & BOX CULVERT INSTALLATIONS @ BELLAIRE BLVD. CITY OF SOUTHSIDE PLACE, TEXAS	Tolunay-Wong Engineers, Inc. Houston, Texas	SLOPE STABILITY ANALYSIS
CLAUNCH & MILLER, INC. HOUSTON, TEXAS		PROJECT NO.: 06.13.400 / FIGURE 6



TYPICAL SOIL PARAMETERS

γ_t = 130 pcf
c' = 140 psf
ϕ' = 19.5°
γ_w = 62.4 pcf

γ_t= TOTAL UNIT WEIGHT

BRACED WALL

$P_1 = 0.4\ \gamma_t H$
$P_2 = 0.4\ (\gamma_t - \gamma_w)\ H$
$P_w = \gamma_w\ (H-h)$
$P_q = 0.5q$

PERMANENT WALL

$P_1 = \gamma_t h\ K_0$
$P_2 = P_1 + (\gamma_t - \gamma_w)\ (H-h)\ K_0$
$K_o = 1 - \sin\phi$
$P_q = 0.5q$

Project: Poor Farm Channel (HCFCD D 111-00-00) Channel Transition & Box Culvert Installations City of Southside Place, Texas	**Tolunay-Wong Engineers, Inc.** Houston, Texas	**PROJECT NO: 06.13.400**
Client: Claunch & Miller, Inc. Houston, Texas	**Lateral Earth Pressure Diagrams (Cohesive Soils)**	**FIGURE 7**

APPENDIX A

Supplemental Boring Log CB-8
(TWEI Project No.: 02-G665)

Tolunay-Wong Engineers, Inc.

LOG OF BORING CB-8

PROJECT: Poor Farm Channel Improvements, Cities of Houston, Southside Place & West University Place, Texas

PROJECT NO.: 02-665 BORING TYPE: Auger: 0'-26'

DATE: 9/17/02

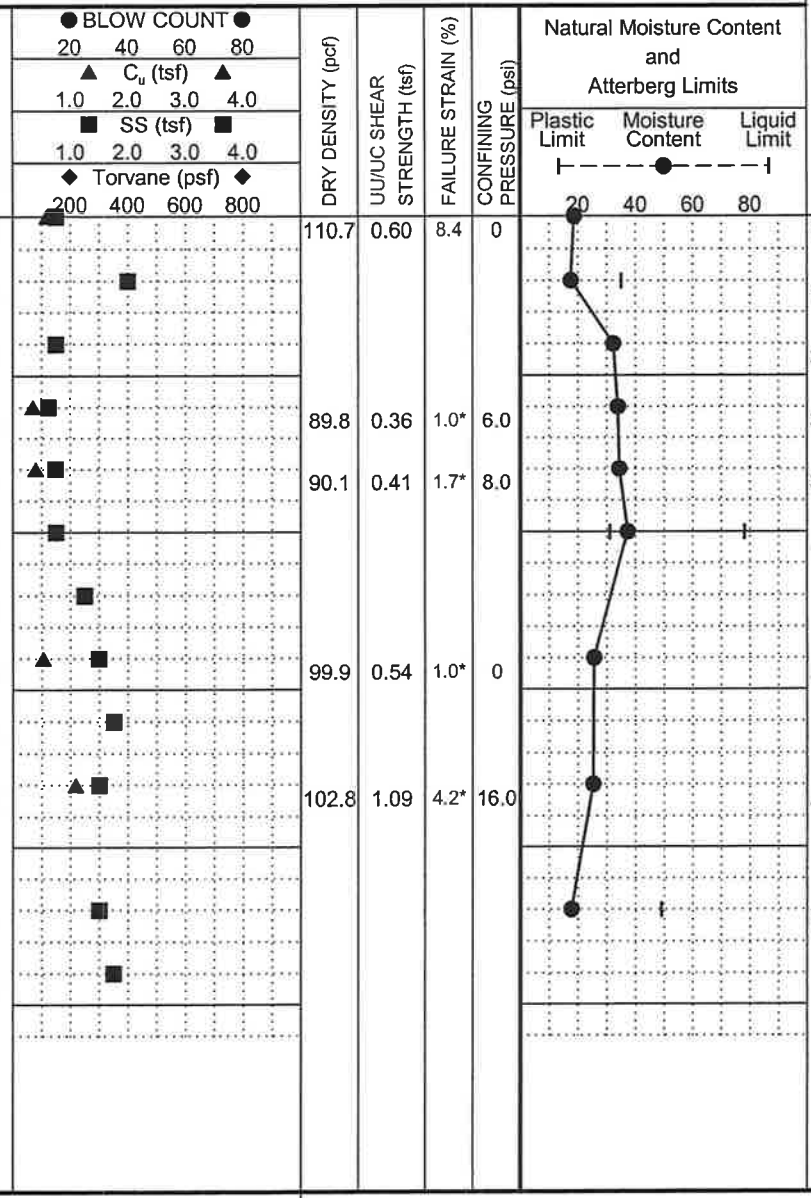
SURFACE ELEVATION: 46.0

LOCATION

Northing: Easting:

See Figure 1

DEPTH (ft.)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	DRY DENSITY (pcf)	UU/UC SHEAR STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	PASSING #200 SIEVE (%)	ESTIMATED ANGLE OF INTERNAL FRICTION (°), OTHER TESTS & REMARKS
0		CL		**SANDY LEAN CLAY (CL)** stiff to very stiff, medium plasticity, light gray & tan w/ sand seams, calcareous & ferrous nodules, moist	P= 1.50	110.7	0.60	8.4	0	18.7					
					P= 4.00					17.6	35	18	17	66.2	
		CH		**FAT CLAY (CH)** stiff to very stiff, high plasticity, light gray & tan w/ slickensides, sand seams, calcareous & ferrous nodules, moist	P= 1.50					32.3				94.1	
5					P= 1.25	89.8	0.36	1.0*	6.0	33.9					* Sample failed along slickensides
					P= 1.50	90.1	0.41	1.7*	8.0	34.4					
10			▼		P= 1.50					37.3	78	31	47		
				- red & gray below 12'	P= 2.50										
					P= 3.00	99.9	0.54	1.0*	0	25.6				99.6	
15					P= 3.50										
					P= 3.00	102.8	1.09	4.2*	16.0	25.3					
20		CL		**LEAN CLAY (CL)** very stiff, high plasticity, light gray & tan w/ sand pockets, calcareous & ferrous nodules, moist	P= 3.00					17.8	49	17	32	86.5	
25					P= 3.50										
				Boring terminated at 26'											



Water Level Est.: ▽ Measured: ▼ Perched: ▽

Water Observations: Ground water was measured at a depth of 9.9' & the borehole was open to a depth of 10.0' 22 hours after completion of drilling.

Sample Key: ☒ SPT ☐ Shelby Tube ☐ Disturbed

Key to Abbreviations:
N - SPT Data (Blows/Ft)
P - Pocket Penetrometer (tsf)
T - Torvane (psf)
C_u - Undrained Cohesion (tsf)
SS - Shear Strength (P/2, tsf)

Notes:
Driller: Van & Sons Logger: G. Singleton, TWEI
water was not encountered during drilling.

Ground

APPENDIX B

Slope Stability Analyses Results for Concrete-Lined Slope

2.0H: 1V Side Slope Inclinations

Soil Profile Consisting of Boring CB-8

(Gstable7 Version 2 Computer Code Output)

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

(All Rights Reserved-Unauthorized Use Prohibited)

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 1/24/2007
Time of Run: 3:47PM
Run By: MI
Input Data Filename: G:cb8-st.dat
Output Filename: G:cb8-st.OUT
Unit System: English
Plotted Output Filename: G:cb8-st.PLT
PROBLEM DESCRIPTION: Poor Farm Channel (HCFCD D111-00-00),
Short Term, 2H:1V w/Concrete Liner, CB-8

BOUNDARY COORDINATES
Note: User origin value specified.
Add 0.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	48.00	27.60	48.00	1
2	27.60	48.00	38.60	46.70	1
3	38.60	46.70	40.20	44.70	2
4	40.20	44.70	53.40	35.10	2
5	53.40	35.10	68.10	34.70	2
6	68.10	34.70	82.40	34.90	2
7	82.40	34.90	83.10	37.20	2
8	83.10	37.20	91.20	42.60	2
9	91.20	42.60	93.30	42.50	2
10	93.30	42.50	100.50	45.60	1
11	100.50	45.60	111.40	47.00	1
12	111.40	47.00	140.00	47.00	1
13	38.60	46.40	38.61	46.70	2
14	38.60	46.40	40.00	44.60	1
15	40.00	44.60	44.00	42.00	1
16	44.00	42.00	53.40	34.70	3
17	53.40	34.70	68.10	34.40	3
18	68.10	34.40	82.70	34.60	3
19	82.70	34.60	83.40	36.90	3
20	83.40	36.90	91.40	42.20	3
21	91.40	42.20	93.30	42.20	3
22	93.30	42.20	93.31	42.50	1
23	0.00	42.00	44.00	42.00	3
24	93.30	42.20	140.00	42.20	3
25	0.00	26.00	140.00	26.00	4

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	131.0	132.0	1200.0	0.0	0.00	0.0	1
2	150.0	150.0	2000.0	0.0	0.00	0.0	1
3	124.0	125.0	1200.0	0.0	0.00	0.0	1
4	130.0	132.0	2100.0	0.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	36.00
2	51.80	36.00
3	53.40	35.00
4	68.00	34.70
5	82.70	34.80
6	83.00	36.00
7	140.00	36.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
1 Surface(s) Initiate(s) From Each Of 1000 Points Equally Spaced
Along The Ground Surface Between X = 53.00(ft)
and X = 84.00(ft)
Each Surface Terminates Between X = 91.00(ft)
and X = 139.50(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
3.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1000
Statistical Data On All Valid FS Values:
FS Max = 190.242 FS Min = 4.816 FS Ave = 7.876
Standard Deviation = 6.591 Coefficient of Variation = 83.69 %
Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.29	34.72
2	71.62	32.83
3	74.11	31.16
4	76.75	29.72
5	79.50	28.53
6	82.35	27.59
7	85.27	26.91
8	88.24	26.50
9	91.24	26.36
10	94.24	26.50
11	97.21	26.90
12	100.13	27.58
13	102.98	28.51
14	105.74	29.70
15	108.37	31.14
16	110.87	32.80
17	113.20	34.69
18	115.35	36.78
19	117.31	39.05
20	119.05	41.50
21	120.56	44.09
22	121.83	46.81
23	121.90	47.00

Circle Center At X = 91.26 ; Y = 59.44 ; and Radius = 33.07
Factor of Safety
*** 4.816 ***
Individual data on the 38 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.0	0.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.4	8.2	0.0	4.1	0.	0.	0.0	0.0	0.0
3	2.0	287.9	0.0	172.7	0.	0.	0.0	0.0	0.0

4	2.5	883.0	0.0	513.1	0.	0.	0.0	0.0	0.0
5	2.6	1456.3	0.0	807.2	0.	0.	0.0	0.0	0.0
6	2.8	1987.9	0.0	1056.8	0.	0.	0.0	0.0	0.0
7	2.8	2451.4	0.0	1259.9	0.	0.	0.0	0.0	0.0
8	0.1	46.6	0.0	23.3	0.	0.	0.0	0.0	0.0
9	0.3	300.4	0.0	139.4	0.	0.	0.0	0.0	0.0
10	0.3	342.6	0.0	80.6	0.	0.	0.0	0.0	0.0
11	0.1	123.3	0.0	54.9	0.	0.	0.0	0.0	0.0
12	0.0	32.8	0.0	14.3	0.	0.	0.0	0.0	0.0
13	0.3	345.8	0.0	151.3	0.	0.	0.0	0.0	0.0
14	1.9	2570.7	0.0	1063.9	0.	0.	0.0	0.0	0.0
15	3.0	4833.1	0.0	1739.7	0.	0.	0.0	0.0	0.0
16	3.0	5632.6	0.0	1766.2	0.	0.	0.0	0.0	0.0
17	0.0	83.6	0.0	24.7	0.	0.	0.0	0.0	0.0
18	0.2	323.2	0.0	95.6	0.	0.	0.0	0.0	0.0
19	1.9	3835.8	0.0	1137.7	0.	0.	0.0	0.0	0.0
20	0.0	20.0	0.0	6.0	0.	0.	0.0	0.0	0.0
21	0.9	1879.4	0.0	552.0	0.	0.	0.0	0.0	0.0
22	3.0	6263.7	0.0	1740.8	0.	0.	0.0	0.0	0.0
23	2.9	6449.7	0.0	1639.8	0.	0.	0.0	0.0	0.0
24	0.4	823.0	0.0	201.0	0.	0.	0.0	0.0	0.0
25	2.5	5521.2	0.0	1288.4	0.	0.	0.0	0.0	0.0
26	2.8	5896.2	0.0	1290.5	0.	0.	0.0	0.0	0.0
27	2.6	5328.6	0.0	1044.9	0.	0.	0.0	0.0	0.0
28	2.5	4668.0	0.0	754.6	0.	0.	0.0	0.0	0.0
29	0.5	939.5	0.0	127.3	0.	0.	0.0	0.0	0.0
30	1.8	2975.9	0.0	294.7	0.	0.	0.0	0.0	0.0
31	1.4	1998.5	0.0	77.0	0.	0.	0.0	0.0	0.0
32	0.8	1081.6	0.0	0.0	0.	0.	0.0	0.0	0.0
33	2.0	2266.7	0.0	0.0	0.	0.	0.0	0.0	0.0
34	1.7	1508.9	0.0	0.0	0.	0.	0.0	0.0	0.0
35	0.4	275.0	0.0	0.0	0.	0.	0.0	0.0	0.0
36	1.1	556.6	0.0	0.0	0.	0.	0.0	0.0	0.0
37	1.3	258.0	0.0	0.0	0.	0.	0.0	0.0	0.0
38	0.1	0.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.13	34.73
2	72.47	32.85
3	74.96	31.18
4	77.59	29.73
5	80.32	28.50
6	83.16	27.51
7	86.06	26.76
8	89.02	26.27
9	92.01	26.02
10	95.01	26.03
11	98.00	26.30
12	100.95	26.82
13	103.85	27.58
14	106.68	28.59
15	109.41	29.84
16	112.02	31.31
17	114.50	33.00
18	116.83	34.89
19	118.99	36.97
20	120.96	39.23
21	122.74	41.65
22	124.30	44.21
23	125.64	46.90
24	125.68	47.00

Circle Center At X = 93.39 ; Y = 61.33 ; and Radius = 35.33

Factor of Safety

*** 4.844 ***

Failure Surface Specified By 21 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	71.18	34.74
2	73.42	32.74
3	75.85	30.98
4	78.45	29.49
5	81.19	28.27
6	84.05	27.34
7	86.98	26.72
8	89.96	26.41
9	92.96	26.41
10	95.95	26.73
11	98.88	27.35
12	101.74	28.28
13	104.48	29.50
14	107.08	31.00
15	109.50	32.76
16	111.74	34.76
17	113.75	36.99
18	115.51	39.41
19	117.02	42.01
20	118.24	44.75
21	118.98	47.00

Circle Center At X = 91.45 ; Y = 55.09 ; and Radius = 28.72

Factor of Safety

*** 4.846 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.78	34.74
2	73.16	32.91
3	75.69	31.30
4	78.36	29.92
5	81.13	28.78
6	83.99	27.89
7	86.93	27.25
8	89.90	26.87
9	92.90	26.75
10	95.90	26.90
11	98.87	27.31
12	101.79	27.98
13	104.65	28.91
14	107.41	30.08
15	110.05	31.49
16	112.57	33.13
17	114.93	34.98
18	117.12	37.04
19	119.11	39.27
20	120.91	41.68
21	122.49	44.23
22	123.83	46.91
23	123.87	47.00

Circle Center At X = 92.71 ; Y = 60.86 ; and Radius = 34.10

Factor of Safety

*** 4.877 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.45	34.70
2	70.78	32.82
3	73.29	31.17
4	75.95	29.77
5	78.73	28.64
6	81.60	27.80
7	84.55	27.24
8	87.54	26.97
9	90.54	27.00
10	93.52	27.32

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   21        118.22        47.00
Circle Center At X =    92.33 ; Y =    52.95 ; and Radius =    26.59
       Factor of Safety
      ***    4.910   ***
Failure Surface Specified By 23 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         69.88        34.72
    2         72.15        32.77
    3         74.60        31.03
    4         77.20        29.53
    5         79.92        28.28
    6         82.76        27.29
    7         85.67        26.56
    8         88.63        26.12
    9         91.63        25.95
   10         94.63        26.06
   11         97.60        26.46
   12        100.53        27.13
   13        103.37        28.07
   14        106.12        29.27
   15        108.75        30.73
   16        111.22        32.42
   17        113.53        34.34
   18        115.65        36.46
   19        117.56        38.77
   20        119.24        41.26
   21        120.69        43.89
   22        121.88        46.64
   23        122.00        47.00
Circle Center At X =    91.91 ; Y =    58.00 ; and Radius =    32.05
       Factor of Safety
      ***    4.921   ***
Failure Surface Specified By 21 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         73.57        34.78
    2         75.74        32.70
    3         78.12        30.87
    4         80.68        29.31
    5         83.40        28.04
    6         86.24        27.07
    7         89.16        26.41
    8         92.14        26.07
    9         95.14        26.05
   10         98.13        26.36
   11        101.06        26.99
   12        103.91        27.94
   13        106.64        29.18
   14        109.21        30.72
   15        111.61        32.52
   16        113.80        34.58
   17        115.75        36.85
   18        117.45        39.33
   19        118.86        41.97
   20        119.99        44.75
   21        120.62        47.00
Circle Center At X =    93.78 ; Y =    53.71 ; and Radius =    27.69
       Factor of Safety
      ***    4.927   ***
Failure Surface Specified By 20 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         71.22        34.74
    2         73.36        32.64
    3         75.73        30.81
    4         78.30        29.26
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    5          81.04        28.03
    6          83.90        27.12
    7          86.84        26.56
    8          89.84        26.35
    9          92.83        26.49
   10          95.79        26.98
   11          98.67        27.82
   12         101.44        28.98
   13         104.05        30.47
   14         106.46        32.25
   15         108.65        34.30
   16         110.59        36.59
   17         112.24        39.09
   18         113.59        41.77
   19         114.61        44.59
   20         115.18        47.00
Circle Center At X =    90.13 ; Y =    51.86 ; and Radius =    25.51
       Factor of Safety
      ***    4.933   ***
          **** END OF GSTABL7 OUTPUT ****
```

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **
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****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.

****

Analysis Run Date: 1/24/2007
Time of Run: 3:01PM
Run By: MI
Input Data Filename: G:CB8-RD.DAT
Output Filename: G:CB8-RD.OUT
Unit System: English
Plotted Output Filename: G:CB8-RD.PLT
PROBLEM DESCRIPTION: Poor Farm Channel (HCFCD D111-00-00),Rap
idDrawDown, 2H:1V w/Concrete Liner, CB-8

BOUNDARY COORDINATES
Note: User origin value specified.
Add 0.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	48.00	27.60	48.00	1
2	27.60	48.00	38.60	46.70	1
3	38.60	46.70	40.20	44.70	2
4	40.20	44.70	53.40	35.10	2
5	53.40	35.10	68.10	34.70	2
6	68.10	34.70	82.40	34.90	2
7	82.40	34.90	83.10	37.20	2
8	83.10	37.20	91.20	42.60	2
9	91.20	42.60	93.30	42.50	2
10	93.30	42.50	100.50	45.60	1
11	100.50	45.60	111.40	47.00	1
12	111.40	47.00	140.00	47.00	1
13	38.60	46.40	38.61	46.70	2
14	38.60	46.40	40.00	44.60	1
15	40.00	44.60	44.00	42.00	1
16	44.00	42.00	53.40	34.70	3
17	53.40	34.70	68.10	34.40	3
18	68.10	34.40	82.70	34.60	3
19	82.70	34.60	83.40	36.90	3
20	83.40	36.90	91.40	42.20	3
21	91.40	42.20	93.30	42.20	3
22	93.30	42.20	93.31	42.50	1
23	0.00	42.00	44.00	42.00	3
24	93.30	42.20	140.00	42.20	3
25	0.00	26.00	140.00	26.00	4

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	131.0	132.0	210.0	23.0	0.00	0.0	1
2	150.0	150.0	2000.0	0.0	0.00	0.0	1
3	124.0	125.0	180.0	13.9	0.00	0.0	1
4	130.0	132.0	210.0	23.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)

3	2.6	859.9	0.0	483.8	0.	0.	0.0	0.0	0.0
4	2.8	1385.8	0.0	741.6	0.	0.	0.0	0.0	0.0
5	2.9	1826.6	0.0	940.2	0.	0.	0.0	0.0	0.0
6	0.1	74.3	0.0	37.3	0.	0.	0.0	0.0	0.0
7	0.3	230.8	0.0	62.0	0.	0.	0.0	0.0	0.0
8	0.4	373.3	0.0	99.3	0.	0.	0.0	0.0	0.0
9	0.3	308.2	0.0	129.4	0.	0.	0.0	0.0	0.0
10	1.8	2087.7	0.0	886.2	0.	0.	0.0	0.0	0.0
11	3.0	4083.0	0.0	1712.8	0.	0.	0.0	0.0	0.0
12	3.0	4768.4	0.0	2002.8	0.	0.	0.0	0.0	0.0
13	0.0	64.0	0.0	31.7	0.	0.	0.0	0.0	0.0
14	0.2	280.5	0.0	141.0	0.	0.	0.0	0.0	0.0
15	1.9	3211.7	0.0	1617.2	0.	0.	0.0	0.0	0.0
16	0.0	16.8	0.0	7.8	0.	0.	0.0	0.0	0.0
17	0.9	1475.8	0.0	688.3	0.	0.	0.0	0.0	0.0
18	2.9	4936.6	0.0	2358.1	0.	0.	0.0	0.0	0.0
19	2.8	4826.4	0.0	2392.2	0.	0.	0.0	0.0	0.0
20	0.7	1175.6	0.0	615.4	0.	0.	0.0	0.0	0.0
21	1.9	3270.8	0.0	1838.4	0.	0.	0.0	0.0	0.0
22	2.4	3741.7	0.0	2261.9	0.	0.	0.0	0.0	0.0
23	2.2	2959.7	0.0	1961.7	0.	0.	0.0	0.0	0.0
24	1.9	2163.4	0.0	1608.8	0.	0.	0.0	0.0	0.0
25	1.7	1408.3	0.0	1208.0	0.	0.	0.0	0.0	0.0
26	0.3	225.2	0.0	232.5	0.	0.	0.0	0.0	0.0
27	0.4	237.4	0.0	244.3	0.	0.	0.0	0.0	0.0
28	0.6	276.4	0.0	286.7	0.	0.	0.0	0.0	0.0
29	1.0	192.0	0.0	259.4	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.79	34.72
2	72.18	32.91
3	74.76	31.37
4	77.48	30.12
5	80.33	29.18
6	83.26	28.55
7	86.25	28.24
8	89.25	28.26
9	92.23	28.60
10	95.15	29.27
11	97.99	30.25
12	100.70	31.54
13	103.25	33.11
14	105.62	34.95
15	107.77	37.04
16	109.69	39.35
17	111.34	41.86
18	112.71	44.53
19	113.65	47.00

Circle Center At X = 87.57 ; Y = 55.73 ; and Radius = 27.52

Factor of Safety

*** 1.347 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.25	34.73
2	72.63	32.90
3	75.20	31.35
4	77.92	30.08
5	80.76	29.12
6	83.69	28.47
7	86.67	28.14
8	89.67	28.15
9	92.65	28.47
10	95.58	29.12
11	98.42	30.09
12	101.14	31.36

13	103.71	32.91
14	106.09	34.74
15	108.25	36.81
16	110.18	39.11
17	111.85	41.61
18	113.23	44.27
19	114.30	47.00

Circle Center At X = 88.17 ; Y = 55.63 ; and Radius = 27.52

Factor of Safety

*** 1.348 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.66	34.74
2	73.16	33.08
3	75.83	31.71
4	78.62	30.63
5	81.52	29.85
6	84.49	29.39
7	87.48	29.24
8	90.48	29.42
9	93.44	29.92
10	96.32	30.74
11	99.11	31.85
12	101.76	33.26
13	104.24	34.95
14	106.53	36.89
15	108.59	39.06
16	110.42	41.44
17	111.97	44.01
18	113.25	46.72
19	113.34	47.00

Circle Center At X = 87.31 ; Y = 57.23 ; and Radius = 27.99

Factor of Safety

*** 1.348 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.55	34.71
2	70.97	32.94
3	73.56	31.42
4	76.28	30.16
5	79.11	29.17
6	82.03	28.46
7	85.00	28.04
8	88.00	27.91
9	90.99	28.07
10	93.96	28.52
11	96.87	29.25
12	99.69	30.27
13	102.40	31.55
14	104.97	33.10
15	107.38	34.88
16	109.61	36.90
17	111.63	39.12
18	113.42	41.52
19	114.97	44.09
20	116.26	46.80
21	116.34	47.00

Circle Center At X = 87.85 ; Y = 58.71 ; and Radius = 30.81

Factor of Safety

*** 1.351 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.79	34.78
2	76.27	33.10

3	78.95	31.73
4	81.77	30.71
5	84.69	30.04
6	87.68	29.75
7	90.68	29.82
8	93.64	30.26
9	96.53	31.07
10	99.30	32.23
11	101.90	33.72
12	104.30	35.53
13	106.45	37.61
14	108.34	39.95
15	109.91	42.50
16	111.16	45.23
17	111.72	47.00

Circle Center At X = 88.58 ; Y = 53.92 ; and Radius = 24.19
Factor of Safety
*** 1.353 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.20	34.72
2	71.55	32.85
3	74.09	31.26
4	76.80	29.96
5	79.63	28.97
6	82.55	28.31
7	85.54	27.98
8	88.54	27.99
9	91.52	28.33
10	94.44	29.01
11	97.27	30.01
12	99.97	31.31
13	102.50	32.92
14	104.84	34.80
15	106.96	36.92
16	108.82	39.27
17	110.41	41.82
18	111.70	44.53
19	112.56	47.00

Circle Center At X = 86.98 ; Y = 54.67 ; and Radius = 26.72
Factor of Safety
*** 1.354 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.49	34.75
2	74.07	33.20
3	76.78	31.91
4	79.60	30.90
5	82.51	30.16
6	85.47	29.71
7	88.47	29.55
8	91.46	29.68
9	94.43	30.10
10	97.35	30.82
11	100.18	31.81
12	102.90	33.07
13	105.48	34.60
14	107.91	36.36
15	110.15	38.36
16	112.18	40.56
17	113.99	42.96
18	115.56	45.51
19	116.29	47.00

Circle Center At X = 88.60 ; Y = 60.29 ; and Radius = 30.74
Factor of Safety

```
      ***    1.355   ***
Failure Surface Specified By 18 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1          70.75        34.74
    2          73.16        32.95
    3          75.76        31.46
    4          78.53        30.30
    5          81.41        29.47
    6          84.38        29.01
    7          87.37        28.90
    8          90.36        29.15
    9          93.30        29.76
   10          96.14        30.72
   11          98.85        32.01
   12         101.38        33.62
   13         103.70        35.53
   14         105.77        37.70
   15         107.57        40.10
   16         109.06        42.70
   17         110.23        45.46
   18         110.65        46.90
Circle Center At X =    86.77 ; Y =    53.72 ; and Radius =    24.84
       Factor of Safety
      ***    1.357   ***
Failure Surface Specified By 19 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1          69.54        34.72
    2          72.03        33.04
    3          74.68        31.65
    4          77.47        30.55
    5          80.37        29.76
    6          83.33        29.29
    7          86.33        29.15
    8          89.32        29.33
    9          92.28        29.84
   10          95.16        30.67
   11          97.94        31.80
   12         100.57        33.24
   13         103.04        34.95
   14         105.30        36.92
   15         107.34        39.12
   16         109.12        41.53
   17         110.63        44.12
   18         111.85        46.87
   19         111.89        47.00
Circle Center At X =    86.14 ; Y =    56.65 ; and Radius =    27.51
       Factor of Safety
      ***    1.358   ***
          **** END OF GSTABL7 OUTPUT ****
```

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **
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****
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
****

Analysis Run Date: 1/24/2007
Time of Run: 3:14PM
Run By: MI
Input Data Filename: G:cb8-rd1.dat
Output Filename: G:cb8-rd1.OUT
Unit System: English
Plotted Output Filename: G:cb8-rd1.PLT
PROBLEM DESCRIPTION: Poor Farm Channel (HCFCD D111-00-00),Rap idDrawDown, 2H:1V w/Concrete Liner, CB-8

BOUNDARY COORDINATES
Note: User origin value specified.
Add 0.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
25 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	48.00	27.60	48.00	1
2	27.60	48.00	38.60	46.70	1
3	38.60	46.70	40.20	44.70	2
4	40.20	44.70	53.40	35.10	2
5	53.40	35.10	68.10	34.70	2
6	68.10	34.70	82.40	34.90	2
7	82.40	34.90	83.10	37.20	2
8	83.10	37.20	91.20	42.60	2
9	91.20	42.60	93.30	42.50	2
10	93.30	42.50	100.50	45.60	1
11	100.50	45.60	111.40	47.00	1
12	111.40	47.00	140.00	47.00	1
13	38.60	46.40	38.61	46.70	2
14	38.60	46.40	40.00	44.60	1
15	40.00	44.60	44.00	42.00	1
16	44.00	42.00	53.40	34.70	3
17	53.40	34.70	68.10	34.40	3
18	68.10	34.40	82.70	34.60	3
19	82.70	34.60	83.40	36.90	3
20	83.40	36.90	91.40	42.20	3
21	91.40	42.20	93.30	42.20	3
22	93.30	42.20	93.31	42.50	1
23	0.00	42.00	44.00	42.00	3
24	93.30	42.20	140.00	42.20	3
25	0.00	26.00	140.00	26.00	4

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	131.0	132.0	120.0	28.0	0.00	0.0	1
2	150.0	150.0	2000.0	0.0	0.00	0.0	1
3	124.0	125.0	140.0	19.5	0.00	0.0	1
4	130.0	132.0	120.0	28.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)

Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	48.00
2	27.60	47.80
3	38.60	46.70
4	40.20	44.70
5	53.40	35.10
6	68.10	34.70
7	82.40	34.90
8	83.10	37.20
9	91.20	42.60
10	93.30	42.50
11	100.50	45.60
12	111.40	47.00
13	140.00	47.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
1 Surface(s) Initiate(s) From Each Of 1000 Points Equally Spaced
Along The Ground Surface Between X = 53.00(ft)
and X = 84.00(ft)
Each Surface Terminates Between X = 91.00(ft)
and X = 139.50(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
3.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1000
Statistical Data On All Valid FS Values:
FS Max = 190.242 FS Min = 1.376 FS Ave = 2.272
Standard Deviation = 5.995 Coefficient of Variation = 263.83 %
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.42	34.77
2	75.99	33.24
3	78.75	32.04
4	81.63	31.20
5	84.59	30.74
6	87.59	30.65
7	90.57	30.95
8	93.50	31.63
9	96.31	32.67
10	98.97	34.07
11	101.42	35.79
12	103.64	37.80
13	105.59	40.09
14	107.22	42.60
15	108.53	45.30
16	108.99	46.69

Circle Center At X = 86.73 ; Y = 54.09 ; and Radius = 23.46
Factor of Safety
*** 1.376 ***
Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.5	11.2	0.0	5.4	0.	0.	0.0	0.0	0.0
2	2.1	259.8	0.0	141.9	0.	0.	0.0	0.0	0.0
3	2.8	774.5	0.0	410.3	0.	0.	0.0	0.0	0.0
4	2.9	1191.8	0.0	608.2	0.	0.	0.0	0.0	0.0

*** 1.379 ***
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.84	34.74
2	73.40	33.17
3	76.12	31.90
4	78.96	30.95
5	81.90	30.33
6	84.89	30.06
7	87.89	30.14
8	90.86	30.55
9	93.76	31.31
10	96.56	32.40
11	99.21	33.80
12	101.68	35.49
13	103.95	37.46
14	105.97	39.68
15	107.72	42.11
16	109.18	44.73
17	110.05	46.83

Circle Center At X = 85.75 ; Y = 56.08 ; and Radius = 26.03
Factor of Safety
*** 1.380 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.28	34.80
2	77.92	33.38
3	80.73	32.32
4	83.65	31.64
5	86.64	31.36
6	89.63	31.48
7	92.59	31.99
8	95.45	32.90
9	98.16	34.18
10	100.68	35.80
11	102.96	37.75
12	104.96	39.99
13	106.65	42.47
14	107.99	45.15
15	108.49	46.63

Circle Center At X = 87.25 ; Y = 53.83 ; and Radius = 22.48
Factor of Safety
*** 1.382 ***
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.66	34.74
2	73.16	33.08
3	75.83	31.71
4	78.62	30.63
5	81.52	29.85
6	84.49	29.39
7	87.48	29.24
8	90.48	29.42
9	93.44	29.92
10	96.32	30.74
11	99.11	31.85
12	101.76	33.26
13	104.24	34.95
14	106.53	36.89
15	108.59	39.06
16	110.42	41.44
17	111.97	44.01
18	113.25	46.72
19	113.34	47.00

Circle Center At X = 87.31 ; Y = 57.23 ; and Radius = 27.99
Factor of Safety
*** 1.383 ***
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.75	34.79
2	77.39	33.37
3	80.18	32.25
4	83.07	31.45
5	86.03	30.97
6	89.03	30.83
7	92.02	31.03
8	94.97	31.56
9	97.85	32.42
10	100.61	33.60
11	103.22	35.07
12	105.65	36.83
13	107.87	38.85
14	109.84	41.11
15	111.56	43.57
16	112.98	46.21
17	113.30	47.00

Circle Center At X = 88.76 ; Y = 57.59 ; and Radius = 26.76
Factor of Safety
*** 1.384 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.50	34.80
2	78.12	33.34
3	80.91	32.25
4	83.83	31.55
5	86.81	31.26
6	89.81	31.38
7	92.76	31.91
8	95.62	32.84
9	98.32	34.15
10	100.81	35.82
11	103.05	37.81
12	105.00	40.10
13	106.61	42.62
14	107.87	45.35
15	108.24	46.59

Circle Center At X = 87.44 ; Y = 53.10 ; and Radius = 21.85
Factor of Safety
*** 1.384 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.44	34.79
2	76.95	33.14
3	79.65	31.84
4	82.51	30.91
5	85.46	30.37
6	88.45	30.22
7	91.44	30.48
8	94.37	31.12
9	97.19	32.15
10	99.85	33.55
11	102.30	35.28
12	104.49	37.32
13	106.40	39.64
14	107.98	42.19
15	109.21	44.92
16	109.77	46.79

Circle Center At X = 88.05 ; Y = 52.74 ; and Radius = 22.52

```
       Factor of Safety
      ***    1.384   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         82.36       34.90
    2         85.25       34.10
    3         88.22       33.70
    4         91.22       33.70
    5         94.19       34.11
    6         97.08       34.91
    7         99.84       36.09
    8        102.42       37.63
    9        104.76       39.50
   10        106.84       41.67
   11        108.60       44.10
   12        110.02       46.74
   13        110.05       46.83
Circle Center At X =    89.71 ; Y =    55.97 ; and Radius =    22.31
       Factor of Safety
      ***    1.385   ***
          **** END OF GSTABL7 OUTPUT ****
```

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                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
  ** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **
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*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
      Modified Bishop, Simplified Janbu, or GLE Method of Slices.
      (Includes Spencer & Morgenstern-Price Type Analysis)
      Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
      Nonlinear Undrained Shear Strength, Curved Phi Envelope,
      Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
      Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:        1/24/2007
Time of Run:              3:10PM
Run By:                   MI
Input Data Filename:      G:cb8-lt.dat
Output Filename:          G:cb8-lt.OUT
Unit System:              English
Plotted Output Filename:  G:cb8-lt.PLT
PROBLEM DESCRIPTION:  Poor Farm Channel (HCFCD D111-00-00),
                      Long Term, 2H:1V w/Concrete Liner, CB-8
BOUNDARY COORDINATES
     Note: User origin value specified.
     Add 0.00 to X-values and 0.00 to Y-values listed.

   12 Top   Boundaries
   25 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00      48.00      27.60      48.00        1
    2        27.60      48.00      38.60      46.70        1
    3        38.60      46.70      40.20      44.70        2
    4        40.20      44.70      53.40      35.10        2
    5        53.40      35.10      68.10      34.70        2
    6        68.10      34.70      82.40      34.90        2
    7        82.40      34.90      83.10      37.20        2
    8        83.10      37.20      91.20      42.60        2
    9        91.20      42.60      93.30      42.50        2
   10        93.30      42.50     100.50      45.60        1
   11       100.50      45.60     111.40      47.00        1
   12       111.40      47.00     140.00      47.00        1
   13        38.60      46.40      38.61      46.70        2
   14        38.60      46.40      40.00      44.60        1
   15        40.00      44.60      44.00      42.00        1
   16        44.00      42.00      53.40      34.70        3
   17        53.40      34.70      68.10      34.40        3
   18        68.10      34.40      82.70      34.60        3
   19        82.70      34.60      83.40      36.90        3
   20        83.40      36.90      91.40      42.20        3
   21        91.40      42.20      93.30      42.20        3
   22        93.30      42.20      93.31      42.50        1
   23         0.00      42.00      44.00      42.00        3
   24        93.30      42.20     140.00      42.20        3
   25         0.00      26.00     140.00      26.00        4
 Default Y-Origin = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
  4 Type(s) of Soil
 Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
 Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   131.0    132.0     120.0     28.0     0.00      0.0      1
   2   150.0    150.0    2000.0      0.0     0.00      0.0      1
   3   124.0    125.0     140.0     19.5     0.00      0.0      1
   4   130.0    132.0     120.0     28.0     0.00      0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
```

Piezometric Surface No. 1 Specified by 7 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	36.00
2	51.80	36.00
3	53.40	35.00
4	68.00	34.70
5	82.70	34.80
6	83.00	36.00
7	140.00	36.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
1 Surface(s) Initiate(s) From Each Of 1000 Points Equally Spaced
Along The Ground Surface Between X = 53.00(ft)
and X = 84.00(ft)
Each Surface Terminates Between X = 91.00(ft)
and X = 139.50(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
3.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1000
Statistical Data On All Valid FS Values:
FS Max = 190.242 FS Min = 1.756 FS Ave = 2.781
Standard Deviation = 5.983 Coefficient of Variation = 215.14 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.84	34.74
2	73.40	33.17
3	76.12	31.90
4	78.96	30.95
5	81.90	30.33
6	84.89	30.06
7	87.89	30.14
8	90.86	30.55
9	93.76	31.31
10	96.56	32.40
11	99.21	33.80
12	101.68	35.49
13	103.95	37.46
14	105.97	39.68
15	107.72	42.11
16	109.18	44.73
17	110.05	46.83

Circle Center At X = 85.75 ; Y = 56.08 ; and Radius = 26.03
Factor of Safety
*** 1.756 ***
Individual data on the 31 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.0	0.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.4	10.7	0.0	4.6	0.	0.	0.0	0.0	0.0
3	2.1	263.5	0.0	140.8	0.	0.	0.0	0.0	0.0
4	2.7	789.3	0.0	414.7	0.	0.	0.0	0.0	0.0
5	2.8	1234.7	0.0	625.7	0.	0.	0.0	0.0	0.0
6	2.9	1575.4	0.0	775.6	0.	0.	0.0	0.0	0.0
7	0.5	291.0	0.0	140.8	0.	0.	0.0	0.0	0.0
8	0.3	197.9	0.0	85.0	0.	0.	0.0	0.0	0.0
9	0.3	238.9	0.0	51.3	0.	0.	0.0	0.0	0.0

10	0.1	88.3	0.0	36.2	0.	0.	0.0	0.0	0.0
11	0.0	23.6	0.0	9.4	0.	0.	0.0	0.0	0.0
12	0.3	248.8	0.0	99.4	0.	0.	0.0	0.0	0.0
13	1.5	1459.7	0.0	546.8	0.	0.	0.0	0.0	0.0
14	3.0	3513.3	0.0	1104.7	0.	0.	0.0	0.0	0.0
15	3.0	4122.9	0.0	1058.8	0.	0.	0.0	0.0	0.0
16	0.3	513.0	0.0	119.7	0.	0.	0.0	0.0	0.0
17	0.2	299.3	0.0	68.8	0.	0.	0.0	0.0	0.0
18	1.9	2760.3	0.0	619.7	0.	0.	0.0	0.0	0.0
19	0.0	14.1	0.0	3.1	0.	0.	0.0	0.0	0.0
20	0.4	635.9	0.0	137.6	0.	0.	0.0	0.0	0.0
21	2.8	4002.8	0.0	776.4	0.	0.	0.0	0.0	0.0
22	2.7	3793.0	0.0	543.7	0.	0.	0.0	0.0	0.0
23	1.3	1804.5	0.0	172.0	0.	0.	0.0	0.0	0.0
24	1.2	1584.3	0.0	81.8	0.	0.	0.0	0.0	0.0
25	0.6	741.9	0.0	12.3	0.	0.	0.0	0.0	0.0
26	1.7	1960.3	0.0	0.0	0.	0.	0.0	0.0	0.0
27	2.0	1961.8	0.0	0.0	0.	0.	0.0	0.0	0.0
28	1.8	1251.4	0.0	0.0	0.	0.	0.0	0.0	0.0
29	0.0	27.8	0.0	0.0	0.	0.	0.0	0.0	0.0
30	1.4	584.4	0.0	0.0	0.	0.	0.0	0.0	0.0
31	0.9	112.8	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.91	34.74
2	73.38	33.05
3	76.07	31.71
4	78.91	30.74
5	81.85	30.17
6	84.85	29.99
7	87.84	30.22
8	90.77	30.85
9	93.59	31.87
10	96.25	33.26
11	98.70	34.99
12	100.89	37.04
13	102.79	39.36
14	104.36	41.92
15	105.57	44.66
16	106.04	46.31

Circle Center At X = 84.64 ; Y = 52.18 ; and Radius = 22.20

Factor of Safety

*** 1.757 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.54	34.72
2	72.03	33.04
3	74.68	31.65
4	77.47	30.55
5	80.37	29.76
6	83.33	29.29
7	86.33	29.15
8	89.32	29.33
9	92.28	29.84
10	95.16	30.67
11	97.94	31.80
12	100.57	33.24
13	103.04	34.95
14	105.30	36.92
15	107.34	39.12
16	109.12	41.53
17	110.63	44.12
18	111.85	46.87
19	111.89	47.00

Circle Center At X = 86.14 ; Y = 56.65 ; and Radius = 27.51

Factor of Safety
*** 1.760 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.62	34.75
2	74.07	33.02
3	76.75	31.66
4	79.59	30.71
5	82.54	30.18
6	85.54	30.08
7	88.52	30.42
8	91.42	31.19
9	94.18	32.37
10	96.74	33.94
11	99.04	35.86
12	101.04	38.09
13	102.70	40.60
14	103.97	43.31
15	104.83	46.16

Circle Center At X = 84.71 ; Y = 50.69 ; and Radius = 20.63

Factor of Safety
*** 1.766 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.15	34.76
2	74.78	33.32
3	77.58	32.23
4	80.48	31.49
5	83.46	31.12
6	86.46	31.11
7	89.44	31.48
8	92.35	32.22
9	95.14	33.31
10	97.78	34.73
11	100.22	36.48
12	102.43	38.51
13	104.37	40.80
14	106.01	43.31
15	107.32	46.01
16	107.49	46.50

Circle Center At X = 84.98 ; Y = 55.20 ; and Radius = 24.14

Factor of Safety
*** 1.766 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	70.75	34.74
2	73.16	32.95
3	75.76	31.46
4	78.53	30.30
5	81.41	29.47
6	84.38	29.01
7	87.37	28.90
8	90.36	29.15
9	93.30	29.76
10	96.14	30.72
11	98.85	32.01
12	101.38	33.62
13	103.70	35.53
14	105.77	37.70
15	107.57	40.10
16	109.06	42.70
17	110.23	45.46
18	110.65	46.90

Circle Center At X = 86.77 ; Y = 53.72 ; and Radius = 24.84

Factor of Safety
*** 1.767 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.23	34.72
2	71.58	32.85
3	74.14	31.28
4	76.86	30.02
5	79.71	29.08
6	82.65	28.49
7	85.64	28.25
8	88.64	28.35
9	91.60	28.81
10	94.49	29.62
11	97.27	30.76
12	99.89	32.21
13	102.32	33.97
14	104.54	35.99
15	106.49	38.27
16	108.17	40.75
17	109.55	43.42
18	110.60	46.23
19	110.77	46.92

Circle Center At X = 86.22 ; Y = 53.75 ; and Radius = 25.51

Factor of Safety
*** 1.768 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.42	34.77
2	75.99	33.24
3	78.75	32.04
4	81.63	31.20
5	84.59	30.74
6	87.59	30.65
7	90.57	30.95
8	93.50	31.63
9	96.31	32.67
10	98.97	34.07
11	101.42	35.79
12	103.64	37.80
13	105.59	40.09
14	107.22	42.60
15	108.53	45.30
16	108.99	46.69

Circle Center At X = 86.73 ; Y = 54.09 ; and Radius = 23.46

Factor of Safety
*** 1.768 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	67.24	34.72
2	69.76	33.08
3	72.42	31.71
4	75.22	30.62
5	78.11	29.82
6	81.07	29.31
7	84.06	29.12
8	87.06	29.23
9	90.03	29.65
10	92.94	30.37
11	95.76	31.38
12	98.47	32.68
13	101.03	34.25
14	103.41	36.07
15	105.59	38.13

```
   16        107.56       40.40
   17        109.28       42.85
   18        110.74       45.47
   19        111.39       47.00
Circle Center At X =    84.47 ; Y =    58.38 ; and Radius =    29.27
       Factor of Safety
      ***    1.770   ***
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         70.50       34.73
    2         73.05       33.15
    3         75.78       31.91
    4         78.66       31.05
    5         81.62       30.58
    6         84.62       30.51
    7         87.60       30.83
    8         90.51       31.55
    9         93.31       32.65
   10         95.93       34.11
   11         98.33       35.90
   12        100.48       38.00
   13        102.32       40.36
   14        103.84       42.95
   15        105.00       45.72
   16        105.13       46.19
Circle Center At X =    83.67 ; Y =    53.00 ; and Radius =    22.52
       Factor of Safety
      ***    1.770   ***
          **** END OF GSTABL7 OUTPUT ****
```

GEOTECHNICAL STUDY
RILEY STREET STA. 1+00 TO STA. 8+00
STORM SEWER REPLACEMENT
CITY OF WEST UNIVERSITY PLACE, TEXAS
CITY OF SOUTHSIDE PLACE, TEXAS

Prepared for

Claunch & Miller, Inc.
Houston, Texas

December 2007

Prepared by

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10710 South Sam Houston Parkway West, Suite 100
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Project No.07.13.242

December 20, 2007
TWEI Project No: 07.13.242

Claunch & Miller, Inc.
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Attn.: Mr. Todd A. Calvin, P.E.

GEOTECHNICAL STUDY
RILEY STREET STA. 1+00 TO STA. 8+00
STORM SEWER REPLACEMENT
CITY OF WEST UNIVERSITY PLACE, TEXAS
CITY OF SOUTHSIDE PLACE, TEXAS

Dear Mr. Calvin:

Presented here is the report of our geotechnical study for the storm sewer replacement project along Riley Street in the cities of West University Place and Southside Place, Texas. This study was conducted in general accordance with our proposal dated August 6, 2007 (TWEI Proposal No. P07-G254), and was authorized by you in your electronic mail on October 17, 2007.

We appreciate this opportunity to be of service. Please contact us if there are any questions or if we may be of further assistance.

Sincerely,

TOLUNAY-WONG ENGINEERS, INC.

STATE OF TEXAS
DAVID B. BOOTHBY, JR.
92222
LICENSED
PROFESSIONAL ENGINEER

12/20/07

David B. Boothby, P.E.

Jenell S. Strachan, P.E.

Copies Submitted: Mr. Todd A. Calvin, P.E. – Claunch & Miller, Inc. (3 copies)

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EXECUTIVE SUMMARY

This report provides geotechnical recommendations for the storm sewer replacement project along Riley Street in the cities of West University Place and Southside Place, Texas. The storm sewer will be constructed on Riley Street between Weslayan and College Streets and includes about 506 linear feet of 7-ft by 4-ft reinforced concrete box (RCB), 25 linear feet of 24-in. reinforced concrete pipe (RCP), and 8 linear feet of 18-in. RCP. The maximum invert depth of the box culvert will be about 15 ft below the existing top of pavement. The existing street paving will be restored following storm sewer construction.

The existing reinforced concrete pavement was 6 in. and 7 in. thick at respective boring locations B-1 and B-2. We encountered 5 in. to 6 in. of stabilized sand immediately below the concrete pavement. Below the existing concrete pavement and stabilized subgrade, the subsurface stratigraphy encountered at boring B-1 (Riley St. at College St.) consists of cohesive high plasticity fat clay with sand to the 10-ft depth, underlain by water-bearing cohesionless poorly graded sand with silt to about the 13-ft depth. The cohesionless soil is underlain by layers of cohesive lean clay with sand and fat clay with sand to the 25-ft termination depth. Below the pavement section, Boring B-2 (Riley St. at Weslayan St.) encountered alternating layers of cohesive medium to high plasticity fat clay, fat clay with sand, lean clay, and sandy lean clay to the 25-ft explored depth.

Groundwater was encountered at about the 10-ft depth in boring B-1. The measured water level rose to about the 6.9-ft depth, 15 minutes after completion. Boring B-2 was dry upon completion, but we measured a water level at about the 15.9-ft depth about 42 minutes after completion.

Excavations for storm sewers within the upper 10-ft depths are anticipated to encounter cohesive soils. Excavations to depths of 15-ft for the proposed box culverts are anticipated to encounter primarily cohesive soils except in the vicinity of boring B-1 where water-bearing poorly graded sand with silt was observed between 10-ft and 18-ft depths. Water seepage or surface runoff within cohesive soils can probably be handled by pumping from sumps. Mechanical dewatering will be necessary to advance the excavation through the water-bearing poorly graded sand with silt strata such as observed in boring B-1. Groundwater levels and seepage conditions should be checked just prior to excavation.

Bedding and backfill for storm sewers should be constructed in accordance with the City of Houston Department of Public Works and Engineering Standards dated October 2002, or an equivalent standard. In accordance with the current OSHA regulations, the observed soils in the project borings would be classified as "Type C".

The surficial soils within the project site consist of cohesive medium to high plasticity fat clay with sand and sandy lean clay. The existing cohesive soils may be used for pavement repair grading purposes. Earth fill should be free of organic matter and excessive silt. Fill for grade adjustments should be placed in lifts not exceeding 8-in. loose measure. All fill should be

compacted to at least 95% of the maximum dry density at moisture content within two percentage points of the optimum, as determined by the standard Proctor density test (ASTM D 698).

The medium to high plasticity pavement subgrade soils should be stabilized to a minimum depth of 6 in. with hydrated lime. For planning purposes 7% lime (dry weight basis) may be considered for the subgrade stabilization. Actual stabilization requirements should be determined in the field by trial. Lime stabilization should adhere to City of Houston Standard Specification Section 02336, *Lime Stabilized Subgrade*. The stabilized soils should be compacted to at least 95% of the standard Proctor maximum dry density (ASTM D 698). The compacted moisture content should be within two percentage points of the optimum moisture content. Compaction of the lime stabilized subgrade should begin immediately after final mixing.

Pavement repair thicknesses should match the existing pavement thickness, with a minimum thickness of 6-in. The roadway pavement criteria and construction consideration are detailed in the report text.

1. INTRODUCTION

Claunch & Miller, Inc. retained Tolunay-Wong Engineers, Inc. (TWEI) to perform a geotechnical study for a segment of the West University Place and Southside Place storm sewer replacement project. The project site is located along Riley Street (Sta. 1+00 to Sta. 8+00), between Weslayan and College Streets, in West University Place, Texas (Key Map: 532 E). Mr. Todd A. Calvin, P.E. of Claunch & Miller, Inc. provided project details verbally and by electronic mail.

The project consists of construction of storm sewer on Riley Street between Weslayan and College Streets. About 506 linear feet of 7-ft by 4-ft reinforced concrete box (RCB), 25 linear feet of 24-in. reinforced concrete pipe (RCP), and 8 linear feet of 18-in. RCP are included. The maximum invert depths of the reinforced concrete pipe and box culvert will be about 5.5-ft and 15 ft below the existing top of pavement, respectively. The existing street paving will be restored following storm sewer construction.

2. SCOPE OF STUDY

The study included field exploration to obtain subsurface information and to secure representative soil samples, laboratory testing to measure selected soil engineering properties, and geotechnical analyses to develop design criteria and construction recommendations. Information developed as part of the study includes:

- Soil stratigraphy and groundwater condition;
- Soil classification for OSHA trenching and shoring recommendations;
- Bedding and backfill criteria for storm sewers;
- Box culvert design and construction criteria;
- Pavement subgrade preparation; and
- Pavement repair criteria.

Environmental assessment, recommendations for areas not covered by the boring layout, and site-specific fault studies were outside the scope of work for this study.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 Test Borings

The fieldwork was performed on October 29, 2007. The field exploration consisted of drilling, logging and sampling a two (2) soil borings (B-1 and B-2) to depth of 25 ft below existing grade, and obtaining water level measurements in the open boreholes prior to grouting. Claunch & Miller, Inc. selected the approximate locations of the test borings. Depth of the borings was determined by TWEI based upon local municipal standards. Van & Sons Drilling Service, Inc. performed the drilling and sampling. A TWEI representative was present to coordinate the field activities, to log the boreholes, and to measure the groundwater levels. The approximate boring locations are shown on Figure 1.

3.2 Drilling Methods

The field operations were performed in general accordance with *Standard Practice for Soil Investigation and Sampling by Auger Borings* [American Society for Testing and Materials (ASTM) D 1452]. The soil borings were drilled with a truck-mounted rig and were dry augered initially in an attempt to measure groundwater levels. Soil samples were obtained at continual 2-ft intervals to 12-ft depth, at the 13 to 15-ft depth, and at 5-ft intervals thereafter. All soil borings were grouted after final groundwater level measurements.

3.3 Soil Sampling

Cohesive soil samples were obtained by hydraulically pushing a 3-inch diameter, thin-walled tube a distance of about 24 inches. The field sampling procedure was conducted in accordance with the *Standard Practice for Thin-Walled Tube Sampling of Soils* (ASTM D 1587). The field technician extruded the soil samples in the field, visually classified the recovered cohesive soils, and obtained a penetration resistance measurement using a pocket penetrometer. The penetrometer readings are presented on the boring logs in Appendix A. Based on experience with local soils, a factor of 0.67 was applied to the pocket penetrometer reading to estimate soil consistency. Representative portions of the soil samples extruded in the field were wrapped in foil and sealed in plastic bags, and transported to the laboratory.

Cohesionless soil, and soil interpreted to be cohesionless, were sampled by driving a 2-inch-diameter, split barrel sampler. The sampler was driven 18 inches by a 140-pound hammer falling about 30 inches in general accordance with the *Standard Method for Penetration Test and Split-Barrel Sampling of Soils* (ASTM D 1586). The field technician recorded the number of blows required to drive the sampler through three consecutive 6-inch intervals. The sum of the blows

4. SUBSURFACE CONDITIONS

4.1 General

Our interpretations of soil and groundwater conditions at the site are based on information obtained at the soil boring locations only. The project boring logs are presented in Appendix A. This information has been used as the basis for our conclusions and recommendations. Subsurface conditions may vary between soil boring locations. Significant variations at areas not explored by the project borings will require re-evaluation of our recommendations.

4.2 Regional Geology

The site is located on the Beaumont clay formation, a deltaic nonmarine Pleistocene deposit. The Beaumont clay is a heterogeneous formation, containing thick interbedded layers of clay, fine sand, and silt.

The clay fraction is primarily composed of montmorillonite, illite, kaolinite, and finely ground quartz. The clay present in the formation has been preconsolidated by a process of desiccation. The sands and silts, which vary in compactness from loose to very dense, are composed of quartz, the feldspars, large particles of kaolinite, calcite, and occasionally hornblende.

The coastal plain in this region has a complex tectonic geology, several major features of which are: Gulf Coastal geosyncline, salt domes, major sea level fluctuations during the glacial stages, subsidence and faulting activities. Most of these faulting activities have ceased for millions of years, but some are still active. A fault investigation and study of the site geology are beyond the scope of this report.

4.3 Existing Pavement

Existing pavement encountered at the boring locations consisted of 6-in. and 7-in. thick reinforced concrete, underlain by a 6-in. and 5-in. thick layer of stabilized sand in borings B-1 and B-2, respectively.

4.4 Soil Stratigraphy

Below the existing concrete pavement and stabilized subgrade, the subsurface stratigraphy encountered at boring B-1 (Riley St. at College St.) consists of cohesive high plasticity fat clay with sand to the 10-ft depth, underlain by water-bearing cohesionless poorly graded sand with silt to about the 13-ft depth. The cohesionless soil is underlain by layers of cohesive lean clay with sand and fat clay with sand to the 25-ft termination depth. Below the pavement section, Boring B-2 (Riley St. at Weslayan St.) encountered alternating layers of cohesive medium to high plasticity fat clay, fat clay with sand, lean clay, and sandy lean clay to the 25-ft explored depth.

Secondary structures observed in the recovered cohesive soil samples consisted of ferrous and calcareous nodules, slickensides, and sand seams.

Detailed descriptions of the soils encountered are presented on the logs of borings in Appendix A.

4.5 Soil Properties

We measured liquid limits of 35% to 64%, and plasticity indices of 13 to 45 on selected cohesive soil samples recovered from the borings, indicative of a high shrink/swell potential with moisture variation. In-situ moisture contents of the samples were between four and nine percentage points wet of the corresponding plastic limits, indicating a relatively moist soil condition at the time of the fieldwork. Measured fines contents of selected cohesive soil samples ranged from 59% to 86%.

Unconfined Compression (UC) tests performed on three selected cohesive samples recovered from various depths in the borings measured undrained shear strengths ranging from 1,190 psf to 1,740 psf. The fat clay soil sample recovered from the 13-ft to 15-ft depth interval in boring B-2 failed prematurely along slickensided surfaces as noted by an asterisk on the boring log. Apparent shear strengths of the recovered cohesive samples, based on converted pocket penetrometer readings, ranged from about 670 psf to 3,000 psf, with most values between 1,000 psf and 1,675 psf. An SPT "N" value of 14 blows per foot was measured within the cohesive lean clay with sand encountered at the 18.5-ft to 20-ft depth interval in boring B-1. Total unit weights of six selected cohesive samples recovered from the project borings were between 122 pcf and 131 pcf. The measured and apparent undrained shear strengths are indicative of firm to very stiff-hard, but mostly stiff consistency. Firm cohesive soils were encountered at the 8-ft to 10-ft and 18-ft to 20-ft depth intervals in respective borings B-1 and B-2.

Measured SPT "N" values within the cohesionless soils encountered at the 10-ft to 18-ft depth interval in boring B-1 were 5 and 9 blows per foot, indicative of very loose to loose relative densities. A particle size analyses was performed on the cohesionless sample recovered from the 13.5-ft to 15-ft depth interval in boring B-1. Results are presented in Table 4-1 and in Appendix B.

Table 4-1
Particle Size Analysis

Sample	Sample Description	Percent Sand	Percent Silt & Clay
B-1 13.5 ft – 15-ft	Tan and Gray Poorly Graded SAND w/SILT	90	10

4.6 Groundwater Observations

Groundwater level measurements obtained during drilling and after completion are summarized in the following table.

Table 4-2
Groundwater Level Measurements

Boring	Boring Depth (ft)	Dry Augered Depth (ft)	Depth to Free water Encountered During Drilling (ft)	End of Field Work	
				Depth to Groundwater (ft)	Caved Depth (ft)
B-1	25	10	10	6.9 after 15 min.	10.3
B-2	25	25	Dry	15.9 after 42 min.	-

Water level observations in open boreholes may not accurately reflect the true (static) groundwater condition since it may be time dependent. A more accurate determination of the static groundwater level is made in open standpipe piezometers. Installation of a piezometer at this site was not included in the work scope.

Fluctuations in groundwater levels may occur with changes in seasonal and climatic conditions. Depending on when the project is developed, the groundwater conditions observed in October 2007 may not be representative during construction. We recommend that the water level be verified prior to construction.

5. GEOTECHNICAL RECOMMENDATIONS

We understand that the proposed storm sewer pipe and box culvert will be installed within the upper 15-ft depths. The recommendations presented in this report are based on an assessment of the observed subsurface conditions at two widely-spaced borings. Excavation retention and construction dewatering are the responsibility of the contractor. The contractor should collect additional subsurface information as necessary to determine if the conditions reported herein are representative.

5.1 Storm Sewer Construction Criteria

5.1.1 Trenching and Shoring

All vertical excavations deeper than 5-ft must be provided with a trench safety system in accordance with the current Occupational Safety and Health Administration (OSHA) standards (29 CFR, Part 1926, Subpart P). The OSHA standards include provisions for the design of sloping and/or benched trench excavations in single or multiple layer soil stratigraphy less than 20-ft deep, in lieu of bracing and shoring. Sloping or benching for excavations greater than 20-ft deep must be designed by a registered professional engineer. The regulations specify maximum slope declivities contingent on soil type. The observed soils typically found along the utility line alignments in the project borings may be classified as "Type C". A trench shield (box), if used, should be designed to withstand lateral loads imposed by specific site soil conditions.

It should be noted that the soil stratigraphy and groundwater conditions encountered during excavations might vary from those observed in the project borings or characterized herein. The contractor should collect additional subsurface information, as he deems necessary, to determine if the conditions described in this report are representative on a station-by-station basis. It is also mandatory that all excavations and retaining structures be monitored on a continuous basis by experienced personnel who can make evaluations as to the appropriateness of the retention system used.

5.1.2 Utility Bedding and Backfill Criteria

Bedding and backfill for storm sewers should be constructed using the City of Houston Department of Public Works and Engineering *Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage, and Street Paving,* dated October 2002, or an equivalent standard. In accordance with these specifications, the backfill requirements should conform to Section 02317 – "Excavation and Backfill for Utilities," and Section 02320 – "Utility Backfill Material".

Bedding. Bedding recommendations outlined on Drawing No. 02317-03, dated October 1, 2002 are expected to be applicable for storm sewer pipes bedded within stable soils. Drawing No.

02317-02 may be required for wet bedding conditions provided the trench bottom is pressure-relieved through dewatering.

Backfill Placement. Backfill placement should be in accordance with the City of Houston Standard Construction Specifications. Trench zone backfill placement and compaction requirements are provided in Section 02317, *Excavation and Backfill for Utilities*, and are summarized in the following table:

Table 5-1
Trench Zone Backfill Placement and Compaction

Soil Type	Maximum Lift Thickness (Compacted)	Minimum Density (ASTM D 698)	Compacted Moisture Content (ASTM D 698)
Bank Run Sand	9 inches	95%	±3 points
Cement-Stabilized Sand	12 inches	95% (1)	Less than optimum (1)
Select Fill	6 inches	95%	± 2 points
Random Fill (2)	9 inches (clay) 12 inches (sand)	90%	None

(1) As determined by ASTM D 558
(2) Random fill is to be used outside pavement areas.

We recommend a minimum 95% relative compaction for random fill. Backfill material specifications for bank run sand, select backfill, and random backfill are provided in the Specification Section 02320, *Utility Backfill Materials*. The City of Houston Standard Construction Specifications preclude the use of silt, organic clay, and peat as utility backfill materials. Cement-stabilized sand material specifications are provided in Section 02321, *Cement Stabilized Sand.*

The City of Houston Standard Construction Specifications require in-place density testing of pipe embedment and trench zone backfill at a minimum frequency of one test per 40 linear feet (embedment) and two tests per 40 linear feet (backfill), with a minimum of three density tests for each shift of work (Section 02317).

5.1.3 Groundwater Control

Construction dewatering and excavation retention are the contractor's responsibilities. We provide excavation planning comments and suggestions for informational purposes. These comments may be used to review the contractor's proposed excavation procedures. Installation of static level piezometers prior to utilities installation should be considered.

Excavations for storm sewers within the upper 10-ft depths are anticipated to encounter cohesive soils. Excavations to depths of 15-ft for the proposed box culverts are anticipated to encounter

permanent wall. The braced excavation case with dewatering support assumes that the poorly graded sand with silt strata is sufficiently transmissive to allow dewatering and that the effectiveness of pressure-relief/dewatering can be verified using observation wells. The braced case without dewatering support assumes that the encountered stratigraphy is primarily cohesive containing no significant transmissive units or those transmissive zones are cut off. The permanent wall case assumes no dewatering, with design groundwater depths at some conservative level above elevations measured in piezometers. For this study, cases 1 through 3 are applicable for cohesive and cohesive/cohesionless soil profiles. Earth pressures profiles for braced and permanent walls have been prepared for the observed cohesive and cohesive/cohesionless soil profiles and are presented on Figures 2 and 3.

5.2.3 Box Culvert Design

The box culvert is a buried rigid structure which is constructed in an excavation and then backfilled. The pressures which the soil can be expected to exert on the walls are mainly a function of the type of backfill and its method of placement. Over compaction of backfill behind walls and utilization of highly plastic expansive clay backfill are practices which generally produce the highest wall pressures that can exceed the vertical earth pressures. Backfill selection and its method of placement are critical.

Bank sand, select cohesive soil, and on-site cohesive soils are the three types of fill material that may be considered for this project. Bank sand is a silty fine sand which contains no more than 25 percent material passing the No. 200 Sieve and is free of clay balls and debris. Select cohesive soil has a plasticity index of 7 to 20, and a maximum liquid limit of 40 percent, and is free of organic and other deleterious material. If on site soils are used, the excavated soils for the box culverts will be clays with most of the plasticity indices more than 20. Cohesive soils with plasticity indices greater than 20 are not as desirable and may result in higher wall pressures because of swell potential. The backfill to be used behind the culvert walls should be inspected prior to use.

The fill should be placed in 8 in. loose lifts and compacted to 95 percent of the maximum standard Proctor density at moisture content within 2 percentage points of the optimum (ASTM D 698). High plasticity soils, if used, should be moisture-conditioned to three to five percentage points above the optimum moisture content to reduce swell potential. Fill under pavements should be compacted to at least 95% of ASTM D 698. Shrinkage of up to 1% of fill thickness can be expected in compacted fill.

Design lateral pressures for the box culvert walls may be calculated for each backfill type and compaction level using the equivalent fluid densities shown in Table 5-2.

Table 5-2
Equivalent Fluid Densities

Soil Type	Compactive Effort (%)	Equivalent Fluid Density (pcf)	
		Above Water Table	Below Water Table*
Select cohesive backfill ($7 \leq PI \leq 20$)	88 to 92 93 to 98	65 85	95 103
Non-select cohesive backfill (PI > 20)	88 to 92 93 to 98	75 100	105 113
Bank Sand (Fines content < 25%)	88 to 92 93 to 98	55 75	88 96
*These magnitudes include a water component, if applicable.			

The bank sand backfill is generally more expensive but produces correspondingly lower design wall pressures. If bank sand is used, it should be capped at the ground surface with 2 ft of select or on-site non-select cohesive material.

An allowable gross total gravity load bearing pressure of 2500 psf may be used in design for box culvert foundations placed in undisturbed cohesive or cohesionless soils. Vertical soil pressure above the top of the box culvert may be calculated by multiplying backfill thickness, in feet, by 120 pcf. Traffic wheel load of 500 psf should also be incorporated into calculations for vertical pressure.

5.3 Pavement Subgrade Preparation

The surficial soils within the project site consist of cohesive medium to high plasticity fat clay with sand and sandy lean clay. The existing cohesive soils may be used for pavement repair grading purposes. Earth fill should be free of organic matter and excessive silt. Fill for grade adjustments should be placed in lifts not exceeding 8-in. loose measure. All fill should be compacted to at least 95% of the maximum dry density at moisture content within two percentage points of the optimum, as determined by the standard Proctor density test (ASTM D 698).

The medium to high plasticity pavement subgrade soils should be stabilized to a minimum depth of 6 in. with hydrated lime. For planning purposes 7% lime (dry weight basis) may be considered for the subgrade stabilization. Actual stabilization requirements should be determined in the field by trial.

Lime stabilization should adhere to City of Houston Standard Specification Section 02336, *Lime Stabilized Subgrade*, or an equivalent. The stabilized soils should be compacted to at least 95% of the standard Proctor maximum dry density (ASTM D 698). The compacted moisture content should be within two percentage points of the optimum moisture content. Compaction of the lime stabilized subgrade should begin immediately after final mixing.

5.4 Pavement Repair Criteria

The new pavement structure over the new storm sewer pipe and box culverts should match the existing pavement sections within the project alignment. This includes stabilizing the upper 6 in. of subgrade soils in accordance with the **Subgrade Stabilization** section of the report.

Pavement repair thicknesses should match the existing pavement thickness, with a minimum thickness of 6-in.

The concrete mix should have a minimum 5.5 sacks of Portland cement per cubic yard (f_c' = 3500 psi) and the pavement should be reinforced per City of Houston Department of Public Works and Engineering Drawing No. 02751-01 entitled "Concrete Pavement Details". Based on the field and laboratory data, the minimum thicknesses would be applicable for pavement placed on properly prepared subgrade soils in accordance with the **Pavement Subgrade Preparation** section of this report.

It is essential to prevent water infiltration into the subgrade soils. Water infiltration into the subgrade will accelerate pavement failure and potential repairs. Periodic maintenance should include sealing any surface cracks.

6. CLOSURE

6.1 Limitations

This report has been prepared for the exclusive use of Claunch & Miller, Inc. for specific application to the referenced project at the aforementioned location in West University Place, and South Side Place, Texas. Our report has been prepared in accordance with the generally accepted geotechnical engineering practice common to the local area. No other warranty, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from the referenced subsurface exploration. The borings indicated subsurface conditions only at the specific locations and time, and only to the depths penetrated. The borings do not necessarily reflect strata variations that may exist between boring locations. The validity of the recommendations is based in part on assumptions about the stratigraphy made by the Geotechnical Engineer. Such assumptions may be confirmed only during earthwork and construction. Our recommendations presented in this report must be re-evaluated if subsurface conditions during construction are different from those described in this report.

If any changes in the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed, and the conclusions are modified or verified in writing by TWEI. TWEI is not responsible for any claims, damages, or liability associated with interpretation or reuse of the subsurface data or engineering analyses without the expressed written authorization of TWEI.

6.2 Design Review

Review of the design and construction drawings as well as the specifications should be performed by TWEI before release. The review is aimed at determining if the geotechnical design and construction recommendations contained in this report have been properly interpreted. Design review is not within the authorized scope of work for this study. Should you elect to retain TWEI to perform a design review, additional fees would be applicable.

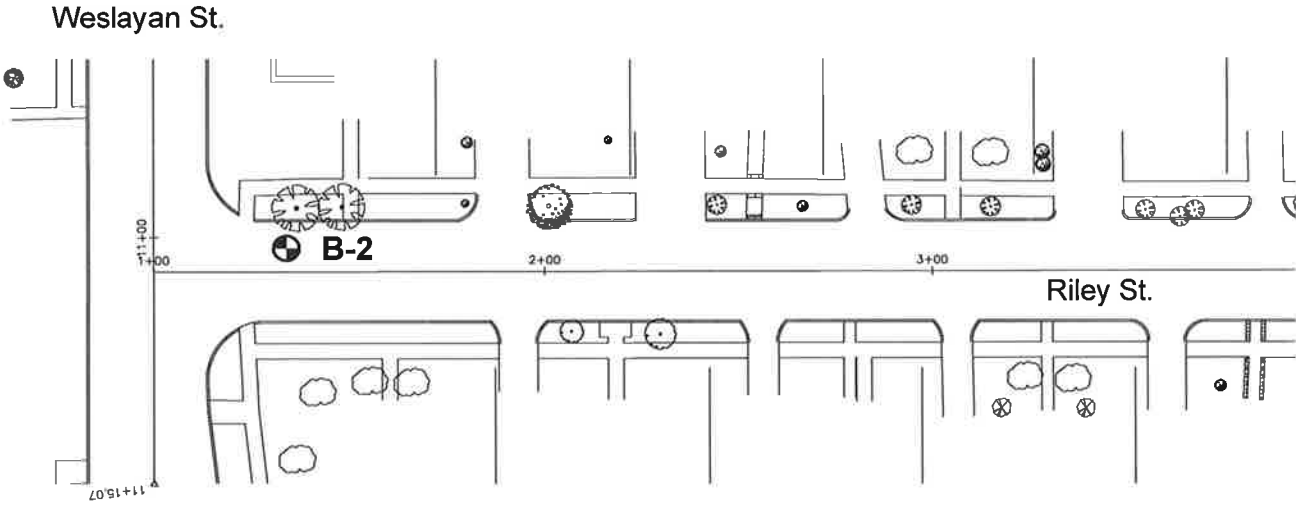
6.3 Construction Monitoring

Storm sewer pipe and box culvert, and paving construction monitoring is recommended and has been assumed in preparing our report. These field services are required to check for changes in conditions that may result in modifications to our recommendations.

FIGURES

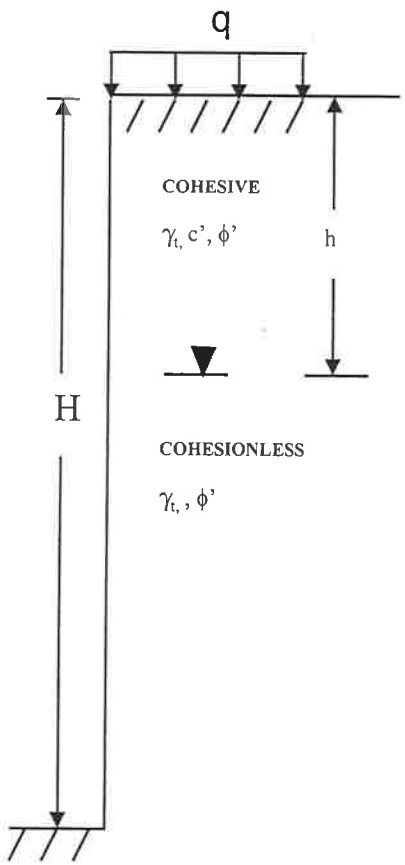
N

APPROXIMATE BORING LOCATION



RILEY STREET STA. 1+00 TO STA. 8+00
STORM SEWER REPLACEMENT
CITY OF WEST UNIVERSITY PLACE & CITY OF SOUTHSIDE PLACE, TEXAS

CLAUNCH & MILLER, INC.
HOUSTON, TEXAS

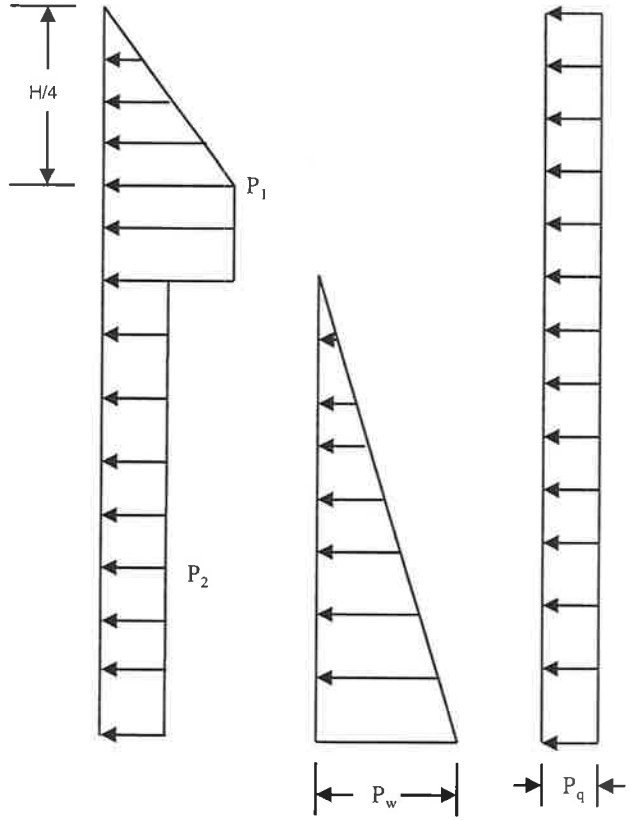


TYPICAL SOIL PARAMETERS
COHESIVE SOILS

γ_t = 125-130 pcf
c' = 200 psf
ϕ' = 18° – 22°
γ_w = 62.4 pcf
γ_t = TOTAL UNIT WEIGHT

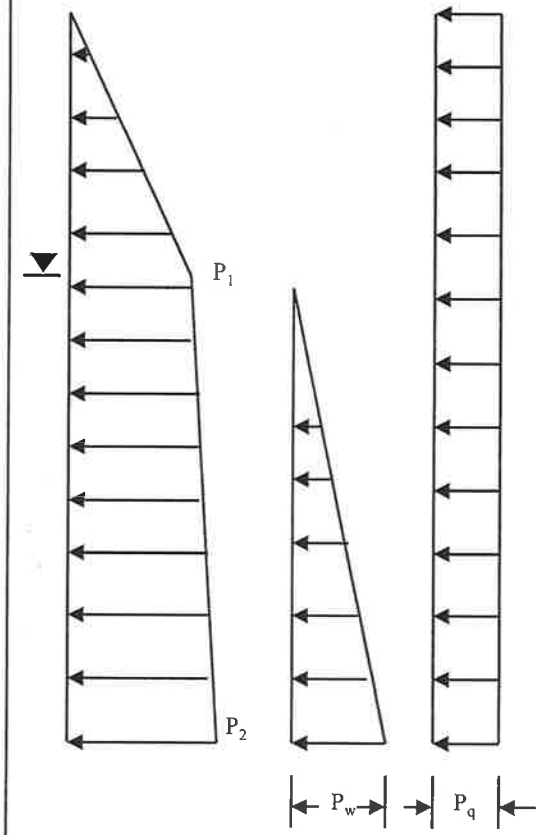
COHESIONLESS SOILS

γ_t = 125 pcf
ϕ' = 30°
γ_w = 62.4 pcf



BRACED WALL

$P_1 = 0.4\ \gamma_t H$
$P_2 = 0.65\ (\gamma_t - \gamma_w) K_a H$
$P_w = \gamma_w (H-h)$
$P_q = 0.5q$
$K_a = \tan^2(45° - \phi'/2)$



PERMANENT WALL

$P_1 = \gamma_t h\ K_0$
$P_2 = P_1 + (\gamma_t - 62.4)\ (H-h)\ K_0$
$K_o = 1 - \sin \phi'$
$P_q = 0.5q$

Riley Street Sta. 1+00 to Sta. 8+00 Storm Sewer Replacement City of West University Place, Texas City of Southside Place, Texas	Tolunay-Wong Engineers, Inc. Houston, Texas	Project No.: 07.13.242
Claunch & Miller, Inc. Houston, Texas	Lateral Earth Pressure Diagrams Layered Soils (Cohesive/Cohesionless)	FIGURE 3

APPENDIX A
LOGS OF BORINGS

LOG OF BORING B-1

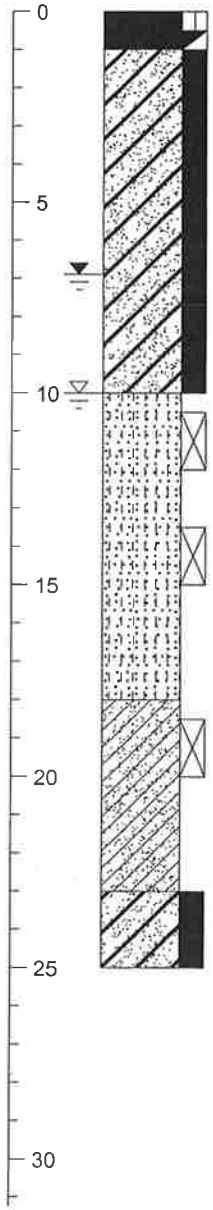
Project: Riley Street Station 1+00 to 8+00 Storm Sewer Replacement
City of West University Place & City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.13.242
Date: 10-29-07
Elevation:

Dry Augered: 0 to 10 ft
Washed Bored: 10 to 25 ft

Free Water During Drilling at: 10 ft
Water at: 6.9 ft after 15 minutes

Caving at: 10.3



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
0			6" Concrete & 6" stabilized sand							
		1.50	Stiff gray FAT CLAY w/ SAND (CH)	22	102					
		2.00	w/ ferrous & calcareous nodules	25				61	41	84
		1.75		28	95	1.19	6			
5		1.50		31						
		1.00	-firm, w/ sand seams @ 8'-10'							72
10		2/6" 2/6" 3/6"	Brown & gray POORLY GRADED SAND w/ SILT (SP-SM) w/ ferrous nodules -tan & gray below 10.5' -very loose @ 10.5'-12'	25						
		1/6" 3/6" 6/6"	-loose @ 13.5'-15'							10
15										
		3/6" 6/6" 8/6"	Tan & gray LEAN CLAY w/ SAND (CL) -stiff, w/ ferrous & calcareous nodules @ 18.5'-20'	16						
20										
		4.00	Very stiff light gray & tan FAT CLAY w/ SAND (CH) w/ calcareous nodules	18	111					
25			Boring terminated @ 25 ft							
30										

Note(s): (1) The boring was backfilled with grout.

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-2

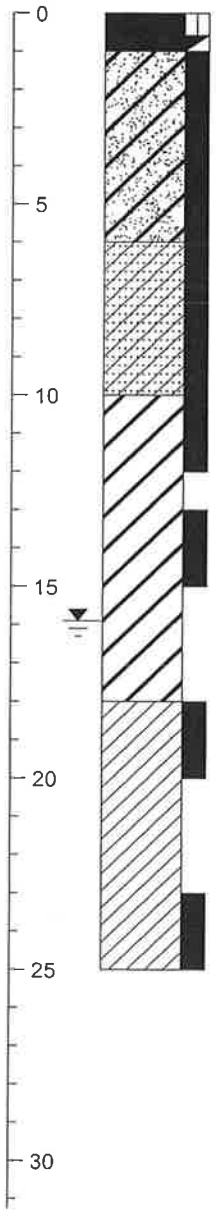
Project: Riley Street Station 1+00 to 8+00 Storm Sewer Replacement
City of West University Place & City of Southside Place, Texas
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.13.242
Date: 10-29-07
Elevation:

Dry Augered: 0 **to** 25 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at: 15.9 ft after 42 minutes

Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	Wc (%)	Dens. (pcf)	Qu or UU (tsf)	Str. (%)	LL	PI	Pass #200 (%)
			7" Concrete & 5" stabilized sand							
		1.50	Stiff gray & tan FAT CLAY w/ SAND (CH)	28				64	45	
		1.50	w/ ferrous & calcareous nodules -w/ sand seams @ 2'-6'	26	98	1.31	14			
		2.00		27						
		2.50	Stiff gray & tan SANDY LEAN CLAY (CL) w/ ferrous & calcareous nodules	22						
		2.25	w/ sand seams @ 8'-10'	24				35	13	59
		3.50	Very stiff brown & light gray FAT CLAY (CH) w/ calcareous nodules	26	100					
		2.75	-stiff @ 13'-15' -slickensided @ 13'-15'	29	94	1.74	5 *			
		1.25	Firm gray & brown LEAN CLAY (CL) w/ ferrous and calcareous nodules	22				44	28	86
		4.50	-very stiff-hard, gray & tan @ 23'-25'	17						
			Boring terminated @ 25 ft							

Note(s): (1) The boring was backfilled with grout.

TOLUNAY-WONG ENGINEERS, INC.

SYMBOLS AND TERMS USED ON BORING LOGS

Most Common Unified Soil Classifications System Symbols

- Fill
- Pavement
- Lean Clay (CL)
- Lean Clay w/ Sand (CL)
- Sandy Lean Clay (CL)
- Fat Clay (CH)
- Fat Clay w/ Sand (CH)
- Sandy Fat Clay (CH)
- Silty Clay (CL)
- Sandy Silty Clay (CL-ML)
- Silty Clayey Sand (SC-SM)
- Clayey Sand (SC)
- Sandy Silt (ML)
- Silty Sand (SM)
- Silt w/ Sand (ML)
- Well Graded Sand (SW)
- Well Graded Sand w/ Gravel (SW-GM)
- Poorly Graded Sand (SP)
- Poorly Graded Sand w/ Silt (SP-SM)
- Silt (ML)
- Elastic Silt (MH)
- Elastic Silt w/ Sand (MH-SP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Gravel (GW)
- Well Graded Gravel w/ Sand (SP-GM)
- Poorly Graded Gravel (GP)
- Peat

Sampler Symbols	Meaning
	Pavement core
	Thin - walled tube sample
	Standard Penetration Test (SPT)
	Auger sample
	Sampling attempt with no recovery
	TxDOT Cone Penetrometer Test

Field Test Data

2.50	Pocket penetrometer reading in tons per square foot
8/6"	Blow count per 6 - in. interval of the Standard Penetration Test
	Observed free water during drilling
	Observed static water level

Laboratory Test Data

Wc (%)	Moisture content in percent
Dens. (pcf)	Dry unit weight in pounds per cubic foot
Qu (tsf)	Unconfined compressive strength in tons per square foot
UU (tsf)	Compressive strength under confining pressure in tons per square foot
Str. (%)	Strain at failure in percent
LL	Liquid Limit in percent
PI	Plasticity Index
#200 (%)	Percent passing the No. 200 mesh sieve
( )	Confining pressure in pounds per square inch
*	Slickensided failure
**	Did not fail @ 15% strain

RELATIVE DENSITY OF COHESIONLESS & SEMI-COHESIONLESS SOILS

The following descriptive terms for relative density apply to cohesionless soils such as gravels, silty sands, and sands as well as semi-cohesive and semi-cohesionless soils such as sandy silts, and clayey sands.

Relative Density	Typical N_{60} Value Range*
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

* N_{60} is the number of blows from a 140-lb weight having a free fall of 30-in. required to penetrate the final 12-in. of an 18-in. sample interval, corrected for field procedure to an average energy ratio of 60% (Terzaghi, Peck, and Mesri, 1996).

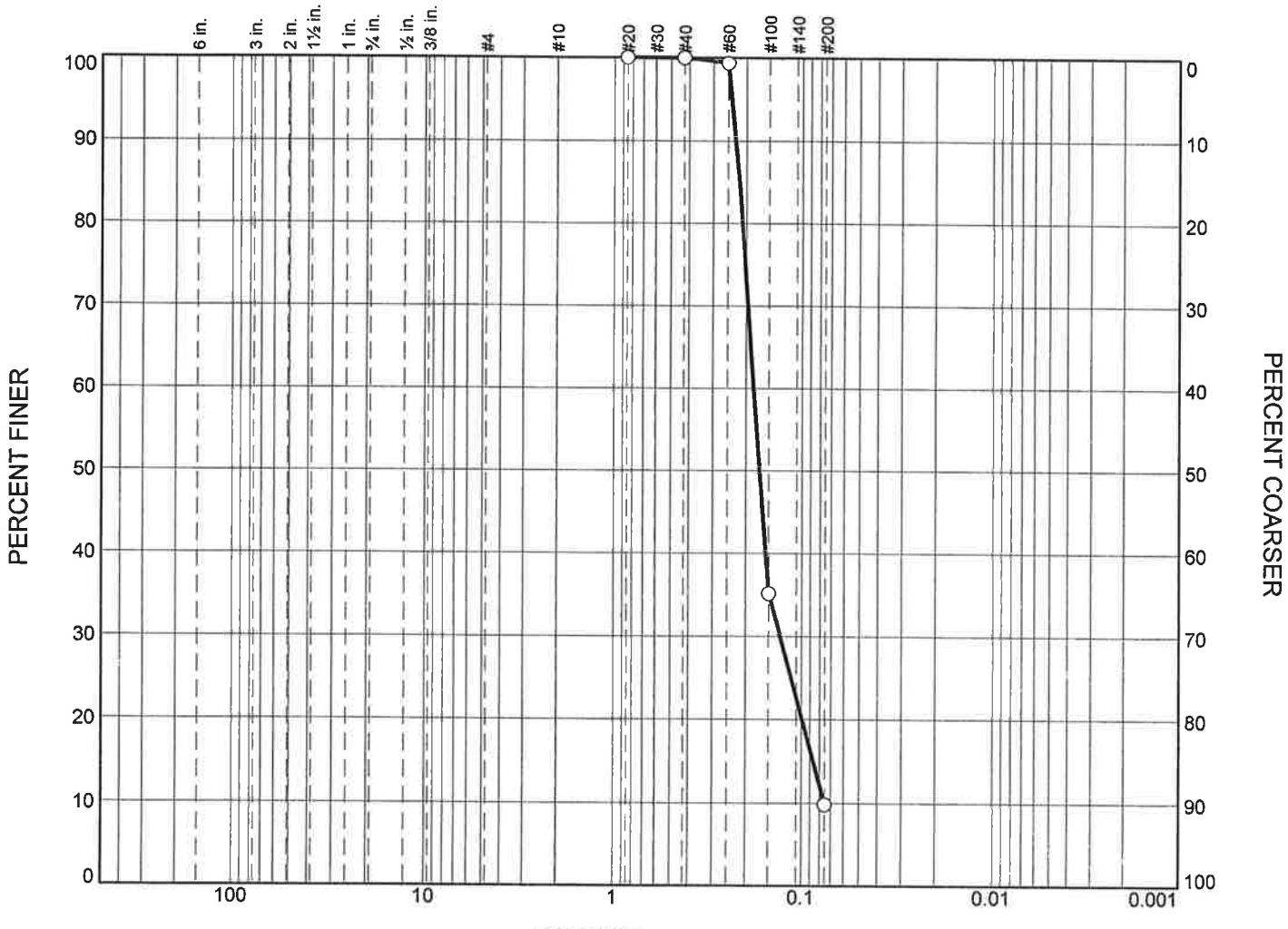
CONSISTENCY OF COHESIVE SOILS

The following descriptive terms for consistency apply to cohesive soils such as clays, sandy clays, and silty clays.

Pocket Penetrometer (tsf)	Typical Compressive Strength (tsf)	Consistency	Typical SPT "N_{60}" Value Range**
$pp < 0.50$	$qu < 0.25$	Very soft	≤ 2
$0.50 \leq pp < 0.75$	$0.25 \leq qu < 0.50$	Soft	3-4
$0.75 \leq pp < 1.50$	$0.50 \leq qu < 1.00$	Firm	5-8
$1.50 \leq pp < 3.00$	$1.00 \leq qu < 2.00$	Stiff	9-15
$3.00 \leq pp < 4.50$	$2.00 \leq qu < 4.00$	Very Stiff	16-30
$pp \geq 4.50$	$qu \geq 4.00$	Hard	≥ 31

** An "N_{60}" value of 31 or greater corresponds to a hard consistency. The correlation of consistency with a typical SPT "N_{60}" value range is approximate.

Particle Size Analysis - ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	90.2	9.8	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1		13.5-15	Brown and gray Poorly graded SAND with SILT	SP-SM

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Houston, Texas

Client: Claunch & Miller, Inc.

Project: Riley Street Station 1+00 to 8+00 Storm Sewer Replacement
City of West University Place & City of Southside Place, Texas

Project No.: 07.13.242

January 3, 2008

Job No. 06-084&85
College Ave. and Bellaire Blvd. Paving, Drainage and Utility Improvements
Private Interest Contact List

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(832) 265-7470

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TRANSMITTAL

DATE: February 20, 2008	JOB NO.: 06-084 & 06-085
TO: Total Contracting, LTD.	
ADDRESS: Hand Delivered	
Attn.: Mr. Luke Morganti	
Re: City of West University Place and City of Southside Place College Ave. and Bellaire Blvd. Paving, Drainage and Utility Improvements	

WE ARE SENDING YOU ☐ Attached ☐ Under Separate Cover Via _____ the following items:

NO. COPIES	DESCRIPTION
2	Blackline prints of sheets revised due to City of Houston comments.
	(Sheets 2,4,16,18-32,36,38,42,56,70,84,89,90,91,97,98,110&111)

REMARKS:

Thanks,

BY: DF

David F. Jorgensen

If enclosures are not as noted, kindly notify us at once

119-49 #1
Special

Riley Street Cont'd

3803 Riley	12" Forked Tallow
3803 Riley	8" Tallow
3803 Riley	8" Oak
3803 Riley	4" Mimosa

Southwestern Street Cont'd

4011 Southwestern	3" Oak
6532 Weslayan	24" Sycamore
6002 Weslayan	36" Sycamore
3936 Southestern	10" Magnolia
3930 Southwestern	12" Ash
3930 Southwestern	8" Mimosa
3930 Southwestern	8" Crepe Myrtle
3928 Southwestern	6" Oak
3924 Southwestern	14" Tallow
3925 Southwestern	6" (dead) Mimosa
3921 Southwestern	2" Oak
3921 Southwestern	2" Maple
3918 Southwestern	24" Tallow
3919 Southwestern	12" Tallow
3919 Southwestern	3" Magnolia
3919 Southwestern	14" Tallow
3915 Southwestern	12" Tallow
3915 Southwestern	18" Tallow
3910 Southwestern	20" (dead) Oak
3910 Southwestern	30" Tallow
3911 Southwestern	14" Whesach
3908 Southwestern	8" Sweetgum
3834 Southwestern	12" Tallow
3834 Southwestern	12" Pecan
3831 Southwestern	9" Pine
3831 Southwestern	12" Pine
3831 Southwestern	10" Pine
3826 Southwestern	16" Pecan
3826 Southwestern	12" Pecan
3821 Southwestern	14" Sycamore
3822 Southwestern	12" Oak
3818 Southwestern	24" Elm
3817 Southwestern	Crepe Myrtle
3817 Southwestern	12" Magnolia
3813 Southwestern	2, 4" Oak
3809 Southwestern	24" Tree
3808 Southwestern	12" Sycamore
3808 Southwestern	2, 12" Oak
3805 Southwestern	12" Tree
3805 Southwestern	30" Oak
3805 Southwestern	18" Tree
East end of Southwestern	3, Hackberry
East end of Southwestern	42" Hackberry

Villanova Street Cont'd

3819 Villanova	2, Crepe Myrtle
3824 Villanova	26" Oak
3818 Villanova	14" Elm
3818 Villanova	30" Elm
3814 Villanova	Landscaped Area
3813 Villanova	18" Tallow
3809 Villanova	18" Oak
3809 Villanova	12" Tallow
3812 Villanova	14" Tallow
3808 Villanova	28" Tallow
3805 Villanova	4" Elm
3805 Villanova	10" Holly
3805 Villanova	12" Tallow
East end of Villanova	3, Trees

Marquette Street

4037 Marquette	2, Crepe Myrtle
4038 Marquette	Crepe Myrtle
4038 Marquette	10" Crepe Myrtle
4034 Marquette	30" Sycamore
4029 Marquette	20" Sycamore
4030 Marquette	30" Oak
4030 Marquette	20" Sycamore
4025 Marquette	2, Oak Seedlings
4025 Marquette	Crepe Myrtle
4024 Marquette	10" Tree
4025 Marquette	30" Oak
4024 Marquette	10" Tree
4017 Marquette	2, Sago Palm
4018 Marquette	36" Sycamore
4014 Marquette	24" Elm
4015 Marquette	12" Crepe Myrtle
4015 Marquette	14" Crepe Myrtle
4002 Marquette	12" Magnolia
4002 Marquette	10" Magnolia
4002 Marquette	16" Magnolia
3932 Marquette	8" Tallow
3932 Marquette	14" Tallow
3933 Marquette	14" Sycamore
3929 Marquette	14" Crepe Myrtle
3930 Marquette	3, Crepe Myrtle
3928 Marquette	24" Ash
3925 Marquette	Crepe Myrtle

Oberlin Street Cont'd

4001 Oberlin	36" Oak
4001 Oberlin	30" Oak
4001 Oberlin	30" Oak
4004 Oberlin	14" Ash
4004 Oberlin	Crepe Myrtle
3936 Oberlin	20" Oak
3933 Oberlin	14" Magnolia
3929 Oberlin	14" Tallow
3929 Oberlin	14" Oak
3932 Oberlin	2, Crepe Myrtle
3932 Oberlin	Landscaped Area
3926 Oberlin	2, Crepe Myrtle
3927 Oberlin	Crepe Myrtle
3921 Oberlin	14" Crepe Myrtle
3919 Oberlin	Crepe Myrtle
3915 Oberlin	40" Oak
3916 Oberlin	18" Crepe Myrtle
3901 Oberlin	2, 6" Crepe Myrtle
3901 Oberlin	8" Crepe Myrtle
3901 Oberlin	12" Crepe Myrtle
3836 Oberlin	18" Sycamore
3833 Oberlin	18" Sycamore
3833 Oberlin	14" Oak
3829 Oberlin	24" Tallow
3829 Oberlin	Landscaped Area
3825 Oberlin	Landscaped Area
3826 Oberlin	Crepe Myrtle
3824 Oberlin	2, Crepe Myrtle
3815 Oberlin	18" Ash
3815 Oberlin	40" Ash
3816 Oberlin	24" Oak
3811 Oberlin	12" Tallow
3808 Oberlin	2, 3" Crepe Myrtle
3807 Oberlin	3" Oak
3801 Oberlin	6" Pine
3801 Oberlin	Crepe Myrtle
3804 Oberlin	Bush
East end of Oberlin	5, Trees

Villanova Street

4040 Villanova	20" Sycamore
4040 Villanova	30" Tallow
4040 Villanova	14" Tallow

Weslayan Street Cont'd

4001 Byron	12" Magnolia
4001 Byron	8" Red Bud
3936 Byron	14" Pecan
4002 Byron	Crepe Myrtle with Landscaping
4001 Case	12" Elm
4001 Case	24" Elm
4001 Case	18" Oak
3933 Case	14" Magnolia
4002 Case	6" Pecan
4002 Case	10" Pecan
4002 Case	8" Pecan
4002 Case	12" Pecan
4001 Swathmore	5, Crepe Myrtle
4004 Swathmore	10" Magnolia
3936 Swathmore	3, 14" Tallow
3936 Swathmore	2, 12" Tallow
3936 Swathmore	24" Tallow
3936 Swathmore	30" Tree
4001 University Blvd.	15" Elm
4001 University Blvd.	8" Magnolia
4001 University Blvd.	14" Elm
3933 University Blvd.	18" Tallow
3933 University Blvd.	12" Tallow
3933 University Blvd.	2, 14" Tallow

Byron Street

4040 Byron	2, 2" Oak
4034 Byron	18" Oak
4039 Byron	2, 10" Magnolia
4034 Byron	12" Hackberry
4032 Byron	Crepe Myrtle
4032 Byron	18" Oak
4031 Byron	40" Cypress
4018 Byron	Landscaped Area
4010 Byron	8" Magnolia
3936 Byron	10' Pecan
3935 Byron	3, Seedlings
3932 Byron	10" Crepe Myrtle
3932 Byron	15" Crepe Myrtle
3932 Byron	20" Crepe Myrtle
3932 Byron	20" Magnolia
3928 Byron	2, Crepe Myrtle
3919 Byron	6" Crepe Myrtle

Ruskin Street Cont'd

3907 Ruskin	3, Crepe Myrtle
3908 Ruskin	12" Pecan
3908 Ruskin	24" Magnolia
3904 Ruskin	36" Chinese Puzzle
3904 Ruskin	10" Tallow
3904 Ruskin	14" Tallow
3827 Ruskin	Crepe Myrtle
3828 Ruskin	6" Cherry Laurel
3824 Ruskin	2, 6" Magnolia
3823 Ruskin	18" Tallow
3823 Ruskin	16" Tallow
3816 Ruskin	2, Crepe Myrtle
3812 Ruskin	14" Oak
3807 Ruskin	14" Tallow
3808 Ruskin	20" Oak
3804 Ruskin	20" Ash

East College Street

3819 Ruskin	6" Bush
3819 Ruskin	3" Oak
3819 Ruskin	Alphia Bush
3811 Ruskin	2, 12" Tallow
3811 Ruskin	10" Tallow
3811 Ruskin	12" Oak
6704 East College	36" Oak
6703 East College	24" Ash
6707 East College	16" Tallow
6707 East College	12" Tallow
6708 East College	36" Elder
6708 East College	16" Tallow
6711 East College	26" Sycamore
6712 East College	14" Tallow
6712 East College	20" Tallow

West College Street

3903 Ruskin	2, Crepe Myrtle
3903 Ruskin	18" Ash
3831 Ruskin	Crepe Myrtle
6704 West College	6" Magnolia
6708 West College	20" Magnolia
6711 West College	36" Ash

119-49 #1
Special

College Street Cont'd

3901 Southwestern	4, Crepe Myrtle
3901 Southwestern	4" Ash
3901 Southwestern	36" Sycamore
3902 Southwestern	18" Sycamore
3902 Southwestern	8" Crepe Myrtle
3902 Southwestern	40" Sycamore
3834 Southwestern	14" Tallow
3834 College	8" Tallow
3834 College	14" Tallow
3901 Marquette	36" Hackberry
3901 Marquette	Bush
3901 Marquette	3, Tree
3835 Marquette	16" Tallow
3825 Marquette	12" Pine
3836 Marquette	10" Tallow
3836 Marquette	14" Tallow
3836 Marquette	10" Mimosa
3901 Vi/llanova	3, Crepe Myrtle
3839 Villanova	6" Red Bud
3839 Villanova	14" Tree
3902 Villanova	12" Tallow
3902 Villanova	12" Tallow
3902 Villanova	14" Tallow
3836 Villanova	36" Oak
3836 Villanova	2, 4" Oak
3833 Oberlin	20" Ash
3833 Oberlin	36" Pecan
3833 Oberlin	10" Oak
3833 Oberlin	20" Sycamore
3901 Oberlin	24" Sycamore
3836 Oberlin	18" Sycamore
3839 Byron	36" Sycamore
3902 Byron	12" Pine
3902 Byron	2, Crepe Myrtle
3902 Byron	2, 8" Elm
3902 Byron	4" Cherry
3840 Byron	12" Tallow
3840 Byron	8" Maple
3840 Byron	10" Oak
3840 Byron	12" Hackberry
3840 Byron	8" Sycamore
3901 Case	40" Oak
3901 Case	20" Cherry

Swathmore Street Cont'd

3902 Swathmore	30" Oak
3836 Swathmore	14" Cedar
3837 Swathmore	Landscaped Area
3932 Swathmore	10" Sycamore
3926 Swathmore	24" Ash
3831 Swathmore	38" Oak
3822 Swathmore	3, 12" Sycamore
3822 Swathmore	16" Sycamore
3823 Swathmore	3" Oak
3823 Swathmore	4" Oak
3822 Swathmore	6" Oak
3819 Swathmore	Crepe Myrtle
3820 Swathmore	6" Oak
3820 Swathmore	Oleander
3815 Swathmore	30" Elm
3805 Swathmore	28" Elm
3805 Swathmore	2, Legustrom
3805 Swathmore	6" Willow
3805 Swathmore	4" Willow
3806 Swathmore	8" Elm
East End of Swathmore	24" Hackberry

Case Street

4039 Case	12" Tallow
4029 Case	24" Oak
4030 Case	36" Tallow
4028 Case	14" Tallow
4021 Case	18" Oak
4020 Case	44" Oak
4017 Case	3, Bush
4010 Case	2, 10" Oak
4009 Case	15" Hackberry
4002 Case	4" Crepe Myrtle
4002 Case	6" Crepe Myrtle
4002 Case	12" Pecan
4001 Case	12" Tallow
4001 Case	20" Tallow
3933 Case	10" Holly
3936 Case	10" Tallow
3936 Case	18" Tallow
3936 Case	20" Tallow
3930 Case	12" Tallow
3930 Case	18" Tallow

06-085 Phase 1 ESA

Prepared for:
Claunch & Miller, Inc.
4635 Southwest Freeway, Suite 1000
Houston, Texas 77027

PHASE I ENVIRONMENTAL SITE ASSESSMENT OF COLLEGE AVENUE PROJECT FROM UNIVERSITY BOULEVARD TO BELLAIRE BOULEVARD CITY OF WEST UNIVERSITY HARRIS COUNTY, TEXAS

TWEI Project Number 06.12.055

September 2006

Prepared by:

Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Parkway West, Suite 100
Houston, Texas, 77031
(713) 722-7064 Fax (713) 722-0319

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SUMMARY

Tolunay-Wong Engineers, Inc., (TWEI) was requested by Claunch & Miller, Inc. to conduct a Phase I Environmental Site Assessment (Phase I ESA) for the College Avenue Project, City of West University, Harris County, Texas.

The purpose of the Phase I ESA was to document environmental conditions of the Project Alignment and adjacent properties. This was done by identifying, to the extent feasible, pursuant to the process described in the *American Society for Testing and Materials (ASTM) Standard Practice for ESA's (ASTM E-1527-05*), recognized environmental conditions (RECs) at the Project Alignment. Several facilities were identified as recognized environmental conditions (RECs), as defined by the ASTM standard for Phase I ESAs:

- The first REC identified in the database report is the ExxonMobil Corporation facility located at 3924 Bellaire Boulevard. The ExxonMobil facility is listed as a PST, RCRA, and LPST facility. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials and no violations are reported. It was reported that groundwater was impacted due to the LPST. Final concurrence has been issued and the case has been closed. Closure was approved in January of 1999.

- The second REC identified in the database report is the West U Cleaners facility located at 3920 Bellaire Boulevard. The West U Cleaners facility is a RCRA facility. The facility currently provides on-site dry cleaning services. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials.

- The third REC identified in the database report is the Pilgrim Cleaners, Inc. facility located at 6723 and 6725 Stella Link. The Pilgrim Cleaners facility is a RCRA facility and a Voluntary Cleanup Program (VCP) participant. According to the database report soil and groundwater have been impacted by perchloroethylene. The facility is also the location of a PST, which was permanently filled in place in 1976. Currently there is no dry cleaning plant at the location. Certification for closure was issued in February of 2003.

- The fourth facility listed is the Southside Village Shopping Center located at 4000 Bellaire Boulevard. The Southside Village Shopping Center facility is reported as a LPST facility with impacted groundwater. Off-site migration is unlikely and final concurrence has been issued and the case has been closed. Closure was approved in July of 1992.

- The fifth facility listed is the Sigmor Shamrock 913 facility located at 3949 Bellaire Boulevard. The Sigmor Shamrock 913 facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and final concurrence has been issued and the case has been closed. Closure was approved in June of 1992.

- The sixth facility listed is the Pressley's Chevron facility located at 4061 Bellaire Boulevard. The Chevron facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and monitoring is ongoing.

- The seventh facility listed is the Mohawk Company facility located at 4068 Bellaire Boulevard. The Mohawk Company facility is reported as a PST facility.

- The eighth facility listed is the City of West University Place Fleet Refueling facility located at 3826 Amherst. The fleet refueling facility is reported as a PST and LPST facility.

The following additional listings for the Bellaire Avenue portion of the Project Alignment, which indicate RECs, were identified from a database search of Standard Environmental Record Sources in our company files for the area:

- The first additional facility listed is the Shell E&P Technology Company located at 3737 Bellaire Boulevard. The Shell E&P Technology Company is a RCRA facility and PST facility. The facility is reported a being a small quantity generator with two violations listed. The violations occurred in 1988 and the enforcements were written informal.

- The second additional facility listed is the Circle K 2141 facility located at 3634 Bellaire Boulevard, The Circle K facility is reported as a LPST facility and PST facility with minor soil contamination reported that does not require a remedial action plan. Final concurrence has been issued and the case is listed as closed as of December of 1992.

- The third additional facility listed is the Quaker State Minit Lube 1176 facility located at 3435 West Holcombe. The Quaker State facility is reported as a PST facility. The facility is also reported a being a small quantity generator with no violations listed.

- The fourth additional facility listed is a Municipal Solid Waste Landfill (MSWLF) facility located 500 ft south of Bellaire Boulevard at Edloe Street. Review of the Houston-Galveston Area Closed Landfill Inventory website revealed that the facility served as a Type V transfer station. The Southside Place transfer station was in operation from 1970 to 1990.

In addition to the aforementioned REC locations listed in regulatory database reports, there were three locations identified during reconnaissance activities and records review that are considered RECs because of their proximity to the Project Alignment:

- River Oaks Cleaners, located at 3907 Bellaire Boulevard, provides on-site dry cleaning services. They use a service to remove hazardous chemical waste and personnel were aware of no violations.

- We observed a Centerpoint Energy natural gas regulator station northeast of the intersection of Bellaire Boulevard and Poor Farm Ditch. We normally do not consider natural gas pipelines to be RECs. However, we consider the regulator station a REC because of the potential for the presence of condensate that could contain harmful substances, such as benzene.

- A dry cleaner, located in a shopping center located at Weslayan Avenue and Bellaire Boulevard, is identified on the 1950 Sanborn Map. It is no longer in operation. However, the dry cleaner's existence on the map indicates that it may have provided dry cleaning services on site in the past; therefore this location is considered a REC.

There are several RECs that could impact the subsurface of the Alignment and thereby the construction of the proposed drainage improvements and pavement reconstruction. Therefore, it is our opinion that a Phase II ESA boring program is warranted to evaluate possible subsurface contamination.

1 INTRODUCTION

Tolunay-Wong Engineers, Inc., (TWEI) was requested by Claunch & Miller, Inc. to conduct a Phase I Environmental Site Assessment (Phase I ESA) for the College Avenue Project, City of West University, Harris County, Texas.

1.1 PURPOSE

The purpose of the Phase I ESA was to document environmental conditions of the Project Alignment and adjacent properties. This was done by identifying, to the extent feasible, pursuant to the process described in the *American Society for Testing and Materials (ASTM) Standard Practice for ESA's (ASTM E-1527-05*), recognized environmental conditions (RECs) at the Project Alignment. "Recognized environmental conditions" include:

> "the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water on the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be de minimis are not recognized environmental conditions." (ASTM-E-1527, 2005).

1.2 DETAILED SCOPE-OF-SERVICES FOR THE PHASE I ESA

The work for this report was conducted in accordance with TWEI Proposal No. P06-E062 dated June 28, 2006, as authorized by Mr. Todd Calvin, P. E., of Claunch & Miller, Inc. on August 8, 2006. Work was executed in general accordance with the guidelines in *ASTM-E-1527-05*.

The scope of services for this project included:

- A historical review of prior owners of the Project Alignment. A review of records available from past and current landowners and interviews with pertinent individuals was included in the process.

- A historical review of land use, including review of aerial photographs, soil conservation maps, or other available historical data.

- Contacting Federal, State and Local regulatory agencies to identify records that could indicate negative environmental impacts at the Project Alignment. Agencies that were contacted included the City of West University Fire Department and the Texas Railroad Commission.

- Reviewing surrounding properties to determine if their land usage or business practices could have contributed to a negative environmental impact to the Project Alignment.

- Evaluating surrounding areas for sensitive environmental receptors, i.e., drinking water wells, aquifers, schools, etc.

- Conducting a site reconnaissance to evaluate topography and visibly observe conditions at the Project Alignment that may have suggested environmental impairment; drums with unknown contents, underground storage tanks, waste dump areas, stained areas, stressed vegetation, etc.

- Preparing this report stating the findings of the Phase I ESA. Included in this report are conclusions and recommendations as to the evidence of, or the potential for RECs at the Project Alignment at the time of the investigation.

2 PROJECT ALIGNMENT DESCRIPTION

2.1 LOCATION AND PROJECT ALIGNMENT DESCRIPTION

The College Avenue Project Alignment is located in Harris County Key Map, page 532, block E. The Alignment, which runs generally north to south for approximately 4000 ft, begins at University Boulevard and travels south to Riley Street, continues west on Riley Street until Weslayan Avenue, and then continues south on Weslayan Avenue until Bellaire Boulevard. The Project includes drainage improvements and pavement reconstruction to these sections of road. At Bellaire Boulevard the Project consists of a 78-inch storm sewer that runs from Bellaire Boulevard east and terminates at the Poor Farm Ditch. The maximum depth of the proposed storm sewer is 13-14 ft. Along the Project Alignment, road stub-outs will be provided to allow for the future tie-in of eight 'dead-end streets' in West University Place. See Figure 1 – Project Alignment Map.

2.2 PROJECT ALIGNMENT AND VICINITY GENERAL CHARACTERISTICS

2.2.1 Topography

The *US Geologic Survey 7.5 Minute Topographic Bellaire, TX 1995 Quadrangle Map* was used to evaluate the Project Alignment. According to the topographic map, the general topography of the area is slight with an elevation of about 55 ft mean sea level (MSL). Drainage appears to be to the south through Poor Farm Ditch, which connects to Brays Bayou. See Figure 2 - Topographic Map.

2.3 CURRENT USE OF THE PROJECT ALIGNMENT

The portions of the Project Alignment along College Avenue, Riley Street, and Weslayan Avenue are currently two-lane public roadways and associated utility easements. The Bellaire Avenue portion of the Project Alignment is currently a six-lane boulevard section and associated utility easements.

2.4 DESCRIPTIONS OF STRUCTURES, ROADS, AND OTHER IMPROVEMENTS ON THE PROJECT ALIGNMENT

The Project Alignment is currently a two-lane public roadway or six-lane boulevard section with municipal easements associated with water, sewer, natural gas, and electricity delivery.

2.5 CURRENT USES OF THE ADJOINING PROPERTIES

Adjoining properties and the surrounding area are primarily residential with commercial development along Bellaire Boulevard.

3 USER PROVIDED INFORMATION

3.1 TITLE RECORDS

Chain-of-Title searches were not included as part of the scope-of-work for this Phase I ESA.

3.2 ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

No environmental liens were recorded in any of the documentation reviewed as part of this Phase I ESA.

3.3 OWNER, PROPERTY MANAGER, AND OCCUPANT INFORMATION

Owner, property manager, and occupant information is not applicable for this Phase I ESA because the Project is a City roadway.

3.4 REASON FOR PERFORMING THE PHASE I ESA

This Phase I ESA was conducted as part of the due diligence process prior to beginning construction activities for the College Avenue Project.

4 RECORDS REVIEW

Atlas Environmental Research, Inc., was contracted to perform a regulatory records search. Environmental databases were searched within a radius as defined by *ASTM E-1527-05*. The *Atlas Regulatory Data Report* is presented in Appendix A. The Report Summary section of the database report defines the search criteria of the regulatory database review. The objective of the records review is to obtain and review records that will help identify recognized environmental conditions in connection with the Project Alignment.

4.1 STANDARD ENVIRONMENTAL RECORD SOURCES

The following listings, which indicate RECs, were identified from the database search of Standard Environmental Record Sources for the College Avenue, Riley Street, and Weslayan Avenue portions of the Project Alignment:

- The first REC identified in the database report is the ExxonMobil Corporation facility located at 3924 Bellaire Boulevard which is listed as being approximately 160 ft south of the Project Alignment. Reconnaissance activities revealed that the southern portion of the Alignment is approximately 200 ft west of this facility. The ExxonMobil facility is a Resource Conservation and Recovery Act (RCRA) facility and a leaking petroleum storage tank (LPST) facility. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials. No violations are reported. The Exxon facility is also reported as a petroleum storage tank (PST) facility with impacted groundwater. Final concurrence has been issued and the case has been closed. Closure was approved in January of 1999.

- The second REC identified in the database report is the West U Cleaners facility located at 3920 Bellaire Boulevard and is listed as being approximately 270 ft south of the Project Alignment. Reconnaissance activities revealed that the southern portion of the Alignment is less than 300 ft of from this facility and we confirmed that they do provide dry cleaning services on site. The West U Cleaners facility is a RCRA facility. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials. No violations are reported.

- The third REC identified in the database report is the Pilgrim Cleaners, Inc. facility located at 6723 and 6725 Stella Link and is listed as being approximately 270 ft south of the Project Alignment. Reconnaissance activities revealed that the southern portion of the Alignment is approximately 200 ft west of this facility. The Pilgrim Cleaners facility is a RCRA facility and a Voluntary Cleanup Program (VCP) participant. According to the database report soil and groundwater have been impacted by perchloroethylene. The facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials. The facility is also the location of a PST. The 2,000-gallon, steel, gasoline storage tank was permanently filled in place in 1976. Certification for closure was issued in February of 2003.

- The fourth facility listed is the Southside Village Shopping Center located at 4000 Bellaire Boulevard and is approximately 60 ft south of the Project Alignment. The Southside Village Shopping Center facility is reported as a LPST facility with impacted groundwater. Off-site migration is unlikely and final concurrence has been issued and the case has been closed. Closure was approved in July of 1992.

- The fifth facility listed is the Sigmor Shamrock 913 facility located at 3949 Bellaire Boulevard and is approximately 320 ft south of the Project Alignment. The Sigmor Shamrock 913 facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and final concurrence has been issued and the case has been closed. Closure was approved in June of 1992.

- The sixth facility listed is the Pressley's Chevron facility located at 4061 Bellaire Boulevard and is approximately 60 ft southwest of the Project Alignment. The Chevron facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and monitoring is ongoing.

- The seventh facility listed is the Mohawk Company facility located at 4068 Bellaire Boulevard and is approximately 475 ft southwest of the Project Alignment. The Mohawk Company facility is reported as a PST facility.

- The eighth facility listed is the City of West University Place Fleet Refueling facility located at 3826 Amherst and is approximately 475 ft north of the Project Alignment. The fleet refueling facility is reported as a PST and LPST facility.

The following additional listings for the Bellaire Avenue portion of the Project Alignment, which indicate RECs, were identified from a database search of Standard Environmental Record Sources in our company files for the area:

- The first additional facility listed is the Shell E&P Technology Company located at 3737 Bellaire Boulevard and is a south adjoining property of Project Alignment. The Shell E&P Technology Company is a RCRA facility and PST facility. The facility is reported a being a small quantity generator with two violations listed. The violations occurred in 1988 and the enforcements were written informal.

- The second additional facility listed is the Circle K 2141 facility located at 3634 Bellaire Boulevard and is situated along the Project Alignment. The Circle K facility is reported as a LPST facility and PST facility with minor soil contamination reported that does not require a remedial action plan. Final concurrence has been issued and the case has been closed. Final concurrence has been issued and the case is listed as closed as of December of 1992.

- The third additional facility listed is the Quaker State Minit Lube 1176 facility located at 3435 West Holcombe and is situated approximately 500 ft east of the Project Alignment. The Quaker State facility is reported as a PST facility. The facility is also reported a being a small quantity generator with no violations listed.

- The fourth additional facility listed is a Municipal Solid Waste Landfill (MSWLF) facility located 500 ft south of Bellaire Boulevard at Edloe Street. It is listed as a grandfather site, one in operation before 1974, and served the City of Southside Place. Review of the Houston-Galveston Area Closed Landfill Inventory website (http://www.hgac-cli.com) revealed that the facility served as a Type V transfer station. A transfer station is a facility where waste is collected and then transferred to a disposal site. The Southside Place transfer station was in operation from 1970 to 1990.

4.2 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

4.2.1 Railroad Commission Pipeline Map

Review of the Texas Railroad Commission (RRC) Pipeline map for the Bellaire topographic sheet indicates that there are no pipeline easements are near the Project Alignment. A Genesis Pipeline Texas, LP crude oil pipeline intersects Bellaire Boulevard in two places approximately 2000 ft west of the Project Alignment. It is our experience that often pipeline locations are often misplotted by as much as several hundred yards on RRC maps. During Project Alignment reconnaissance, we did not observe markers for a Genesis Pipeline near the Project Alignment. Because of the distance from the Project Alignment, the Genesis Pipeline is not considered a REC. The Pipeline Map is dated January 22, 2003. See Figure 3- Railroad Commission Pipeline Map.

4.2.2 Railroad Commission Oil and Gas Well Map

Review of the RRC Oil and Gas Well map for the Bellaire topographic sheet reveals that there are no oil or gas wells in the vicinity of the Project Alignment.

4.2.3 City of West University Fire Department

Fire Chief Steve Ralls, of the West University Fire Department, was contacted regarding any incidents of hazardous material spills or leaks at, or near, the Project Alignment. He knew of no spills in the area for at least thirty years. A copy of the conversation including date, time, and contact information is contained in Appendix B- Records of Communication.

4.3 PHYSICAL SETTING SOURCES

The *US Geologic Survey 7.5 Minute Topographic Bellaire, TX 1995 Quadrangle Map* was reviewed as part of the Phase I ESA. In addition to the discussion in Section 2.2.1 of this report, pertaining to the general topography of the Project Alignment, other features of note shown on the Topographic Maps include:

- College Avenue, the Project Alignment is visible on the topographic map.

- Water tanks are visible to the east side of the Project Alignment.
- Pershing Junior High School is visible to the south of the Project Alignment.
- Mark Twain School is visible to the south of the Project Alignment.
- West University School is visible to the north of the Project Alignment.
- St. Vincent de Paul School is visible to the east of the Project Alignment.
- The Union Pacific Railroad line is visible to the west of the Project Alignment.
- Colonial Park is visible to the west of the Project Alignment.

4.4 HISTORICAL USE INFORMATION ON THE PROJECT ALIGNMENT AND ADJOINING PROPERTIES

4.4.1 City Directories

City directories include listings of residences, businesses, and professional concerns organized both alphabetically by name similar to a telephone book, and alphanumerically by street name then specifically by street address.

TWEI reviewed directory listings, provided in the Atlas City Directory Search report, for the properties along the College Avenue, Riley Street, and Weslayan Avenue portion of the Project Alignment for the years 1955, 1960, 1965, 1970, 1975, 1980, 1984, and 2002. Several types of business listing show a potential for RECs and include publishers, service stations, dry cleaners, an industrial chemical company, and manufacturing and supply companies. All of the businesses listed in the city directory, which could constitute RECs, are discussed in relevant sections of this report. A copy of the Atlas City Directory Search report is presented in Appendix C.

4.4.2 Sanborn Map Review

In the late nineteenth century, companies began preparing maps for use by fire insurance companies. These maps indicate construction materials of specific structures in developed urban areas. With the advent of retail gasoline service stations, the approximate locations of tanks were noted, often without AST or UST designations. These maps were updated and expanded geographically periodically through the twentieth century. Areas of these maps containing possible RECs can be found in Appendix D.

We reviewed Sanborn maps for 1950 and 1969. Along the Project Alignment, there are several businesses identified that show a potential for RECs. In 1950, these include a dry cleaner, four filling stations, a welding plant, a chemical laboratory, the Shell Oil geophysical research laboratory, and Southside Place Sewage Disposal Plant. The dry cleaner was

located in a shopping center located at Weslayan Avenue and Bellaire Boulevard and is no longer in operation. However, the dry cleaner's existence on the map indicates that it may have provided dry cleaning services on site in the past; therefore this location is considered a REC. Three of the filling stations and the welding plant, located at 4000, 3856, 3936, and 3905 Bellaire Boulevard respectively, no longer exist and have been replaced by parking lots or new buildings. The chemical laboratory is currently an office building. The Shell Oil research facility is currently expanded and in operation. The Southside Place Sewage Disposal Plant marked on the map appears to be the location of the MSWLF listed in the regulatory database report discussed in Section 4.1.

In the 1969 maps, businesses that show a potential for RECs include three of the same filling stations, an auto service station, which was previously a filling station, the chemical laboratory, now owned by Shell Oil, an automotive sales and service facility with a filling station located at 4061 Bellaire Boulevard, Shell Oil research laboratory and instrument manufacturing, and the Southside Place Sewage Disposal Plant.

4.4.3 Aerial Photography

TWEI sourced historical aerial photographs for the Project Alignment from Atlas. Atlas provided photos from 1944, 1953, 1969, 1979, 1986, 1995, and 2004. These historical aerial photographs are contained in Appendix E of this report.

The aerial photographs show the Project Alignment to be located in an area of dense urban development with the majority of the adjoining properties consisting of primarily residential properties along College Avenue with commercial development along Bellaire Boulevard. In the 1944 and 1953 aerial photographs some development is visible along Bellaire Boulevard and the development appears to be primarily commercial in nature. In the 1969 aerial photograph the Alignment appears to have undergone additional development and appears to have remained primarily commercial in nature. No features that appear on the aerial photographs are indicative of RECs.

5 PROJECT ALIGNMENT RECONNAISSANCE

5.1 OBJECTIVE

The objective of the Project Alignment reconnaissance was to obtain information indicating the likelihood of identifying recognized environmental conditions in connection with the Project Alignment. A TWEI environmental professional conducted a Phase I Project Alignment reconnaissance inspection on August 23 and 30, 2006. Project Alignment reconnaissance photographs are contained in Appendix F of this report.

5.2 METHODOLOGY AND LIMITING CONDITIONS

The TWEI environmental professional traversed the Project Alignment and documented activities occurring on the adjoining properties that are situated along the Project Alignment. This documentation includes photographs and interviews with pertinent individuals. In addition, representative conditions and key features were photographed and documented.

5.3 GENERAL PROJECT ALIGNMENT SETTING

The portions of the Project Alignment along College Avenue and Riley Street are located in an area of single-family residential properties. The area appears to have been residential for many years. There are commercial developments along Weslayan Avenue near Bellaire Boulevard and along Bellaire Boulevard. These commercial businesses include banks, retail sales, restaurants, and medical services.

5.4 EXTERIOR OBSERVATIONS

5.4.1 Roads and Paths

The Project Alignment is currently a paved public roadway. In addition, there are driveways connecting the roadway to the properties and residential neighborhoods located along the Project Alignment. As Weslayan Avenue travels south from Riley Street, it branches into two forks with a landscaped median. One branch, Weslayan Avenue, travels directly south. The other, which becomes Stella Link Road, branches to the southeast.

5.4.2 Potable Water Supply, Waste Water, and Sewage Disposal Systems

Potable water, waste water, and sewage disposal systems serving the properties surrounding the Project Alignment are supplied by municipal sources. A water tank was observed at the West University Public Works facility, located at 3825 Milton, approximately 475 ft north of the College Avenue portion of the Alignment. Water supply tanks were observed north of the Bellaire Boulevard portion of the Project Alignment between Auden and Edloe Streets. A water tower serving the City of West University was observed south of the Bellaire Boulevard portion of Project Alignment west of Poor Farm Ditch. The water tanks and tower are visible in Figure 2- Topographic Map.

5.4.3 Pits, Ponds, or Lagoons

One major drainage ditch was observed along the Bellaire Boulevard portion of Project Alignment. Poor Farm Ditch, located east of Edloe Street, appears to drain to the south into Brays Bayou.

5.4.4 Storage Tanks and Pipelines

During Project Alignment Reconnaissance, we observed several facilities that were listed in the regulatory database report as being PST and LPST locations. The ExxonMobil Corporation facility, located at 3924 Bellaire Boulevard, is not currently in operation and there was one monitoring well observed on the property. The Pilgrim Cleaners, Inc. facility, located at 6725 Stella Link Road, no longer functions as a dry-cleaning facility and no monitoring wells were observed. No monitoring wells were observed at The Southside Village Shopping Center, located at 4000 Bellaire Boulevard. The Sigmor Shamrock 913 facility, located at 3949 Bellaire Boulevard, the Pressley's Chevron facility, located at 4061 Bellaire Boulevard, and the Mohawk Company facility, located at 4068 Bellaire Boulevard, are currently a CVS drugstore, a shopping center, and a parking lot, respectively, and no monitoring wells were observed. The City of West University Place Fleet Refueling facility, located at 3825 Milton, currently has one petroleum storage tank in use. The Circle K, listed as a PST and LPST facility as being located at 3634 Bellaire Boulevard is currently single-family residences and no monitoring wells were observed. Interviews with representatives of The Pilgrim Cleaners and The City of West University Place Fleet Refueling are available in Appendix B- Records of Communication.

There was one indication of a Centerpoint Energy natural gas pipeline north of the Project Alignment. We observed a Centerpoint Energy natural gas regulator station northeast of the intersection of Bellaire Boulevard and Poor Farm Ditch. We normally do not consider natural gas pipelines to be RECs. However, we consider the regulator station a REC because of the potential for the presence of condensate that could contain harmful substances, such as benzene. See Figure 3- Railroad Commission Pipeline Map.

5.4.5 Other Conditions of Concern

The following conditions were also checked-for but were not observed during the Project Alignment reconnaissance:

- PCB-containing equipment;
- Unidentified substance containers;
- Stained soil or pavement;
- Odors;
- Drums;
- Pools of non-aqueous liquid;
- Stressed vegetation;
- Oil, gas, and water wells;

- Hazardous substances and petroleum products in connection with identified uses;
- Hazardous substance and petroleum products containers;
- High voltage power lines.

6 INTERVIEWS

Records of Communication from interviews conducted as part of this Phase I ESA are contained in Appendix B of this report.

6.1 INTERVIEWS WITH OWNERS, MANAGERS, OCCUPANTS, AND LOCAL GOVERNMENT OFFICIALS

The Project Alignment is a roadway owned and maintained by the City of West University, and County officials, project managers, and occupants were not interviewed as part of this Phase I ESA. No research from other activities undertaken as part of this Phase I ESA resulted in findings warranting interviews with government officials.

6.2 INTERVIEWS WITH OTHERS

We attempted to contact owners or occupants of facilities directly adjacent to the Project Alignment. The following is a summary of the business representatives with which we were able to make contact. Specific time and contact information is located in Appendix B-Records of Communication.

During Project Alignment reconnaissance activities on August 23, 2006, we interviewed a representative of the City of West University Public Works facility, located at 3825 Milton. He confirmed a petroleum storage tank used for fleet refueling and the removal and clean-up of a leaking petroleum storage tank in the past. The Public Works facility is considered a REC because of its proximity to the Project Alignment. We also interviewed a representative of the Jiffy Lube, located at 3435 West Holcomb Boulevard. This location is listed as a PST as a Quaker State Minute Lube. The Jiffy Lube representative confirmed the presence of a PST and stated that they use a service to dispose of waste oil off site.

We also spoke with a representative of Pilgrim Cleaners, located at 6723 Stella Link. This location was listed as a PST, LPST, and RCRAGEN facility in the regulatory database report. He explained that there was a dry-cleaning plant there in the past but the location now serves as business offices for Pilgrim Cleaners. We spoke with two dry cleaning facilities that provide on-site services, West University Cleaners, located at 3920 Bellaire Boulevard, and River Oaks Cleaners, located at 3907 Bellaire Boulevard. Both business use services to remove hazardous chemical waste and knew of no violations. The Pilgrim Cleaners, West University Cleaners, and the River Oaks Cleaners are considered RECs because of their proximity to the Project Alignment. In addition, we interviewed a

representative of a Pilgrim Cleaners, located at 4001B Bellaire Boulevard. This facility is not considered a REC because it does not provide dry-cleaning services on site and has not in the past.

We attempted to interview Shell E & P Technology, located at 3737 Bellaire Boulevard, regarding their listing as RCRAGEN and PST locations but were refused an in-person interview and were unable to make contact via telephone.

7 FINDINGS, OPINIONS, AND CONCLUSIONS

Tolunay-Wong Engineers, Inc., (TWEI) was requested by Claunch & Miller, Inc. to conduct a Phase I Environmental Site Assessment (Phase I ESA) for the College Avenue Project, City of West University, Harris County, Texas.

The purpose of the Phase I ESA was to document environmental conditions of the Project Alignment and adjacent properties. This was done by identifying, to the extent feasible, pursuant to the process described in the *American Society for Testing and Materials (ASTM) Standard Practice for ESA's (ASTM E-1527-05*), recognized environmental conditions (RECs) along the Project Alignment. Several facilities were identified as recognized environmental conditions (RECs), as defined by the ASTM standard for Phase I ESAs.

- The first REC identified in the database report is the ExxonMobil Corporation facility located at 3924 Bellaire Boulevard. The ExxonMobil facility is listed as a PST, RCRA, and LPST facility. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials and no violations are reported. It was reported that groundwater was impacted due to the LPST. Final concurrence has been issued and the case has been closed. Closure was approved in January of 1999.

- The second REC identified in the database report is the West U Cleaners facility located at 3920 Bellaire Boulevard. The West U Cleaners facility is a RCRA facility. The facility currently provides on-site dry cleaning services. According to the database report the facility is not a generator, treatment, storage, disposal facility or a transporter of hazardous waste or materials.

- The third REC identified in the database report is the Pilgrim Cleaners, Inc. facility located at 6723 and 6725 Stella Link. The Pilgrim Cleaners facility is a RCRA facility and a Voluntary Cleanup Program (VCP) participant. According to the database report soil and groundwater have been impacted by perchloroethylene. The facility is also the location of a PST, which was permanently filled in place in 1976. Currently there is no dry cleaning plant at the location. Certification for closure was issued in February of 2003.

- The fourth facility listed is the Southside Village Shopping Center located at 4000 Bellaire Boulevard. The Southside Village Shopping Center facility is reported as a LPST facility with impacted groundwater. Off-site migration is unlikely and final concurrence has been issued and the case has been closed. Closure was approved in July of 1992.

- The fifth facility listed is the Sigmor Shamrock 913 facility located at 3949 Bellaire Boulevard. The Sigmor Shamrock 913 facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and final concurrence has been issued and the case has been closed. Closure was approved in June of 1992.

- The sixth facility listed is the Pressley's Chevron facility located at 4061 Bellaire Boulevard. The Chevron facility is reported as a LPST facility and PST facility with impacted groundwater. No apparent threats or impacts are reported and monitoring is ongoing.

- The seventh facility listed is the Mohawk Company facility located at 4068 Bellaire Boulevard. The Mohawk Company facility is reported as a PST facility.

- The eighth facility listed is the City of West University Place Fleet Refueling facility located at 3826 Amherst. The fleet refueling facility is reported as a PST and LPST facility.

The following additional listings for the Bellaire Avenue portion of the Project Alignment, which indicate RECs, were identified from a database search of Standard Environmental Record Sources in our company files for the area:

- The first additional facility listed is the Shell E&P Technology Company located at 3737 Bellaire Boulevard. The Shell E&P Technology Company is a RCRA facility and PST facility. The facility is reported a being a small quantity generator with two violations listed. The violations occurred in 1988 and the enforcements were written informal.

- The second additional facility listed is the Circle K 2141 facility located at 3634 Bellaire Boulevard, The Circle K facility is reported as a LPST facility and PST facility with minor soil contamination reported that does not require a remedial action plan. Final concurrence has been issued and the case is listed as closed as of December of 1992.

- The third additional facility listed is the Quaker State Minit Lube 1176 facility located at 3435 West Holcombe. The Quaker State facility is reported as a PST facility. The facility is also reported a being a small quantity generator with no violations listed.

- The fourth additional facility listed is a Municipal Solid Waste Landfill (MSWLF) facility located 500 ft south of Bellaire Boulevard at Edloe Street. Review of the Houston-Galveston Area Closed Landfill Inventory website revealed that the facility

served as a Type V transfer station. The Southside Place transfer station was in operation from 1970 to 1990.

In addition to the aforementioned REC locations listed in regulatory database reports, there were three locations identified during reconnaissance activities and records review that are considered RECs because of their proximity to the Project Alignment:

- River Oaks Cleaners, located at 3907 Bellaire Boulevard provides on-site dry cleaning services. They use a service to remove hazardous chemical waste and personnel were aware of no violations.

- We observed a Centerpoint Energy natural gas regulator station northeast of the intersection of Bellaire Boulevard and Poor Farm Ditch. We normally do not consider natural gas pipelines to be RECs. However, we consider the regulator station a REC because of the potential for the presence of condensate that could contain harmful substances, such as benzene.

- A dry cleaner, located in a shopping center located at Weslayan Avenue and Bellaire Boulevard, is identified on the 1950 Sanborn Map. It is no longer in operation. However, the dry cleaner's existence on the map indicates that it may have provided dry cleaning services on site in the past; therefore this location is considered a REC.

8 RECOMMENDATIONS

There are several RECs that could impact the subsurface of the Alignment and thereby the construction of the proposed drainage improvements and pavement reconstruction. Therefore, it is our opinion that a Phase II ESA boring program is warranted to evaluate possible subsurface contamination.

9 DEVIATIONS

Suggested ASTM E1527-05 report headings which have been deleted from the former sections of this report due to their not being investigated or relevant to this study include:

- Significant Assumptions

- Special Terms and Conditions

- Specialized Knowledge

- Valuation Reduction for Environmental Issues

- Interior Observations (no structures on the Project Alignment)

- References (all sources cited are noted in the relevant section of text)

10 LIMITATIONS AND EXCEPTIONS

10.1 USER RELIANCE

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions, recommendations, and conclusions contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. Environmental conditions may exist at the property that cannot be identified by visual observation. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

The following limitations apply to the Phase I ESA:

Pursuant to *ASTM E-1527-05*, the following were excluded from the scope-of-work for the Phase I ESA:

- Radon;
- Regulatory compliance;
- Soils testing;
- Health and safety;
- Biological agents;
- Asbestos surveys;
- Lead in drinking water;
- Lead-based paints;
- Industrial hygiene;
- Ecological resources;
- Mold;
- Groundwater testing.

11 ADDITIONAL SERVICES

TWEI is not providing any environmental services additional to this Phase I ESA for the Phase I Environmental Site Assessment (Phase I ESA) for the College Avenue Project, City of West University, Harris County, Texas.

12 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

The material and data in this report for Phase I Environmental Site Assessment (Phase I ESA) for the College Avenue Project, City of West University, Harris County, Texas, were prepared under the supervision and direction of the undersigned.

We, the undersigned, declare that, to the best of our professional knowledge and belief, we meet the definition of *Environmental Professionals* as defined in 312.10 of 40 CFR 312 and we have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the subject *property*. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR 312.

TWEI Project Number 06.12.055

September 6, 2006

Amy Kunza
Cheif Biologist
Environmental Services Division

Paul R. Wild
Vice President
Environmental Services Division

13 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

The resumes of the environmental professionals who prepared this report are presented below.

AMY KUNZA
STAFF BIOLOGIST, ENVIRONMENTAL SERVICES DIVISION

SPECIALIZATION

Over 6 years experience in the education of coastal ecosystem functioning. Conducted research in wetland plant identification and diversity patterns of barrier island marshes. This research included work in the coastal marshes of the Texas Gulf Coast from Bolivar Peninsula to Port Aransas. Research projects also included work with the Georgia Coastal Ecosystem chapter of the Long Term Ecological Research program. Has experience in Animal and Plant Taxonomy, Animal and Plant Survey Methods, and Phase I Environmental Site Assessments.

PROFESSIONAL HISTORY

Tolunay-Wong Engineers, Inc., Houston, TX, May 2006 - Present
University of Houston, Houston, TX, August 2003 – August 2006
Kiawah Island Resort, Kiawah Island, SC, 2003
Outside Hilton Head, Hilton Head Island, SC, 2000-2001

EDUCATION

Bachelor of Science, University of Georgia, Botany, May 1999.
Master of Science, University of Houston, Biology, August 2006.
Thesis : Plant Diversity Patterns of Salt Water Marshes of Texas and Georgia.

PAUL R. WILD
VICE PRESIDENT - ENVIRONMENTAL SERVICES DIVISION

SPECIALIZATION

Conducts technical reviews of environmental management systems, and directs environmental compliance audits, risk assessments, environmental site assessments, and asbestos surveys. Manages RCRA Facility Investigations and Corrective Measures Studies. Manages all phases of underground storage tank release evaluations from initial investigation to remediation. Conducts Environmental Assessments under the National Environmental Policy Act. Evaluates analytical testing data and oversees contract laboratory quality asurance, including on-site auditing. Supervises drilling and sampling operations at hazardous waste sites and provides assessment of soil and groundwater contamination. Conducts chemical literature research and assesses waste treatment methods. Evaluates applicable or relevant and appropriate requirements (ARARs) in relation to remedial actions and air/water/waste permitting. Develops health and safety plans and monitors health and safety plan compliance. Evaluates census tract data, property ownership records, aerial photography, house-to-house survey data, and other publicly-available data, including interviews with regulatory and governmental agency personnel, to assess possible or probable social and economic impacts to communities from construction and remediation projects.

PROFESSIONAL HISTORY

Tolunay-Wong Engineers, Inc., Houston, Texas, 2002 to Present
Washington Group International, Houston, Texas, 1985 - 2002, Manager of Environmental Services
Resource Engineering, Inc. (ENSR), Houston, Texas, 1985, Staff Chemist
McBride-Ratcliff and Associates, Inc., Houston, Texas, 1984 - 1985, Field Technician

EDUCATION

B.S. Chemistry (Zoology minor): Marshall University, 1983

CERTIFICATION

OSHA Certified for Hazardous Waste Site Work (OSHA 29 CFR 1910.120)
OSHA 29 CFR 1910.120 Supervisor Training
Asbestos Hazard Emergency Response Act (AHERA) building inspector and management planner
Illinois Licensed Asbestos Inspector #100-7145
TCEQ Corrective Action Project Manager Reg. #CAPM00385

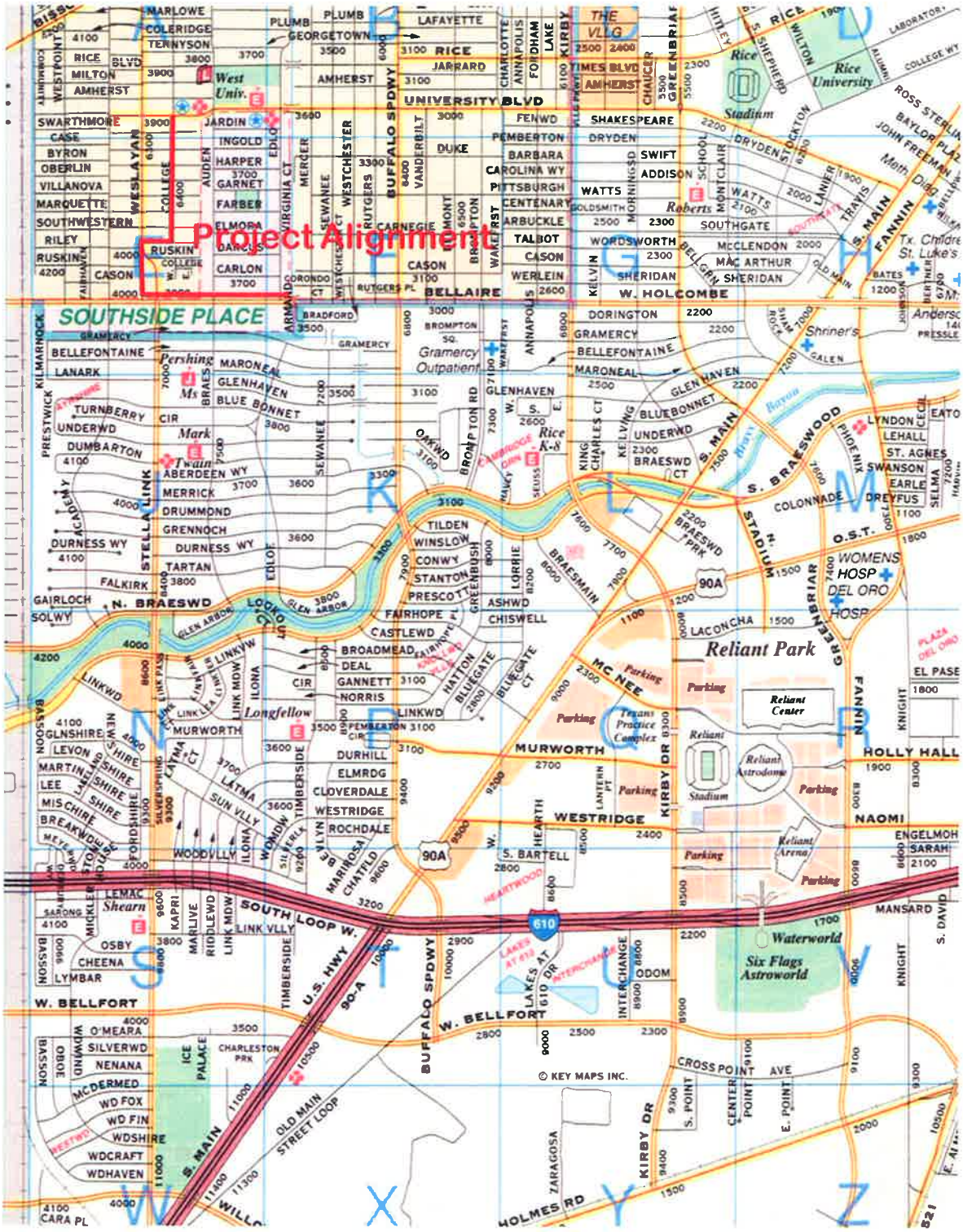
AFFILIATIONS

American Chemical Society

PUBLICATIONS

"A Contaminant-Resistant Slurry Trench," W. R. Tobin, co-author, presented at the First Annual Southern Regional Ground Water Conference, San Antonio, Texas, September 1985, pp. 193-208.
"Attapulgite: A Clay Liner Solution?" W. R. Tobin, co-author, Civil Engineering, Vol. 56, No. 2, February 1986, pp. 56-58.
"The Environmental Site Assessment as a Pre-Investment Security," presented at the Texas Section, American Society of Civil Engineers Spring Meeting, Dallas, Texas, April 1987.

FIGURE 1: PROJECT ALIGNMENT MAP



PROJECT ALIGNMENT MAP

SOURCE: Harris County Key Map Page 532, Block E & F

Scale 1"=~2650'

N

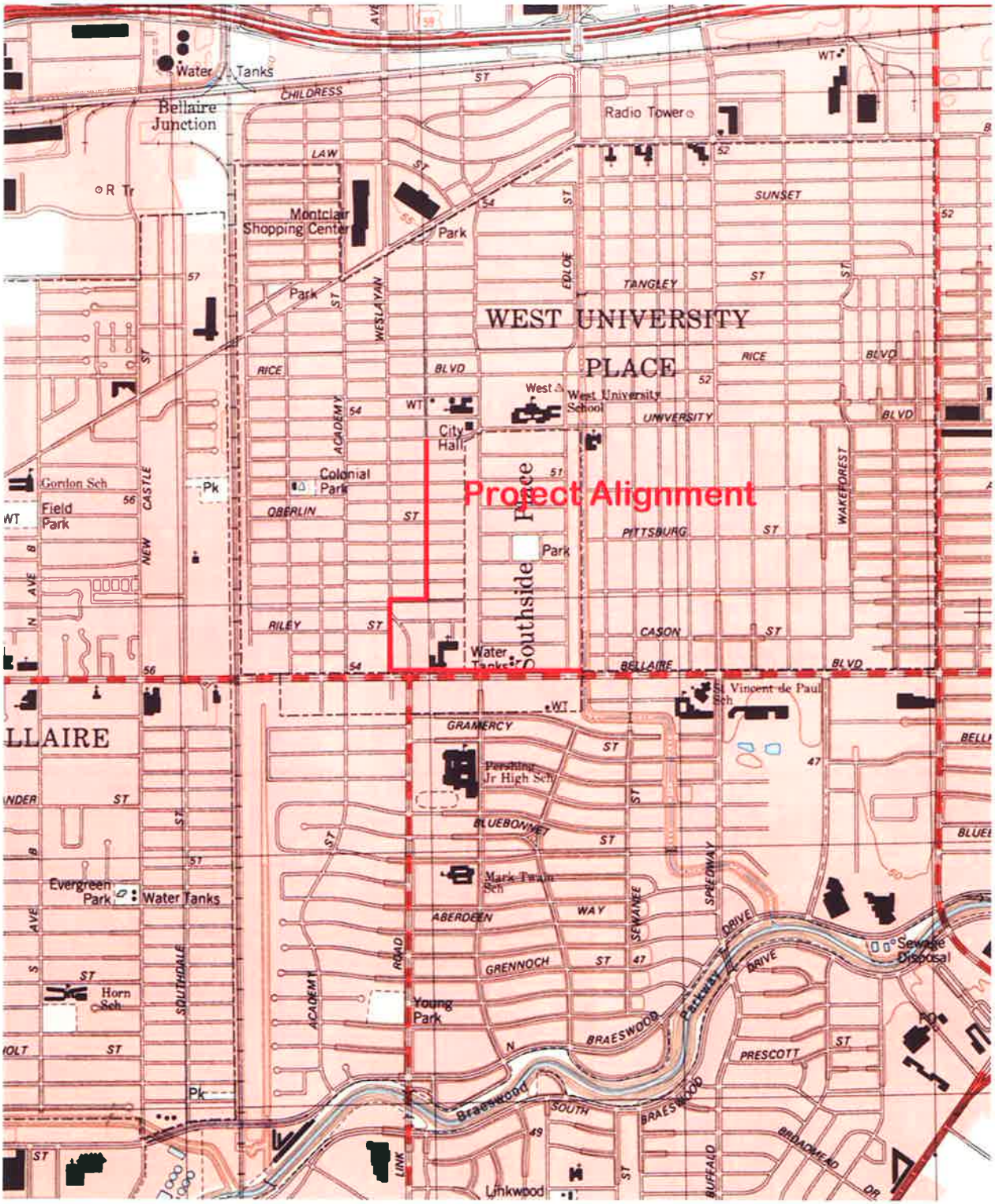
Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

FIGURE 2: TOPOGRAPHIC MAP



TOPOGRAPHIC MAP

SOURCE: USGS 7.5 Minute Quadrangle Map
Bellaire, TX, 1995

Scale 1"=~2000'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

FIGURE 3: RAILROAD COMMISSION PIPELINE MAP

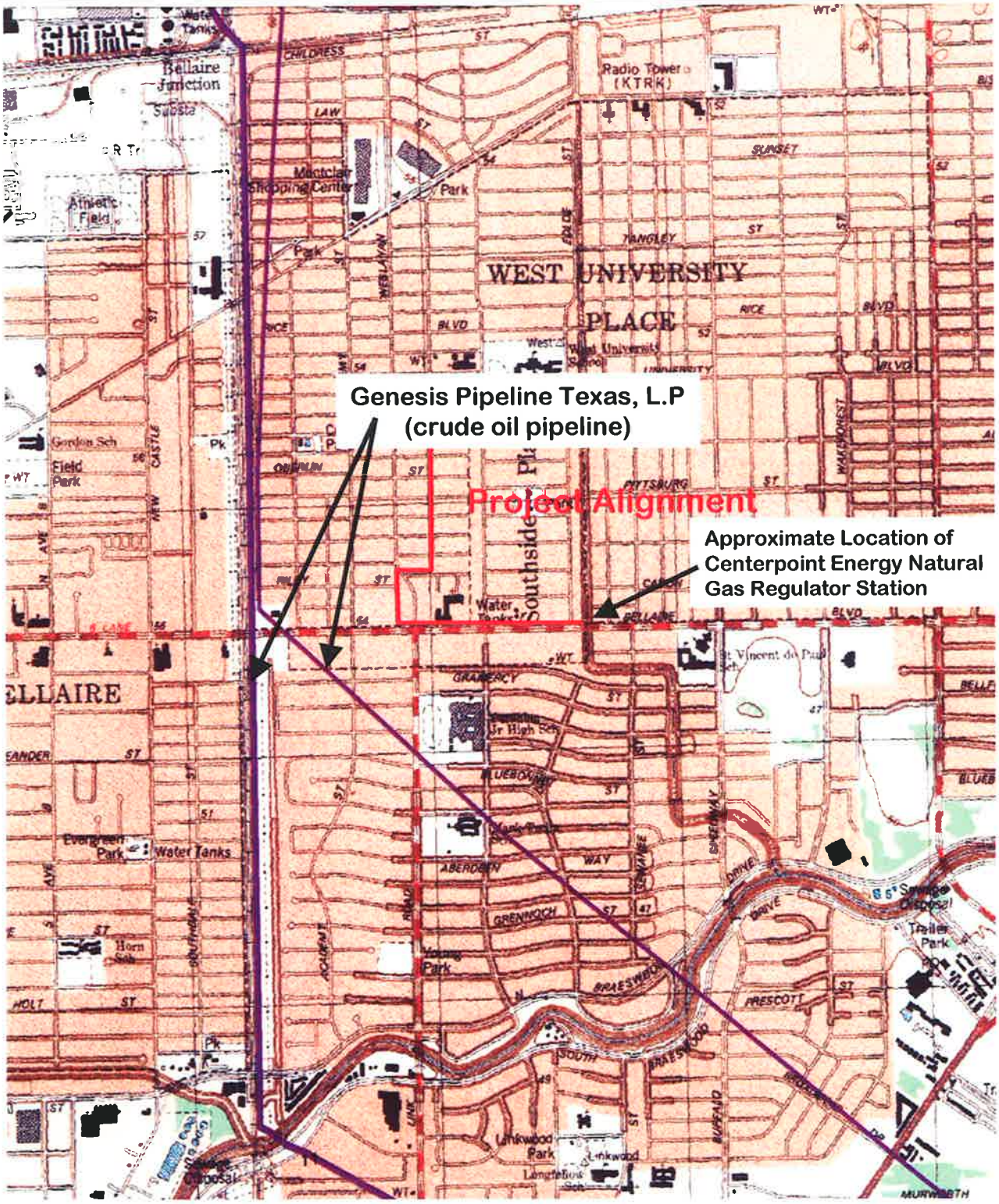


FIGURE 3: RAILROAD COMMISSION PIPELINE MAP

SOURCE: USGS 7.5 Minute Quadrangle Map
Bellaire, TX, January 22, 2003

Scale 1"=~'

N

Project: Phase I ESA **College Avenue Project** **City of West University** **Harris County, Texas**	**Tolunay-Wong Engineers, Inc.** **Houston, Texas**	**Project No.: 06.12.055** **Client:** **Claunch & Miller, Inc.**

APPENDIX A: ATLAS REGULATORY DATA REPORT

REGULATORY DATA REPORT

Area of Review:

Project: 06.12.055
College Avenue Project Phase I ESA
College, Riley, Weslayan
Houston, TX

Site (Centerpoint) Coordinates:

North 29° 42' 37" (29.7105)

West 95° 26' 21" (-95.4394)

Prepared For:

Amy Kunza
Tolunay-Wong Engineers, Inc.
Houston, TX

08/14/06

Atlas E.R., Inc.
8705 Shoal Creek Blvd., Suite 207
Austin, Texas 78757

Phone: 512-339-4155 / 800-940-0977
Fax: 512-339-4413
Email : atlas@environmentalmaps.com

EXCEPTIONAL INFORMATION - EXCEPTIONAL SERVICE

ATLAS ENVIRONMENTAL RESEARCH
DATABASE SUMMARY

DATABASE	ACRONYM	DATABASE DATE	MAPPED	LOCATION UNKNOWN	SEARCH RADIUS
FEDERAL					
NATIONAL PRIORITY LIST	NPL	01/01/06	0	0	1 Mile
DELISTED NATIONAL PRIORITY LIST	DNPL	01/01/06	0	0	1 Mile
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION & LIABILITY INFORMATION SYSTEM	CERCLIS	01/01/06	0	0	500 feet
NO FURTHER REMEDIAL ACTION PLANNED	NFRAP	01/01/06	0	0	500 feet
RESOURCE CONSERVATION & RECOVERY ACT - CORRECTIVE ACTION	RCRACOR	06/13/06	0	0	1 Mile
RESOURCE CONSERVATION & RECOVERY ACT - TREATMENT, STORAGE & DISPOSAL	RCRATSD	06/13/06	0	0	1 Mile
RESOURCE CONSERVATION & RECOVERY ACT - GENERATOR / HANDLER	RCRAGEN	06/13/06	3	0	500 feet
EMERGENCY RESPONSE NOTIFICATION SYSTEM	ERNS	01/01/04	0	0	500 feet
NATIONAL RESPONSE SYSTEM	NRS	01/01/04	0	0	500 feet
PROPOSED NATIONAL PRIORITY LIST	PNPL	01/01/06	0	0	1 Mile
STATE					
SUPERFUND	SUPER	01/01/06	0	0	1 Mile
VOLUNTARY CLEANUP PROGRAM	VCP	07/01/05	1	0	500 feet
MUNICIPAL SOLID WASTE LANDFILL SITES	MSWLF	01/01/05	0	0	500 feet
CLOSED & ABANDONED LANDFILL INVENTORY	CLI	11/01/05	0	0	500 feet
LEAKING PETROLEUM STORAGE TANKS	LPST	01/01/06	5	0	500 feet
PETROLEUM STORAGE TANKS	PST	01/22/06	6	0	500 feet
INNOCENT OWNER / OPERATOR PROGRAM	IOP	07/01/05	0	0	500 feet
BROWNFIELDS SITE ASSESSMENTS	BSA	07/01/05	0	0	500 feet
TOTAL			15	0	

DISCLAIMER

Atlas E.R, Inc. will not be held financially liable for any errors or omissions that may occur in the Atlas E.R. Regulatory Data Report as a result of the information obtained from the Environmental Protection Agency (EPA), Texas Commission on Environmental Quality (TCEQ) or other Local / State / Federal Government Agencies. All information in this report has been obtained from local, state and/or federal publicly available databases and is presented "as is." This information may be inaccurate and/or incomplete. Certain errors within these databases may prevent a site from geocoding or even from being manually pointed on the map. For these reasons, it is recommended that all data received be field verified and that the area of review be field surveyed to help ensure that no sites are overlooked in the due diligence process.

OTHER STANDARD ENVIRONMENTAL RECORD SOURCES

Institutional Control (IC) / Engineering Control (EC) Registries - No Federal, State, Tribal, or Local registries are currently reviewed by Atlas E.R., Inc. However, several databases included in this report may contain information concerning institutional or engineering controls. A review of local land records is recommended to help satisfy this requirement of ASTM E1527-05.

LOCATION UNKNOWN SITES (LUs)

Extensive effort is made to ensure that as many sites as possible are geocoded or manually pointed for an Atlas E.R. Regulatory Data Report. However, due to inaccurate and /or insufficient information within a particular database, some sites cannot be accurately located and may be noted as "LU" in this report. These sites will not appear on the map, but database information has been included in the report. These sites may or may not be within the area but are submitted for your review.

MAPPED FACILITIES SUMMARY

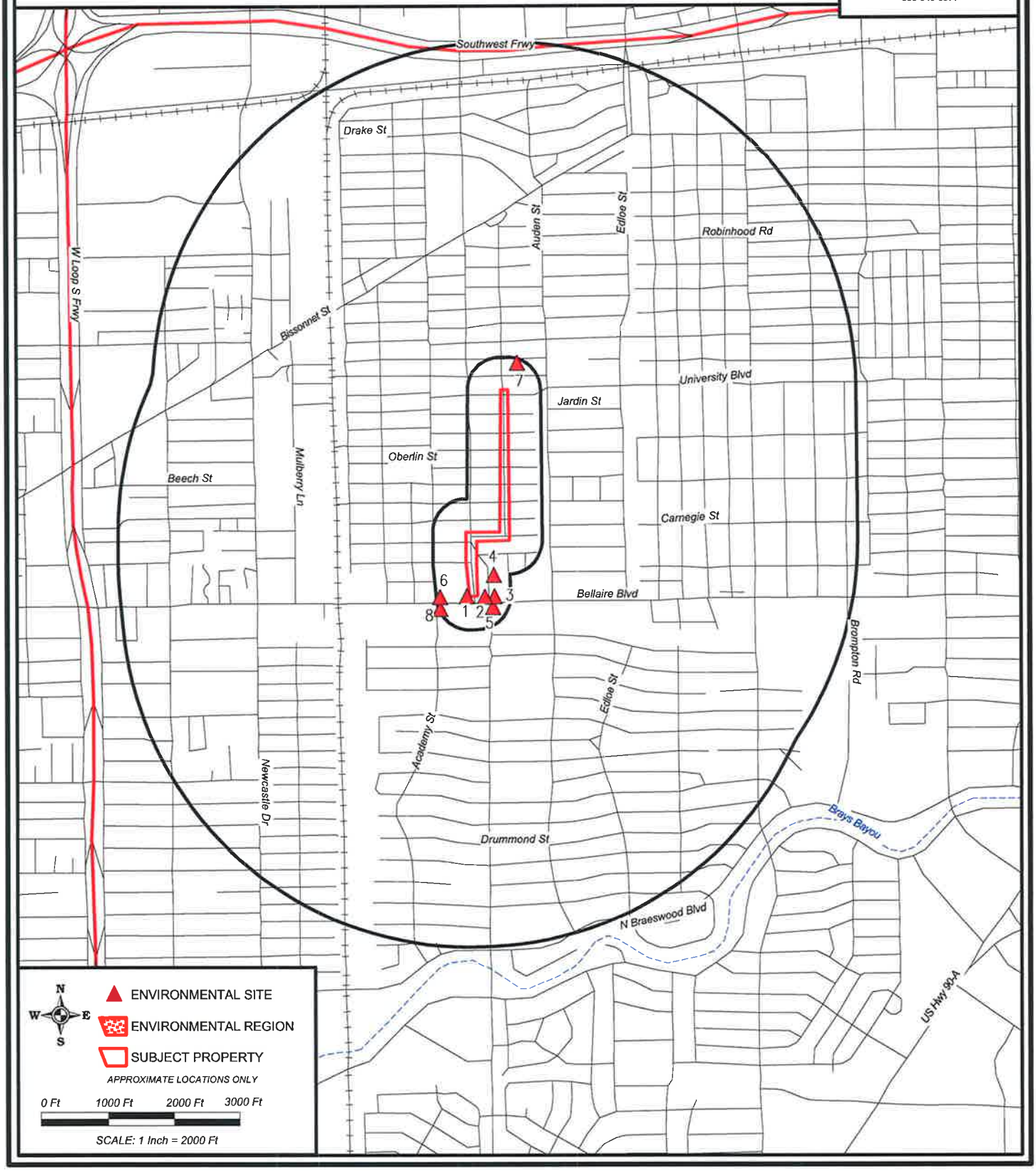
MAP ID	MILES FROM SUBJECT	DATABASE	FACILITY ID	FACILITY NAME	STREET ADDRESS	CITY	ZIP CODE
1	0.01 S	LPST	103800	SOUTHSIDE VILLAGE SHOPPING CTR	4000 BELLAIRE BLVD	HOUSTON	77025
2	0.03 S	LPST	110541	EXXON 67576	3924 BELLAIRE BLVD	HOUSTON	77025
2	0.03 S	PST	0026654	WEST UNIVERSITY EXXON 67576	3924 BELLAIRE BLVD	HOUSTON	77025
2	0.03 S	RCRAGEN	TXD988030466	EXXON MOBIL CORPORATION	3924 BELLAIRE	HOUSTON	77025
3	0.05 S	RCRAGEN	TX0000062091	WEST U CLEANERS	3920 BELLAIRE	HOUSTON	77025
4	0.05 S	PST	0023837	PILGRIM ENTERPRISES INC	6723 STELLA LINK	HOUSTON	77005
4	0.05 S	RCRAGEN	TXD981050685	PILGRIM CLEANERS INC	6725 STELLA LINK RD	HOUSTON	77005
4	0.05 S	VCP	0117	PILGRIM CLEANERS - STELLA LINK	6723 STELLA LINK	HOUSTON	77005
5	0.06 S	LPST	095157	SIGMOR SHAMROCK 913	3949 BELLAIRE	HOUSTON	77025
5	0.06 S	PST	0040199	SIGMOR SHAMROCK 913	3949 BELLAIRE	HOUSTON	77025
6	0.09 SW	PST	0019581	MOHAWK CO	4068 BELLAIRE BLVD	HOUSTON	77025
7	0.09 N	LPST	097623	CITY OF WEST UNIVERSITY PLACE	3825 MILTON	WEST UNIVERSITY	77005
7	0.09 N	PST	0041656	CITY OF WEST UNIVERSITY PLACE	3826 AMHERST ST	HOUSTON	77005
8	0.10 SW	LPST	114505	PRESSLYS CHEVRON	4061 BELLAIRE BLVD	HOUSTON	77025
8	0.10 SW	PST	0054808	FORMER PRESSLEYS CHEVRON	4061 BELLAIRE BLVD	HOUSTON	77025

Atlas Job # 608930, August 14, 2006

College Avenue Project Phase I ESA
College, Riley, Weslayan, Houston, TX

Project #: 06.12.055

ENVIRONMENTAL RESEARCH
ATLAS
8705 Shoal Creek Blvd., Suite 207
Austin, Texas 78757
800-940-0977



RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
GENERATOR AND HANDLER FACILITIES

FACILITY

EPA ID	TXD988030466
NOTIFICATION DATE	20051129
NAME	EXXON MOBIL CORPORATION
ADDRESS	3924 BELLAIRE, HOUSTON, TX, 77025

X = -95.440339
Y = 29.706198

MAP ID 2

Located 0.03 Miles S of Property

ACTIVITY

BUSINESS TYPE	NOT REPORTED
GENERATOR TYPE	Not a Generator
TSD INDICATOR	NOT A TSD
TRANSPORTER INDICATOR	NOT A TRANSPORTER
VIOLATIONS	NO VIOLATIONS

FACILITY

EPA ID	TX0000062091
NOTIFICATION DATE	20010214
NAME	WEST U CLEANERS
ADDRESS	3920 BELLAIRE, HOUSTON, TX, 77025

X = -95.439874
Y = 29.706217

MAP ID 3

Located 0.05 Miles S of Property

ACTIVITY

BUSINESS TYPE	DRYCLEANING AND LAUNDRY SERVICES (EXCEPT COIN-OPERATED)
GENERATOR TYPE	Not a Generator
TSD INDICATOR	NOT A TSD
TRANSPORTER INDICATOR	NOT A TRANSPORTER
VIOLATIONS	NO VIOLATIONS

FACILITY

EPA ID	TXD981050685
NOTIFICATION DATE	20010214
NAME	PILGRIM CLEANERS INC
ADDRESS	6725 STELLA LINK RD, HOUSTON, TX, 77005

X = -95.439905
Y = 29.707101

MAP ID 4

Located 0.05 Miles S of Property

ACTIVITY

BUSINESS TYPE	DRYCLEANING AND LAUNDRY SERVICES (EXCEPT COIN-OPERATED)
GENERATOR TYPE	Not a Generator
TSD INDICATOR	NOT A TSD
TRANSPORTER INDICATOR	NOT A TRANSPORTER
VIOLATIONS	NO VIOLATIONS

VOLUNTARY CLEANUP PROGRAM (VCP)

X = -95.439905
Y = 29.707101

MAP ID 4

Located 0.05 Miles S of Property

FACILITY

ID	0117
NAME	PILGRIM CLEANERS - STELLA LINK
ADDRESS	6723 STELLA LINK, HOUSTON, TX
ACRES	1.69
FACILITY TYPE	DRY CLEANERS
APPLICATION DATE	09/11/95
DATE OF AGREEMENT	12/14/95
DATE OF CERTIFICATE	NONRESIDEN
CERTIFICATE TYPE	Pump/Treat,
TYPE LEAD	OWNER
PHASE	COMPLETED
CONTAMINANTS	PCE
MEDIA AFFECTED	SOILS/GROUNDWATER
REMEDY	F
TCEQ SOLID WASTE ID	NOT REPORTED
LPST ID	NOT REPORTED
EPA CERCLIS ID	NOT REPORTED
EPA RCRA ID	NOT REPORTED

APPLICANT

ORGANIZATION	PILGRIM ENTERPRISES
NAME	DOUG MULVANEY, VICE PRESIDENT
ADDRESS	10575 WESTOFFICE DRIVE, HOUSTON, TX, 77042-5310
PHONE	713-666-0351
FAX	NOT REPORTED

CONSULTANT/ATTORNEY

ORGANIZATION	INCONTROL TECHNOLOGIES
NAME	MIKE MARCON, PROJECT MANAGER
ADDRESS	3845 FM 1960 WEST, SUITE 318, HOUSTON, TX, 77068
PHONE	281-580-8892
FAX	281-580-8853

LEAKING PETROLEUM STORAGE TANKS (LPST)

FACILITY

X = -95.441200
Y = 29.706216

MAP ID 1

Located 0.01 Miles S of Property

LPST ID	103800
FACILITY ID	
DATE REPORTED	7/13/1992
NAME	SOUTHSIDE VILLAGE SHOPPING CTR
ADDRESS	4000 BELLAIRE BLVD, HOUSTON, TX
PRIORITY CODE	(2C) GROUP 1 GOUNDWATER, OFF-SITE MIGRATION UNLIKELY
STATUS CODE	(6A) FINAL CONCURRENCE ISSUED, CASE CLOSED

POTENTIALLY RESPONSIBLE PARTY

NAME	FDIC
ADDRESS	999 NW GRAND BLVD STE 200, OKLAHOMA CITY, OK 73118-6077
CONTACT	VIRGINIA ROBERTSON
PHONE	214/508-5321

FACILITY

X = -95.440339
Y = 29.706198

MAP ID 2

Located 0.03 Miles S of Property

LPST ID	110541
FACILITY ID	0026654
DATE REPORTED	
NAME	EXXON 67576
ADDRESS	3924 BELLAIRE BLVD, HOUSTON, TX
PRIORITY CODE	(4.1) GROUNDWATER IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS
STATUS CODE	(6A) FINAL CONCURRENCE ISSUED, CASE CLOSED

POTENTIALLY RESPONSIBLE PARTY

NAME	EXXON COMPANY USA
ADDRESS	PO BOX 4620, HOUSTON, TX 77092
CONTACT	GREGORY BARTON
PHONE	713/656-2243

FACILITY

X = -95.439949
Y = 29.705770

MAP ID 5

Located 0.06 Miles S of Property

LPST ID	095157
FACILITY ID	0040199
DATE REPORTED	1/2/1990
NAME	SIGMOR SHAMROCK 913
ADDRESS	3949 BELLAIRE, HOUSTON, TX
PRIORITY CODE	(4.1) GROUNDWATER IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS
STATUS CODE	(6A) FINAL CONCURRENCE ISSUED, CASE CLOSED

POTENTIALLY RESPONSIBLE PARTY

NAME	DIAMOND SHAMROCK REF & MKTG CO
ADDRESS	1117 SILBER RD BDG C, HOUSTON, TX 77055
CONTACT	LOUIS MOSCONI
PHONE	713/957-1393

LEAKING PETROLEUM STORAGE TANKS (LPST)

FACILITY

X = -95.438767
Y = 29.715866

MAP ID 7

Located 0.09 Miles N of Property

LPST ID	097623
FACILITY ID	0041656
DATE REPORTED	12/18/1990
NAME	CITY OF WEST UNIVERSITY PLACE
ADDRESS	3825 MILTON, WEST UNIVERSITY, TX
PRIORITY CODE	(2.5) GROUNDWATER IMPACT, PUBLIC/DOMESTIC WATER SUPPLY WELL W/IN 0.25 MILES
STATUS CODE	(6A) FINAL CONCURRENCE ISSUED, CASE CLOSED

POTENTIALLY RESPONSIBLE PARTY

NAME	CITY OF WEST UNIVERSITY PLACE
ADDRESS	3800 UNIVERSITY BLVD, HOUSTON, TX 77005
CONTACT	JERRY BURNS
PHONE	713/662-5839

FACILITY

X = -95.442468
Y = 29.705710

MAP ID 8

Located 0.10 Miles SW of Property

LPST ID	114505
FACILITY ID	0054808
DATE REPORTED	12/17/1998
NAME	PRESSLYS CHEVRON
ADDRESS	4061 BELLAIRE BLVD, HOUSTON, TX
PRIORITY CODE	(4.1) GROUNDWATER IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS
STATUS CODE	(3) MONITORING

POTENTIALLY RESPONSIBLE PARTY

NAME	PRESSLY JIM
ADDRESS	5102 GRAND LAKE, BELLAIRE, TX 77401
CONTACT	VIRGINIA PRESSLY
PHONE	713/668-7460

PETROLEUM STORAGE TANKS (PST)

FACILITY

ID	0026654
FACILITY TYPE	RETAIL
NAME	WEST UNIVERSITY EXXON 67576
ADDRESS	3924 BELLAIRE BLVD, HOUSTON, TX
CONTACT	E. SVOBODA
PHONE	713/656-9026

X = -95.440339
Y = 29.706198

MAP ID 2

Located 0.03 Miles S of Property

OWNER

NAME	EXXON MOBIL CORPORATION
ADDRESS	12596 W BAYAUD AVE STE 100, LAKEWOOD, CO, 80228
CONTACT	ERIC MCPHEE
PHONE	303-986-8011

TANK(S)

TANK ID	4
TYPE	UST
INSTALLED	01/01/1985
STATUS / DATE	REMOVED FROM GROUND / 12/28/1995
CAPACITY (in gallons)	1000
CONTENTS	USED OIL
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

TANK ID	3
TYPE	UST
INSTALLED	01/01/1985
STATUS / DATE	REMOVED FROM GROUND / 12/28/1995
CAPACITY (in gallons)	12000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

PETROLEUM STORAGE TANKS (PST)

TANK ID	1
TYPE	UST
INSTALLED	01/01/1985
STATUS / DATE	REMOVED FROM GROUND / 12/28/1995
CAPACITY (in gallons)	8000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

TANK ID	2
TYPE	UST
INSTALLED	01/01/1985
STATUS / DATE	REMOVED FROM GROUND / 12/28/1995
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

TANK ID	1
TYPE	UST
INSTALLED	01/24/1996
STATUS / DATE	IN USE / NOT REPORTED
CAPACITY (in gallons)	12000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	DOUBLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	DOUBLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

TANK ID	2
TYPE	UST
INSTALLED	01/24/1996
STATUS / DATE	IN USE / NOT REPORTED
CAPACITY (in gallons)	12000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	DOUBLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	DOUBLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

TANK ID	3
TYPE	UST
INSTALLED	01/24/1996
STATUS / DATE	IN USE / NOT REPORTED
CAPACITY (in gallons)	12000
CONTENTS	GASOLINE
TANK MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
TANK CONTAINMENT	DOUBLE WALL
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	DOUBLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	AUTO. LINE LEAK DETECTOR (3.0 GPH FOR PRESSURE PIPING)
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
SPILL & OVERFILL PROTECTION	AUTO. FLOW RESTRICTOR VALVE

FACILITY

ID	0023837
FACILITY TYPE	UNIDENTIFIED
NAME	PILGRIM ENTERPRISES INC
ADDRESS	6723 STELLA LINK, HOUSTON, TX
CONTACT	R. SCHISSLER
PHONE	713/666-0351

X = -95.439905
Y = 29.707101

MAP ID 4

Located 0.05 Miles S of Property

OWNER

NAME	PILGRIM ENTERPRISES INC
ADDRESS	6723 STELLA LINK, HOUSTON, TX, 77005
CONTACT	NOT REPORTED
PHONE	7136661351

TANK(S)

PETROLEUM STORAGE TANKS (PST)

TANK ID	1
TYPE	UST
INSTALLED	01/01/1976
STATUS / DATE	PERM. FILLED IN PLACE / 02/28/1986
CAPACITY (in gallons)	2000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

FACILITY

ID	0040199
FACILITY TYPE	UNIDENTIFIED
NAME	SIGMOR SHAMROCK 913
ADDRESS	3949 BELLAIRE, HOUSTON, TX
CONTACT	LYN HOLMES
PHONE	512/641-6800

X = -95.439949
Y = 29.705770

MAP ID 5

Located 0.06 Miles S of Property

OWNER

NAME	DIAMOND SHAMROCK REFINING AND MARKETING COMPANY
ADDRESS	PO BOX 696000, SAN ANTONIO, TX, 78269
CONTACT	KENT HAMEL
PHONE	210-345-4670

TANK(S)

TANK ID	4
TYPE	UST
INSTALLED	01/01/1974
STATUS / DATE	REMOVED FROM GROUND / 12/21/1989
CAPACITY (in gallons)	10000
CONTENTS	DIESEL
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

TANK ID	1
TYPE	UST
INSTALLED	01/01/1974
STATUS / DATE	REMOVED FROM GROUND / 12/21/1989
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	3
TYPE	UST
INSTALLED	01/01/1974
STATUS / DATE	REMOVED FROM GROUND / 12/21/1989
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	2
TYPE	UST
INSTALLED	01/01/1974
STATUS / DATE	REMOVED FROM GROUND / 12/21/1989
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

TANK ID	6
TYPE	UST
INSTALLED	NOT REPORTED
STATUS / DATE	REMOVED FROM GROUND / 12/31/1989
CAPACITY (in gallons)	3000
CONTENTS	UNKNOWN
TANK MATERIAL	NOT REPORTED
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	7
TYPE	UST
INSTALLED	NOT REPORTED
STATUS / DATE	REMOVED FROM GROUND / 12/31/1989
CAPACITY (in gallons)	3000
CONTENTS	UNKNOWN
TANK MATERIAL	NOT REPORTED
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	5
TYPE	UST
INSTALLED	NOT REPORTED
STATUS / DATE	REMOVED FROM GROUND / 12/31/1989
CAPACITY (in gallons)	3000
CONTENTS	UNKNOWN
TANK MATERIAL	NOT REPORTED
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

FACILITY

ID	0019581
FACILITY TYPE	UNIDENTIFIED
NAME	MOHAWK CO
ADDRESS	4068 BELLAIRE BLVD, HOUSTON, TX
CONTACT	
PHONE	866/492-6836

X = -95.442478
Y = 29.706195

MAP ID 6

Located 0.09 Miles SW of Property

OWNER

NAME	SOUTHWESTERN BELL TELEPHONE LP
ADDRESS	308 S AKARD ST 3 SBC PLAZA RM 900, DALLAS, TX, 75202
CONTACT	HARRY C HIXSON
PHONE	866-492-6836

TANK(S)

TANK ID	1
TYPE	UST
INSTALLED	12/31/1972
STATUS / DATE	IN USE / NOT REPORTED
CAPACITY (in gallons)	9862
CONTENTS	DIESEL
TANK MATERIAL	STEEL
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	ANNUAL PIPING TIGHTNESS TEST (@ 0.1 GPH)
TANK CORROSION PROTECTION	CATHODIC PROTECTION - FACTORY INSTALLATION
PIPE CORROSION PROTECTION	CATHODIC PROTECTION - FACTORY INSTALLATION
SPILL & OVERFILL PROTECTION	AUTO. DELIVERY SHUT/OFF VALVE

FACILITY

ID	0041656
FACILITY TYPE	FLEET REFUELING
NAME	CITY OF WEST UNIVERSITY PLACE
ADDRESS	3826 AMHERST ST, HOUSTON, TX
CONTACT	NEIGHBORS
PHONE	713/662-5845

X = -95.438767
Y = 29.715866

MAP ID 7

Located 0.09 Miles N of Property

OWNER

NAME	CITY OF WEST UNIVERSITY PLACE
ADDRESS	3826 AMHERST ST, HOUSTON, TX, 77005
CONTACT	BRADLEY NEIGHBORS
PHONE	713-662-5845

TANK(S)

PETROLEUM STORAGE TANKS (PST)

TANK ID	1
TYPE	UST
INSTALLED	01/01/1961
STATUS / DATE	REMOVED FROM GROUND / 08/31/1991
CAPACITY (in gallons)	6000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	4
TYPE	UST
INSTALLED	01/01/1958
STATUS / DATE	REMOVED FROM GROUND / 08/31/1991
CAPACITY (in gallons)	8000
CONTENTS	UNKNOWN
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	3
TYPE	UST
INSTALLED	01/01/1961
STATUS / DATE	REMOVED FROM GROUND / 08/31/1991
CAPACITY (in gallons)	6000
CONTENTS	DIESEL
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

TANK ID	2
TYPE	UST
INSTALLED	01/01/1958
STATUS / DATE	REMOVED FROM GROUND / 08/31/1991
CAPACITY (in gallons)	5000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	STEEL
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	1
TYPE	UST
INSTALLED	06/01/1993
STATUS / DATE	IN USE / NOT REPORTED
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	COMPOSITE (STEEL W/EXTERNAL FRP CLADDING)
TANK CONTAINMENT	SINGLE WALL
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	SINGLE WALL
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

FACILITY

ID	0054808
FACILITY TYPE	RETAIL
NAME	FORMER PRESSLEYS CHEVRON
ADDRESS	4061 BELLAIRE BLVD, HOUSTON, TX
CONTACT	JIM PRESSLEY
PHONE	713/668-7460

X = -95.442468

Y = 29.705710

MAP ID 8

Located 0.10 Miles SW of Property

OWNER

NAME	PRESSLEYS CHEVRON
ADDRESS	5102 GRAND LAKE ST, BELLAIRE, TX, 77401
CONTACT	JIM PRESSLEY
PHONE	713-668-7460

TANK(S)

PETROLEUM STORAGE TANKS (PST)

TANK ID	170283
TYPE	UST
INSTALLED	06/01/1990
STATUS / DATE	REMOVED FROM GROUND / 03/29/2000
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	170278
TYPE	UST
INSTALLED	06/01/1990
STATUS / DATE	REMOVED FROM GROUND / 03/29/2000
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	170282
TYPE	UST
INSTALLED	06/01/1990
STATUS / DATE	REMOVED FROM GROUND / 03/29/2000
CAPACITY (in gallons)	10000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

TANK ID	170288
TYPE	UST
INSTALLED	06/01/1990
STATUS / DATE	REMOVED FROM GROUND / 03/29/2000
CAPACITY (in gallons)	560
CONTENTS	USED OIL
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	FRP(FIBERGLASS-REINFORCED PLASTIC)
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	FRP TANK OR PIPING (NONCORRODIBLE)
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	1A
TYPE	UST
INSTALLED	01/01/1950
STATUS / DATE	REMOVED FROM GROUND / NOT REPORTED
CAPACITY (in gallons)	550
CONTENTS	USED OIL
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	4A
TYPE	UST
INSTALLED	01/01/1959
STATUS / DATE	REMOVED FROM GROUND / NOT REPORTED
CAPACITY (in gallons)	6000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

PETROLEUM STORAGE TANKS (PST)

TANK ID	3A
TYPE	UST
INSTALLED	01/01/1959
STATUS / DATE	REMOVED FROM GROUND / NOT REPORTED
CAPACITY (in gallons)	6000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

TANK ID	2A
TYPE	UST
INSTALLED	01/01/1954
STATUS / DATE	REMOVED FROM GROUND / NOT REPORTED
CAPACITY (in gallons)	5000
CONTENTS	GASOLINE
TANK MATERIAL	STEEL
TANK CONTAINMENT	NOT REPORTED
PIPE MATERIAL	NOT REPORTED
PIPE CONTAINMENT	NOT REPORTED
TANK RELEASE DETECTION	NOT REPORTED
PIPE RELEASE DETECTION	NOT REPORTED
TANK CORROSION PROTECTION	NOT REPORTED
PIPE CORROSION PROTECTION	NOT REPORTED
SPILL & OVERFILL PROTECTION	NOT REPORTED

DATABASE DEFINITIONS

Brownfields Site Assessments (BSA)

This database is maintained by the Texas Commission on Environmental Quality (TCEQ) as part of the Brownfields Redevelopment Initiative program. This program provides for the cleanup of contaminated brownfield properties to aid in transferability and revitalization The brownfields in this database have been given funding for site assessments and / or redevelopment. This database contains basic site information, contaminate categories, affected media, and other applicant information. Other information is often available from the files located in TCEQ Central Records - Austin. These files can be obtained and/or researched by Atlas Environmental Research at your request. See http://www.tceq.state.tx.us for more information.

Comprehensive Environmental Response, Compensation & Liability Information System (CERCLIS)

The CERCLIS Database is the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database that contains information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation. The database includes sites that are on the National Priorities List (NPL) or are being considered for the NPL. More information can be obtained on the EPA's website at www.epa.gov.

Closed & Abandoned Landfill Inventory (CLI)

This database was originally obtained by Atlas E.R., Inc. in October 2003. The information contained within this database was collected by the TNRCC (TCEQ) under contract with Southwest Texas State University (Texas State University) under authorization by Texas House Bill 2537 beginning in 1993 and continuing through the present. After the initial inventory by the TNRCC (TCEQ) and Southwest Texas State University (Texas State University), the information was passed on to the regional councils of governments (COGs). The COGs are required under House Bill 2537 to include an inventory of closed municipal solid waste landfills in their regional plans for solid waste management. These requirements are referenced in the Texas Health and Safety Code, Chapter 363.064. Other information is often available from the Landfill files located in TCEQ Central Records - Austin. These files can be obtained and/or researched by Atlas Environmental Research at your request. See http://www.tceq.state.tx.us for more information.

Delisted National Priority List (DNPL)

This database contains sites that were originally on the EPA National Priority List. They have been deleted or "delisted" because remedial action has been completed as ordered by the EPA.

Emergency Response Notification System (ERNS)

The Emergency Response Notification System (ERNS) is an archived database that stores information on notifications of oil discharges and hazardous substances releases through the year 2000. ERNS provides the most comprehensive data compiled on notifications of oil discharges and hazardous substance releases in the United States from 1986 - 2000. During its use, more than 275,000 release notifications were entered into ERNS. In mid-2000, the EPA began phasing out their responsibility for maintaining the ERNS database and turning over full control to the National Response Center (NRC). The database was redesigned and

renamed the National Response System (NRS). The NRC is now the sole federal point of contact for reporting oil and chemical spills and the NRS is now the most comprehensive source of data compiled on notification of oil and chemical spills from the year 2000 to present. More information is available at http://www.nrc.uscg.mil.

Note: ASTM E1527-05 3.2.65 states that records which "do not have adequate address information to be located geographically are not generally considered practically reviewable." It also states that the information being reviewed "shall be such that the user can review the records for a limited geographic area" and that the information is not "practically reviewable unless they can be obtained from the source agency in the smaller geographic area of zip codes."

If the address, zip code, county, or other location fields in the ERNS/NRS database are blank, then that particular discharge or release record may not be included in the Atlas E.R. Regulatory Data Report.

Innocent Owner / Operator (IOP)

The Texas Innocent Owner / Operator Program (IOP) was created by House Bill 2776 of the 75th Legislature, and provides a certificate to an innocent owner or operator, under the Texas Health and Safety Code or Water Code, if their property has become contaminated as a result of a release or migration of contaminants from a source or sources not located on the property, and they did not cause or contribute to the source or sources of contamination. Like the VCP, the IOP can be used as a redevelopment tool or as a way to add value to a contaminated property by providing a certificate that confirms an innocent owner or operator is entitled to immunity from liability. This database is maintained by the Texas Commission on Environmental Quality (TCEQ). It contains basis site information, contaminate categories, affected media, and other applicant and consultant contact information. Other information is often available from the files located in TCEQ Central Records - Austin. These files can be obtained and/or researched by Atlas Environmental Research at your request. See http://www.tceq.state.tx.us for more information.

Leaking Petroleum Storage Tanks (LPST)

This database is maintained by the Texas Commission on Environmental Quality (TCEQ) - Petroleum Storage Tank Division. It contains summary information about leaking tanks reported to the commission such as identification numbers, location information, responsible party information, and priority and status codes. Other information, including maps of monitor wells, subsurface information, and contaminant data is often available in report format from the LPST file located in TCEQ Central Records - Austin. These files can be obtained and/or researched by Atlas Environmental Research at your request. See http://www.tceq.state.tx.us for more information.

Municipal Solid Waste Landfills (MSWLF)

This database is maintained by the Texas Commission on Environmental Quality (TCEQ) - Municipal Solid Waste Division. It contains summary information about landfills permitted by the commission such as identification numbers, location information, applicant / owner information, and site characteristics / status. Other information is often available from the Landfill files located in TCEQ Central Records - Austin. These

files can be obtained and/or researched by Atlas Environmental Research at your request. See http://www.tceq.state.tx.us for more information.

No Further Remedial Action Planned (NFRAP)

Archive (NFRAP) sites have been removed and archived from the CERCLIS inventory. This designation means that to the best of the EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the NPL, unless information indicates that this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site. It only means that based upon available information, the location is not judged to be a potential NPL site. This database contains the same fields and information as CERCLIS. More about NFRAP can be found on the internet at http://www.epa.gov.

National Priority List (NPL)

The NPL serves primarily informational purposes, identifying for the States and the public those sites or other releases that appear to warrant remedial actions. Section 105(a)(8)(B) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, requires that the statutory criteria provided by the Hazardous Ranking System (HRS) be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. Sites that are placed on the National Priorities List are also known as Superfund sites and are considered priorities for State and Federal cleanup efforts. Information concerning NPL sites is maintained by the EPA - Office of Emergency and Remedial Response. More about the NPL / Superfund program can be found on the internet at http://www.epa.gov.

National Response System (NRS)

See ERNS Database.

Proposed National Priority List (PNPL)

A site that has been proposed by the Environmental Protection Agency for listing on the National Priority List.

Petroleum Storage Tanks (PST)

This information is maintained by the Texas Commission on Environmental Quality (TCEQ) - Petroleum Storage Tank Division. It has been retrieved from the TCEQ's TRACS PST System. Facility, owner, operator, and specific tank information is maintained within nine files in this system. These files contain information on above / underground storage tanks that have been registered with the TCEQ. Owner and facility address and contact name information has been extracted for all tanks in this database. Specific tank data such as status, installation date, capacity, construction, and contents has been included in this report. See http://www.tceq.state.tx.us for more information.

Resource Conservation & Recovery Act (RCRA)

This database was obtained from the Environmental Protection Agency. RCRAInfo is a national program management and inventory system of RCRA (Resource Conservation and Recovery Act) hazardous waste handlers. Handlers can be characterized as either Treatment, Storage, Disposal, and Combustion Facilities (TSD's), Generators (Large Quantity, Small Quantity, or Conditionally Exempt), or Transporters. RCRIS captures identification and location data for all handlers and a wide range of information on TSDs regarding permit/closure status, compliance with Federal and State regulations, and cleanup activities. Information regarding state and/or federal evaluations, violations, and enforcement actions is also maintained within RCRISInfo. More about RCRISInfo can be found on the internet at http://www.epa.gov.

State Superfund (SUPER)

The Texas Commission on Environmental Quality (TCEQ) is required under the Texas Solid Waste Disposal Act, Texas Health and Safety Code Chapter 361, as amended, to identify and assess facilities that may constitute an imminent and substantial endangerment to public health and safety or the environment due to a release or threatened release of hazardous substances into the environment. Information on State Superfund Sites is maintained by the TCEQ - Pollution Cleanup Division. More information is available on the internet at http://www.tceq.state.tx.us. Additional information on each site in the Atlas E.R. Regulatory Data Report is available from TCEQ Central Records - Austin. This information can be obtained and/or researched by Atlas Environmental Research at your request.

Voluntary Cleanup Program (VCP)

This database is maintained by the Texas Commission on Environmental Quality (TCEQ) - Pollution Cleanup Division. It contains basic site information, contaminate categories, affected media, and other applicant and consultant contact information. Other information is often available from the VCP files located in TCEQ Central Records - Austin. These files can be obtained and/or researched by Atlas Environmental Research at your request. The Texas Voluntary Cleanup Program (VCP) provides administrative, technical, and legal incentives to encourage the cleanup of contaminated sites in Texas. Since all non-responsible parties, including future lenders and landowners, receive protection from liability to the state of Texas for cleanup of sites under the VCP, most of the constraints for completing real estate transactions at those sites are eliminated. As a result, many unused or under used properties may be restored to economically productive or community beneficial use. Also under the VCP, site cleanups follow a streamlined approach to reduce future human and environmental risk to safe levels. Any site not subject to an order or permit from the TCEQ is eligible to enter the VCP, except in cases where TCEQ enforcement action is pending. Parties entering the VCP must submit an application, an environmental site assessment describing the contaminated area of concern, and an application fee. Upon acceptance of the application, the applicant must sign an agreement that describes a schedule of events necessary to achieve cleanup and confirms that the applicant has agreed to pay all VCP oversight costs. After completion of the cleanup, the parties will receive a certificate of completion from the TCEQ, which states that all non-responsible parties are released from all liability to the state for cleanup of areas covered by the certificate. Parties may terminate their participation in the VCP at any time by written notice. See http://www.tceq.state.tx.us for more information.

APPENDIX B: RECORDS OF COMMUNICATION

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/14/2006
TELEPHONE #:	713-662-5835
NAME OF CONTACT:	Steve Ralls
TIME OF CONTACT:	10:40 am

DESCRIPTION (WHAT WAS SAID)

Mr. Ralls is the Fire Department Chief for the City of West University in Harris County, Texas. As far as he knows, there have been no hazardous material spills on College Avenue between University Boulevard and Bellaire Boulevard for the last 30 years unless they were not reported. He explained that the portion of the College Avenue Project is mostly residential and unlikely to experience hazardous spills.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PAGE 1 OF 1

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Ron Axman
TIME OF CONTACT:	9:30 am

DESCRIPTION (WHAT WAS SAID)

Mr. Axman works for the City of West University Public Works facility, located at 3825 Milton. He has worked there since 1993. He confirmed that there is a petroleum storage tank for fleet refueling, as shown in the regulatory database report. The tank provides both gasoline and diesel fuel. They also have a tank for oil waste that is emptied by a service. Regarding the leaking petroleum storage tank listed in the database report, he explained that the tanks and surrounding soil were removed and everything has been cleaned up. The tank that is there currently is new. He requested that we contact his supervisor, Brad, with any more questions at 713-662-5832.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Johnny Wilson
TIME OF CONTACT:	10:15 am

DESCRIPTION (WHAT WAS SAID)

Mr. Wilson works for the Pilgram Cleaners, located in an upstairs suite at 6723 Stella Link. He has been with the company for 21 years. Currently, the facility serves as business offices for Pilgram Cleaners. He explained that there had been a dry-cleaning plant on the ground floor in the past, at least 10 years ago. Currently, as far as he knows, there are no tanks at the location.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Tony Do
TIME OF CONTACT:	10:30 am

DESCRIPTION (WHAT WAS SAID)

Mr. Do has worked at West University Cleaners, located at 3920 Bellaire Boulevard, for 1 ½ years. The facility does dry-cleaning service on site. He stated that they receive chemicals from Harkrider Dist. Co. Inc. and store them in a tank according to regulations. They use Sweetwater as a chemical waste pick-up service. He knew of no problems or violations regarding hazardous chemicals on the property.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Jesse Barfield
TIME OF CONTACT:	11:50 am

DESCRIPTION (WHAT WAS SAID)

Ms. Barfield has worked for the Pilgrim Cleaners, located at 4001B Bellaire Boulevard, for three years. They do not do any on-site dry cleaning and therefore handle no hazardous chemicals.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Rosa Urbieta
TIME OF CONTACT:	12:00 am

DESCRIPTION (WHAT WAS SAID)

Ms. Urbieta has worked for the River Oaks Cleaners, located at 3907 Bellaire Boulevard, for two years. They provide on-site dry cleaning services, use a service to dispose of waste chemicals, and have had no problems or citations regarding hazardous chemicals.

Tolunay-Wong Engineers, Inc.
Houston, Texas

RECORD OF COMMUNICATION

PAGE 1 OF 1

PROJECT:	College Avenue Project
PROJECT NO.:	06.12.055
CLIENT:	Claunch & Miller, Inc.
DATE:	08/23/2006
TELEPHONE #:	In person interview
NAME OF CONTACT:	Bryan Guishard
TIME OF CONTACT:	2:00 pm

DESCRIPTION (WHAT WAS SAID)

Mr. Guishard works for Jiffy Lube, located at 3435 West Holcomb Boulevard. They provide minor automotive repair and oil change services. They have two petroleum storage tanks. Waste oil is stored in the basement and removed with a service. We were shown another petroleum waste disposal tank and there was no staining surrounding it. There were also no monitoring wells visible on the property. He knew of no problems or citations associated with any of the tanks on the property.

APPENDIX C: CITY DIRECTORY SEARCH RESULTS

ATLAS

Assessment, Compliance and Permitting Support

August 18, 2006

Amy Kunza
Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Parkway, Suite 100
Houston, Texas 77031

Re: City Directory Search
College Avenue Project Phase I ESA
Houston, Texas
Job #06-08-930

Dear Ms. Kunza:

Atlas Environmental Research has reviewed city directories for the above referenced site. Atlas has attempted to review these directories in five year increments dating back fifty years. Any gaps in this research reflect gaps in the Texas State Library's and the Center for American History's collections concerning this site.

3936, 4003-4007 Bellaire Boulevard:

2002-all addresses are individuals or vacant except:

3936-A & D Lamp Co
4003-Asthma & Lung Hstn
-ATP Fitness Center
-Baylor Clg Medcn
-Chrysalis Dance
-Ford E Gerald DMV
-Packaging Store
-U-HI Co Indpndnt
-W U Dance Ctr
-W U Karate Academy
-W Univ Dance Ctr
4004-Whole Foods Market
-Whole Foods Market
-Whole Foods Market
-Whole Foods Market
-Whole Foods Market
-Whole Fds Mkt Inc
4005-Building
-Silver Palc Chin
4007-Building
-Apollo Image
-Brain Injry Rsrch
-Nrctcs Anon 24 Hr
-Option Cr Entrprss

ATLAS E. R., Inc.
8705 Shoal Creek Blvd., Suite 207 • Austin, Texas 78757
800.940.0977 • 512.339.4155 • FAX 512.339.4413

3936, 4003-4007 Bellaire Boulevard (continued):

1984-all addresses are individuals or vacant except:
- 4003-Herald Publishing Co graphics & typesetting
  - -Herald Graphics
- 4004-Grocery Store The
- 4005-Herald Graphics (Ofc)
- 4005 ½-Bargain Counter used clo

1980-all addresses are individuals or vacant except:
- 3936-Cellar Door (Admn Ofc)
- 4003-Herald Publishing Co
  - -Herald Graphics
- 4004-Fed-Mart Stores Inc dept store
  - -Fed-Mart Pharmacy
- 4005-Herald Graphics (Ofc)
- 4005 ½-Bargain Counter used clo
- 4006-F-M Liquor

1975-all addresses are individuals or vacant except:
- 3936-Cellar Door
- 4004-Fed-Mart Stores Inc dept store
  - -Fed-Mart Pharmacy
- 4005-Hinson Brothers oil producers
- 4005 ½-Bargain Counter used clo
- 4006-American Health Food Co
- 4007a-Offic Bldg (vacant)
- 4007b-Ofc Bldg
  - 5-De Jean Gene hypnotist
  - 6-Instant Maids No 6
- 4007c-Baxter Coiffures

1970-all addresses are individuals or vacant except:
- 3936-Hannah's Old Time Pies
- 4003-Davis Frank A dentist
  - -Mendell Henry E phys
  - -Mendell Jack L phys
  - -Rhodes Wm H dentist
- 4004-Fed-Mart Stores Inc dept store
  - -Fed-Mart Pharmacy
- 4005-Hannah John T Investments
  - -Ayrshire Corp real estate
  - -Cantrell Ralph B geol
- 4005 ½-Bargain Counter used clo
- 4006-American Health Food Co
- 4007a-Breedlove Plummer Inc landscape
  - 1-A D C O Real Estate
  - 6-Cooperative Electronics Co temperature controls
- 4007b-Ofc Bldg
  - 1-Richardson R L realty
  - 2-Scientific Marketing
  - 4-De Jean Gene hypnotist
  - 6-Visual Electronics Corp
  - 7-Space Electronics mfg rep electronic equip
  - 8-Hammond Inc adv & publ
  - 9-Lutheran Brotherhood Insurance
  - 10-Knox Insurance Agency
  - 11-McIntire Realty & Leasing
  - 12-Britt Jim Realty
  - 13-Church Computer Systems Inc (Ofcs)

3700, 3800, 3900, 4000, 4100, 4200 Blocks of Bellaire Boulevard (1970 continued):

4007b-Ofc Bldg continued
14-Chemetron Corp Sale of Catalysts
15-Church Computer Systems Inc
16-Ann's Answering Service
17-Church Computer Systems Inc (Ofcs)
18-Armour Industrial Chemical Co
19-Lacaze Printing
20-Ryco Engineering
-Daggett Max Jr & Associates mfg rep
4007c-Baxter Coiffures

1965-all addresses are individuals or vacant except:
3936-Interurban Pharm
4003-Davis Frank A dentist
-Mendell Jack L phys
-Rhodes Wm H dentist
4004-Fed-Mart Pharmacy
4005-Bargain Counter used clo
4007-Building
-Murphy Watson Realty
-Reese Aretta real est
-Mid-Continent Steel Castings Corp
-Swanson Eng & Mfg Co mfrs agts
-Cleveland Tramrail heavy equip
-Day Sls machy
-Girdler Catalysts chem.
-Harrell Ins Agcy
-Peck Gordon V Co The mfrs agts
-Baxter Coiffures beauty shop
-Knox Ins Agcy
-Visual Electronics Corp
-Stromatt Anne Realtor
-Tate & Roe Equip Co machy dlrs
-Mallory P R & Co electronic equip
-Ann Secretarial Serv
4007-Building continued
-Beane R C Instruments electronic
-Pennsalt Chem Corp
-Productive Equip pump mfrs
-Universal Magnetics Inc elec equip
-Westshire Corp real estate

1960-all addresses are individuals or vacant except:
3936-Interurban Pharm
4003-Lunin Arth B phys
-Boulevard Land Co real est
-Cantrell Ralph B geol
-Univ Place Realty Co
4007-Mid-Continent Steel Castings Corp
-Lbr Mut Fire Ins Co
-Sangamo Elec Co contr
-Swanson Eng & Mfg The mfr rep
-Peck Gordon V Co The mfr rep
-Portland Cement Assn bus organization
-Bullock Alex Assoc ins
-Knox Ins Agcy
-Schutte & Koerting Co mfrs agt

3700, 3800, 3900, 4000, 4100, 4200 Blocks of Bellaire Boulevard (1960 continued):

4007-continued
-Gibson Flavius M ins
-Visual Electronics Corp
-Ayrshire Printing Co
-Stromatt Anne Realtor
-Tate & Roe Equip Co machy dlrs
-US Borax & Chem Corp (br)
-Mallory P R & Co Inc electronic equip
-Ayshire Secretarial Serv

1955-all addresses are individuals or vacant except:
3936-Interurban Pharm
4002-10-Henke & Pilot Inc No 17 gro
4007-Mahr Frank R jr ins agt
-Servco Gulf Corp oil field serv
-Ayrshire Secretarial Serv

3839, 3839, 3901 and 3902 Byron Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3835, 3836, 3901 and 3901 Case Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

6300, 6400, 6500 and 6600 blocks of College Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant except:
6630-no return
1980-no listings for these blocks
1975-no listings for these blocks
1970-no listings for these blocks
1965-no listings for these blocks
1960-no listings for these blocks
1955-no listings for these blocks

3835, 3836, 3901 and 3902 Marquette Street:

2002-all addresses are individuals or vacant except:
3836-The Stivison Co
-Stvsn Ralph Archt
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant

3835, 3836, 3901 and 3902 Marquette Street (continued):

1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3833, 3836, 3901 and 3902 Oberlin Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3835, 3836, 3900 block, 4001 and 4004 Riley Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3832, 4003 and 4004 Ruskin Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3833, 3834, 3901 and 3904 Southwestern Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3835, 3836, 3901 and 3902 Swarthmore Street:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3834, 3835, 3901 and 3902 University Boulevard:

2002-all addresses are individuals or vacant
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

3835, 3836, 3901 and 3902 Villanova Street:

2002-all addresses are individuals or vacant except:
3836-Lowes Sarah M. CPA
1984-all addresses are individuals or vacant
1980-all addresses are individuals or vacant
1975-all addresses are individuals or vacant
1970-all addresses are individuals or vacant
1965-all addresses are individuals or vacant
1960-all addresses are individuals or vacant
1955-all addresses are individuals or vacant

6614 and 6700 block of Weslayan Street:

2002-all addresses are individuals or vacant except:
6713-Timeer Networking
6719-Reef Builders
-Sawadee TH Rstrnt
6723-T R Acpntr & Herb
6727-Golden Paws
1984-all addresses are individuals or vacant except:
6715-A & O Lamp Repair
6719-Swink's Lounge
6721-Informacio
6723-Bon Ton Cleaners
6725-Weslayan Medicosurgical Clinic
1980-all addresses are individuals or vacant except:
6713 ½-Wes-Land Realty Co
6715-A & O Lamp Repair
6719-Dart Lounge
6721-Raymonde's Beauty Salon
6723-Bon Ton Cleaners
6725-Weslayan Medicosurgical Clinic
6727-C D Nursery flowers sls
1975-all addresses are individuals or vacant except:
6713-Herald Publishing Co
6713 ½-Royal Super Markets
-Wes-Land Realty Co
6715-A & O Lamp Repair
6719-Wink's Lounge
6721-Raymonde's Beauty Shop
6723-Bon Ton Cleaners
6725-Weslayan Medicosurgical Clinic
6727-Cellar Door Restaurants (main office)
-Bell Catering & Products

6614 and 6700 block of Weslayan Street (continued):

1970-all addresses are individuals or vacant except:

6713 ½-Royal Super Markets
-Wes-Land Realty Co
6715-A & O Lamp Repair
6719-Black Orchid Lounge
6721-Style & Care Salon
6723-Bon-Ton Cleaners
-Colman's Dental Laboratory
6725-Weslayan Medicosurgical Clinic
6727-Cellar Door Restaurants (main ofc)

1965-all addresses are individuals or vacant except:

6713-Handee Food Mart Inc
6713 ½-Wes-Land Realty Co
-Royal Super Markets
6715-17-Champion Auto Supply
6719-Black Orchid Lounge
6721-Shears & Tears beauty shop
6723-Stanley Home Prods Inc (area ofc
-Nakfoor Emil A Ins Agcy
-Miller Mary C artist
-Bon-Ton Clns
6725-Weslayan Medicosurgical Clinic

1960-all addresses are individuals or vacant except:

6713-Handee Food Mart
6713 ½-Wes-Land Realty Co
-Royal Super Markets gro
6715-Summer Auto Sup
6717-Carousel Cleaners
6712-Stanley Home Prod Inc (area ofc)
-Nakfoor Emil A Ins agcy
-Davis Frank A dentist
6725-Weslayan Medicosurgical Clinic
6727-Southwest Book Store
-Thompson Mary M psychologist

1955-all addresses are individuals or vacant except:

6723-Wes-Land Realty Co
-Jones Wm T dentist
-Brent Jane optom
-Harvey John acct
6725-Weslayan Medicosurgical Clinic
6727-Southwest Bookstore
-Thompson Mary M psychologist

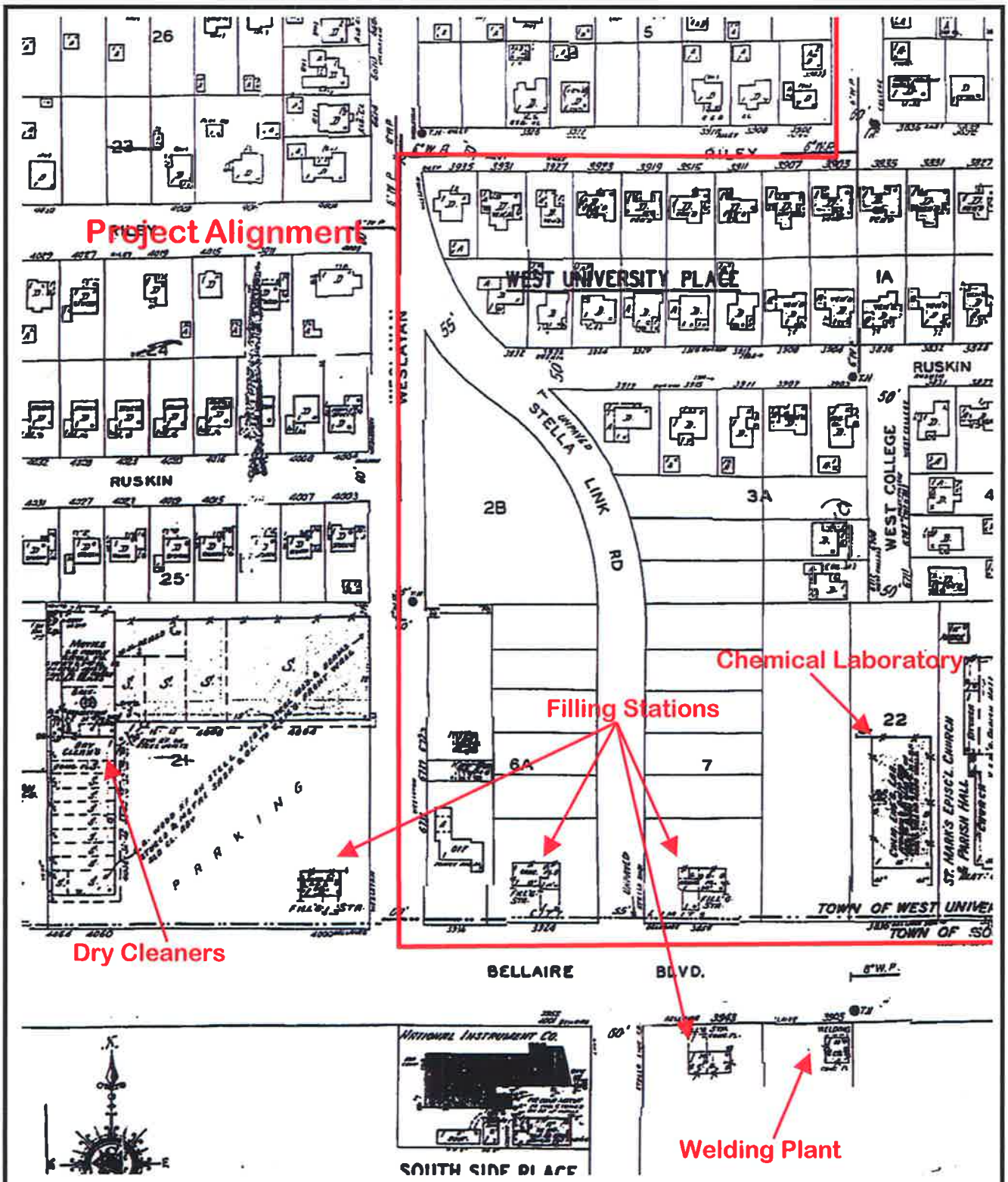
Please do not hesitate to call me at 800-940-0977 if you have any questions concerning this project. Thank you for utilizing Atlas's research services to meet your environmental information needs. I look forward to being of service to you in the future.

Sincerely,

Scott Anderson

Scott Anderson
Research Consultant

APPENDIX D: SANBORN MAP SEARCH RESULTS



1950 SANBORN MAP-
Weslayan Avenue and Bellaire Boulevard

Not to scale

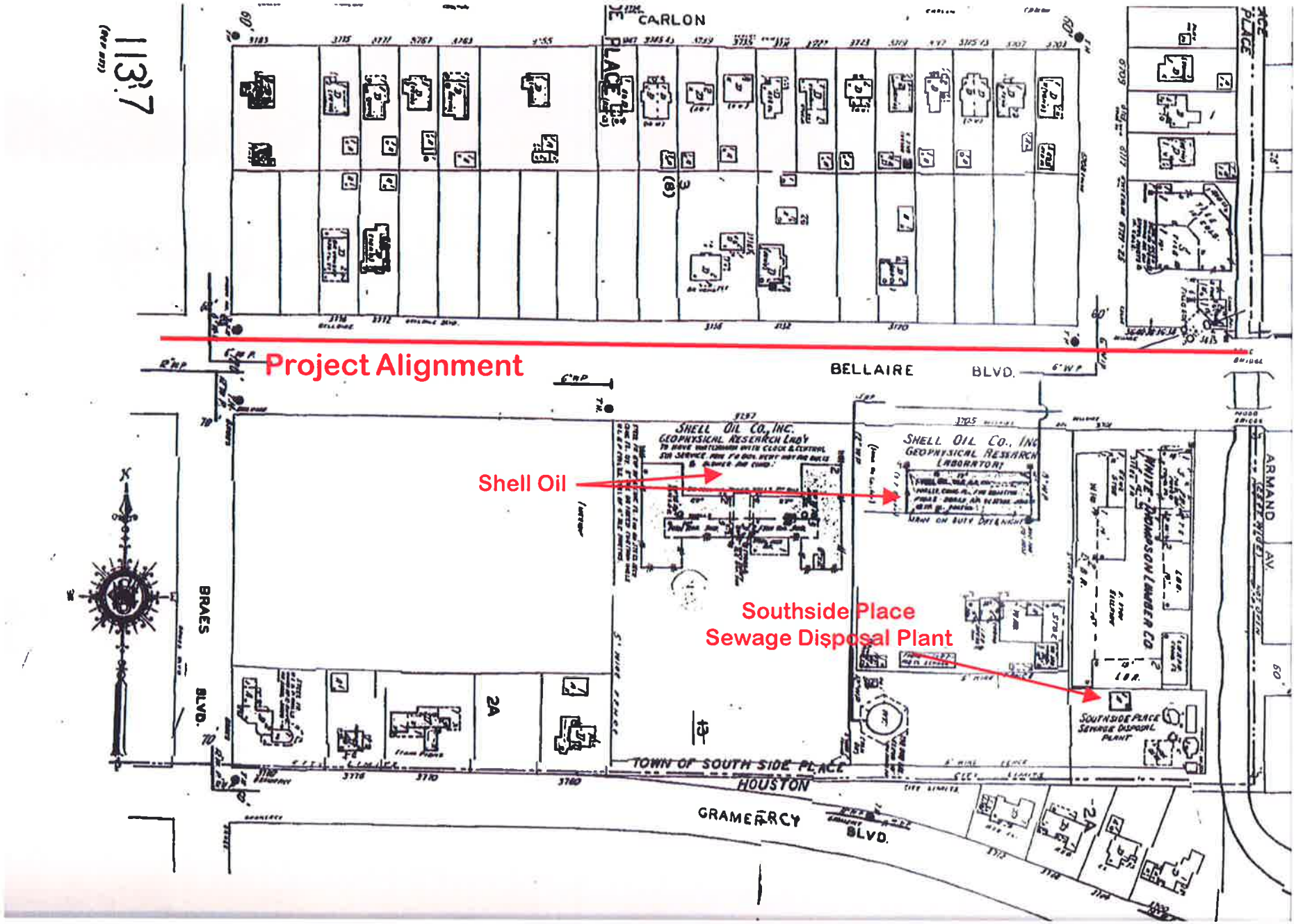
N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

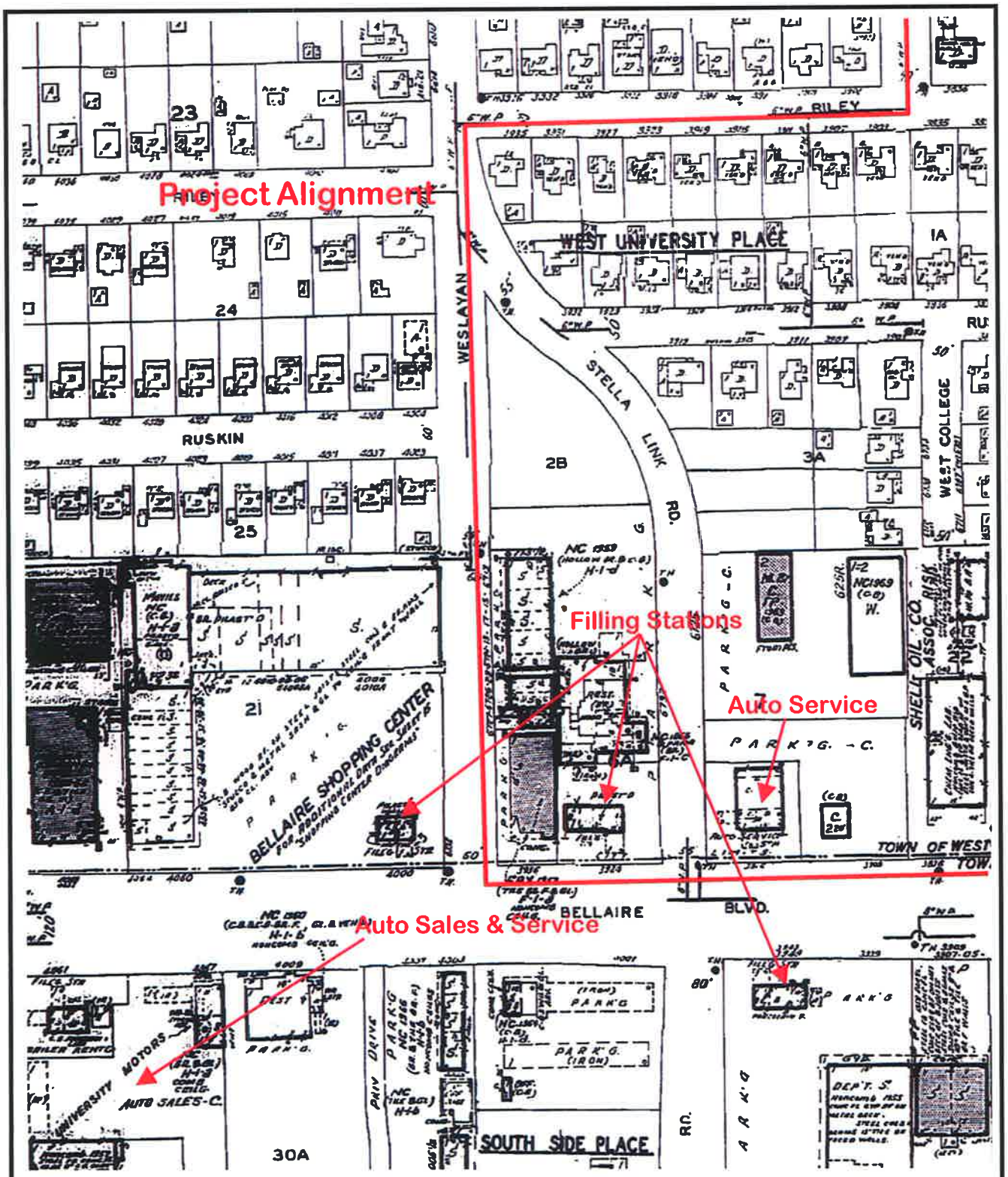
Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.



Project: Phase I ESA College Avenue Project City of West University Harris County, Texas	1950 SANBORN MAP- Bellaire Boulevard	Tolunay-Wong Engineers, Inc. Houston, Texas	N	Client: Claunch & Miller, Inc.	Project No.: 05.12.055



1969 SANBORN MAP-
Weslayan Avenue and Bellaire Boulevard

Not to scale

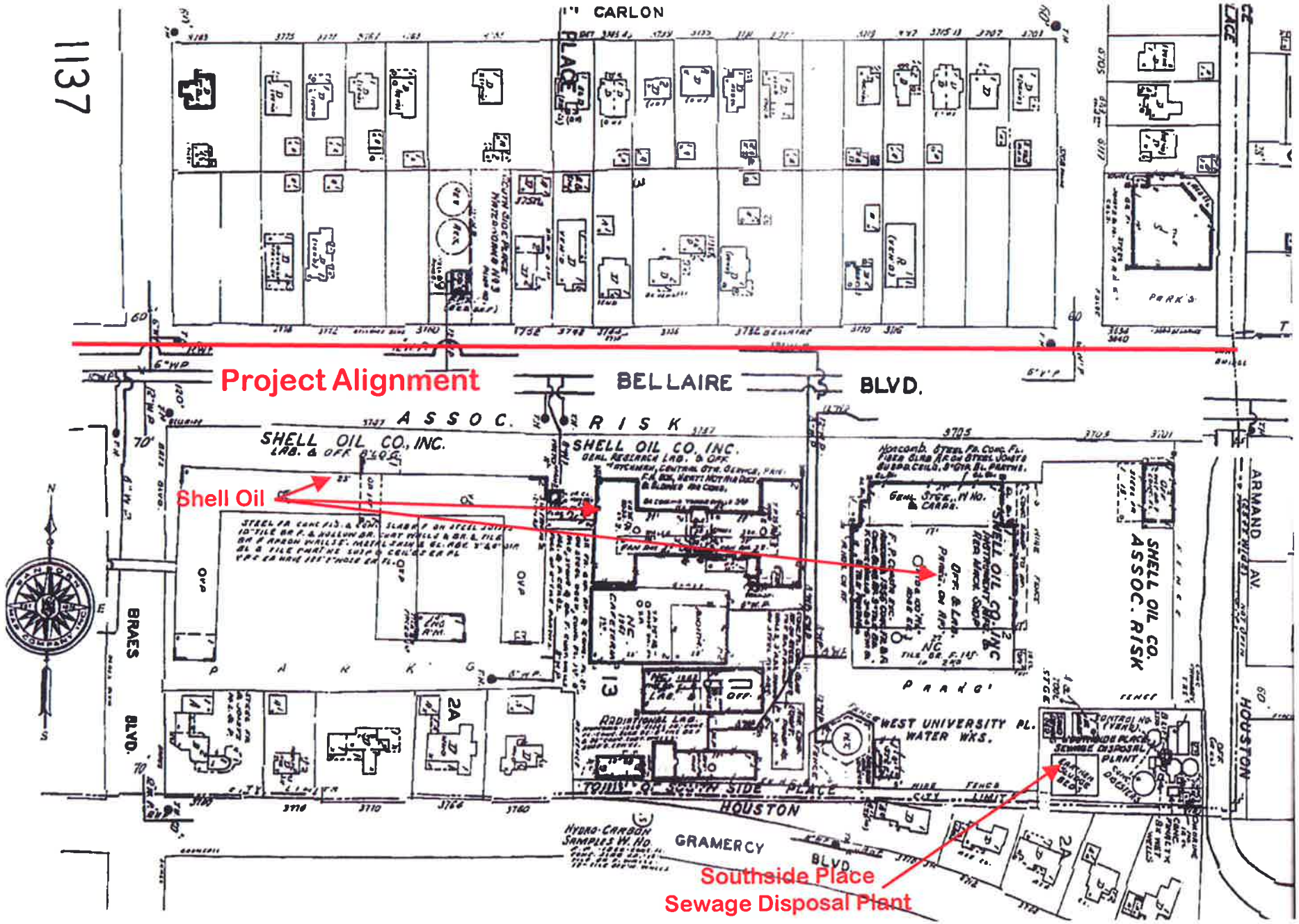
N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

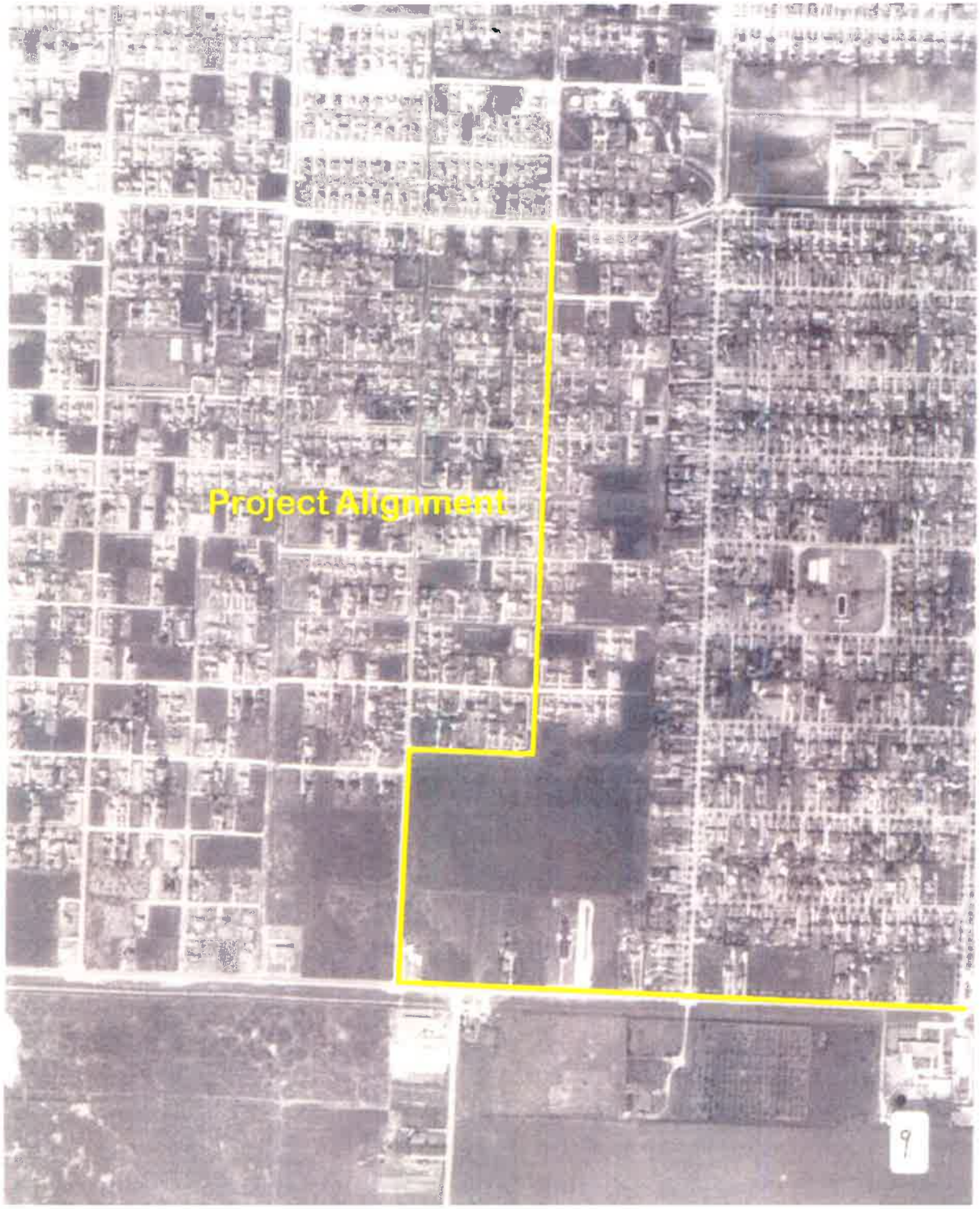
Project No.: 06.12.055

Client:
Claunch & Miller, Inc.



Project: Phase I ESA College Avenue Project City of West University Harris County, Texas	1969 SANBORN MAP- Bellaire Boulevard	Tolunay-Wong Engineers, Inc. Houston, Texas	N	Client: Claunch & Miller, Inc.	Project No.: 05.12.055

APPENDIX E: HISTORICAL AERIAL PHOTOGRAPHS



1944 Aerial Photograph

SOURCE: Agricultural Stabilization & Conservation Service via Atlas

Scale 1"=~650'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

1953 Aerial Photograph

SOURCE: Agricultural Stabilization & Conservation Service via Atlas

Scale 1"=~650'

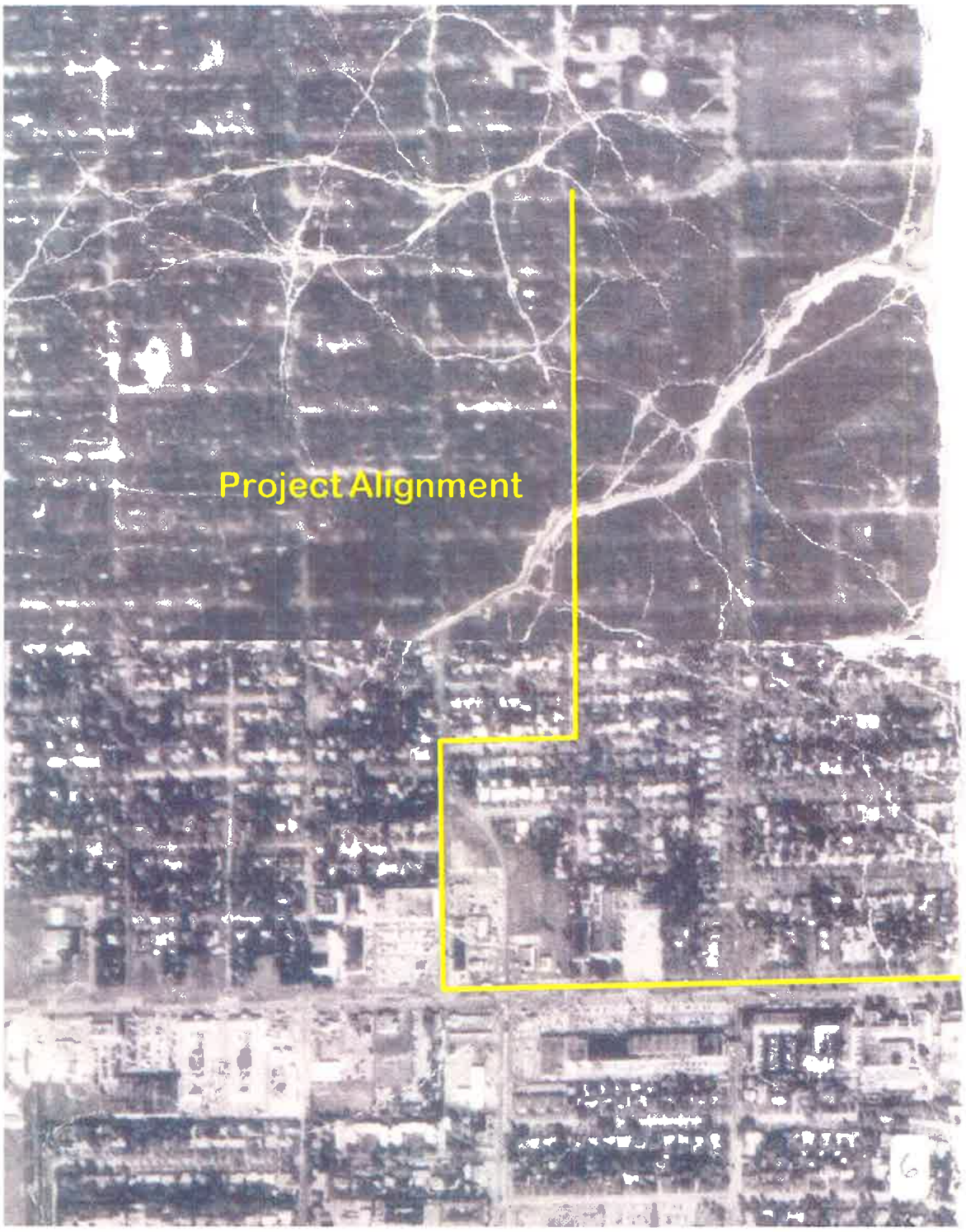
N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.



1969 Aerial Photograph
SOURCE: Wallace (private company) via Atlas

Scale 1"=~650'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

1979 Aerial Photograph
SOURCE: Texas Department of Transportation via Atlas

Scale 1"=~650'

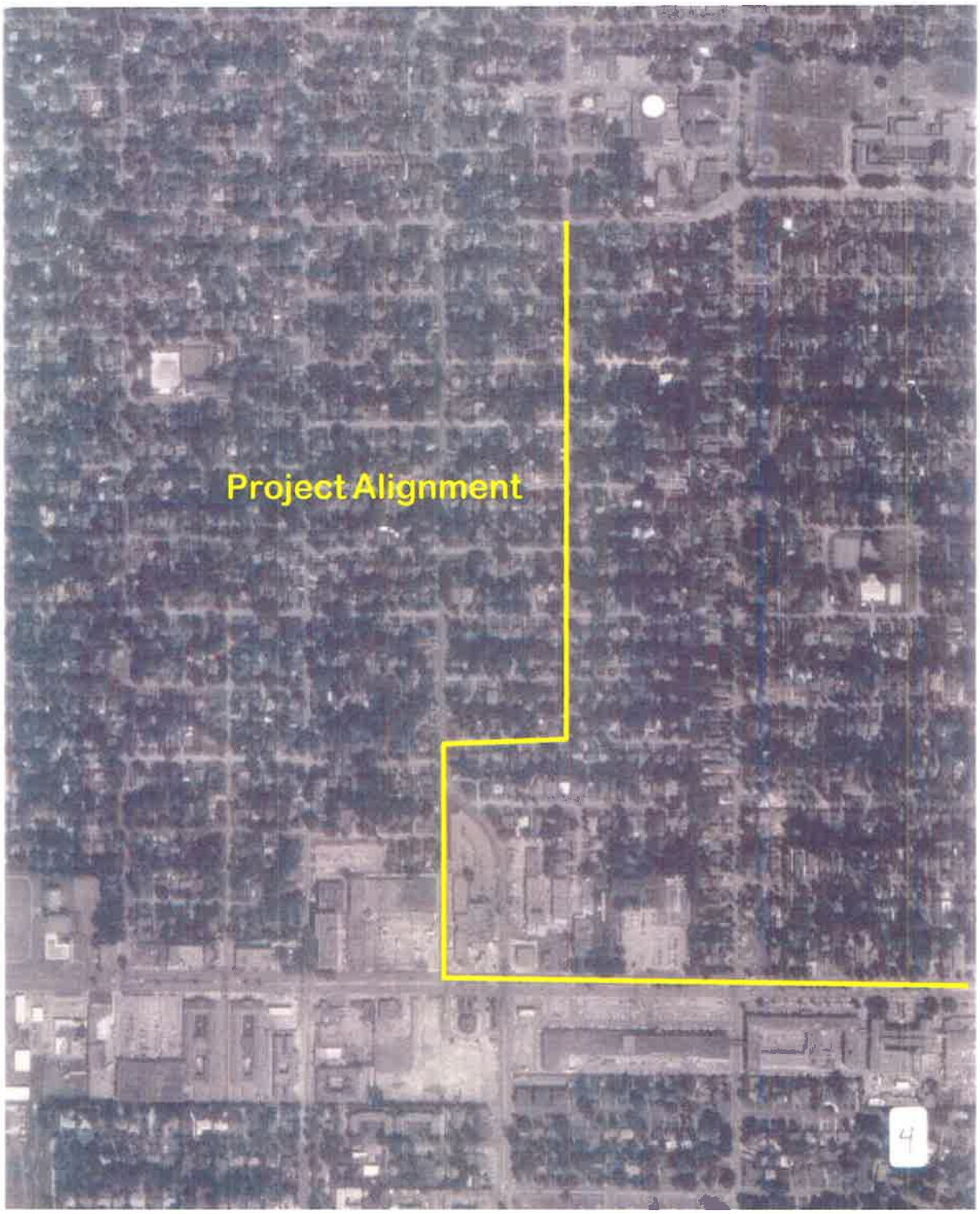
N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.



1986 Aerial Photograph
SOURCE: Texas Department of Transportation via Atlas

Scale 1"=~650'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

1995 Aerial Photograph
SOURCE: United States Geological Service via Atlas

Scale 1"=~650'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

2004 Aerial Photograph
SOURCE: United States Department of Agriculture via Atlas

Scale 1"=~650'

N

Project: Phase I ESA
College Avenue Project
City of West University
Harris County, Texas

Tolunay-Wong Engineers, Inc.
Houston, Texas

Project No.: 06.12.055

Client:
Claunch & Miller, Inc.

APPENDIX F: PROJECT ALIGNMENT RECONNAISSANCE PHOTOGRAPHS

Photo 1: South facing view of Project Alignment. Photo taken from corner of College Avenue and University Boulevard.

Photo 2: West facing view of Riley Street portion ofProject Alignment. Photo taken from College Avenue and Riley Street.

Photo 3: South facing view of Weslayan portion of Project Alignment. Photo taken from Weslayan Avenue and Riley Street.

Photo 4: North facing view of Weslayan portion of Project Alignment. Photo taken from Weslayan Avenue and Bellaire Boulevard.

Photo 5: South adjoining property showing Southside Village Shopping Center. Photo taken from Weslayan Avenue and Bellaire Blvd.

Photo 6: North facing view of Poor Farm Ditch and north adjoining property.

PROJECT ALIGNMENT RECONNAISSANCE PHOTOGRAPHS

Project: Phase I ESA College Avenue Project City of West University Harris County, Texas	Tolunay-Wong Engineers, Inc. Houston, Texas	Client: Claunch & Miller, Inc.	Project No.: 05.12.055

DRAFT

06-084 Phase II ESA

Prepared for:
CLAUNCH & MILLER, INC.
4635 Southwest Freeway, Suite 1000
Houston, Texas 77027

PHASE II ENVIRONMENTAL SITE ASSESSMENT
OF BELLAIRE BOULEVARD PROJECT
CITY OF SOUTHSIDE PLACE
HARRIS COUNTY, TEXAS

TWEI Project Number 07.12.018

July 2007

Prepared by:

Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Parkway W., Suite 100
Houston, Texas 77031
(713) 722-7064 Fax (713) 722-0319

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Figure 2: Recognized Environmental Conditions Location Map

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Appendix A: Soil Boring Logs

Appendix B: Xenco Laboratories Analytical Reports

1 EXECUTIVE SUMMARY

Tolunay-Wong Engineers, Inc., (TWEI) was requested by Claunch & Miller, Inc., (Claunch & Miller) to conduct a Phase II Environmental Site Assessment (ESA) for the Bellaire Boulevard Project, located in the City of Southside Place, Harris County, Texas.

The work was conducted by following, to the extent feasible, processes described in the *American Society for Testing and Materials (ASTM) Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process (ASTM E-1903-97 Reapproved 2002)*. The Phase II ESA was also conducted in general accordance with TWEI's proposal P06-E102, revision 2, dated December 1, 2006.

The objective of this subsurface Phase II investigation was to discover, document, and report potential impacted soils and groundwater along the Bellaire Blvd. Alignment in the areas of the recognized environmental conditions (RECs) (Figure 2). The analytical results indicate the presence of impacted subsurface media in the areas surrounding borings EB-3B, EB-1B, and EB-2C.

Soil samples from boring EB-3B exceed Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Limits (PCL) for soil to groundwater (GW) ingestion exposure pathways limits for toluene, ethylbenzene, and xylenes. Additionally, benzene and total petroleum hydrocarbons (TPH) for gasoline range hydrocarbons (C6-C12) were identified within the boring, all of which suggest contamination from fuels.

Groundwater samples collected from boring EB-3B contained reportable concentrations of benzene, toluene, ethylbenzene, and xylenes, and TPH (C6-C12). Of the identified chemicals of concern (COC), only toluene and ethylbenzene exceeded the ${}^{GW}GW_{Ing}$ (ingestion of Class 1 or Class 2 groundwater/leaching to Class 1 or Class 2 groundwater) and ${}^{GW}GW_{Class3}$ (soil to groundwater leaching to Class 3 groundwater) PCL. Samples collected from boring EB-1B contained elevated concentrations of tetrachloroethylene and trichloroethylene. The EB-1B concentration of tetrachloroethylene were found to exceed the established ${}^{GW}GW_{Ing}$ and ${}^{GW}GW_{Class3}$ PCL of 0.005 mg/L and 0.5 mg/L, respectively. Additonally, the concentration of trichloroethylene within the groundwater of EB-1B exceeded the established ${}^{GW}GW_{Ing}$ PCL of 0.005 mg/L and the ${}^{GW}GW_{Class3}$ PCL of and 0.5 mg/L. Tetrachloroethylene and trichloroethylene are frequently used in the dry cleaning of fabrics as well as degreasing metal surfaces. Groundwater samples collected from boring EB-2C contained reportable concentrations of BTEX-MTBE with the benzene concentration being 0.0103 mg/L, which exceeds the TRRP Tier 1 ${}^{GW}GW_{Ing}$ PCL of 0.005 mg/L.

It is our opinion that the data collected from the Phase II ESA indicate that subsurface media have been affected by releases of petroleum substances and volatile organic compounds (VOCs) from one or more of the "recognized environmental condition" sites identified in the Phase I ESA (Figure 2). Based on our findings, the limits of the contamination may be in the area of EB-1B and EB-3B as well as the immediately adjacent areas. W[illegible]end that copies of this report be included in the waterline const[illegible]ge as the conditions identified during the Phase II ESA could [illegible]rding worker safety, construction practices, and material disposal. [illegible]s for additional study.

Boring	GW	Soil
EB-3B	16' ✓	✓
EB-1B	16' ✓	
EB-2C	14' ✓	

2 INTRODUCTION

Tolunay-Wong Engineers, Inc., (TWEI) was requested by Claunch & Miller, Inc., (Claunch & Miller) to conduct a Phase II Environmental Site Assessment (ESA) for the Bellaire Boulevard Project, located in the City of Southside Place, Harris County, Texas. The Project Alignment and boring locations are presented in Figure 1.

2.1 PURPOSE

The purpose of the Phase II ESA was to evaluate the recognized environmental conditions (RECs) identified in the Phase I ESA (Figure 2), specifically to discover, document, and report potentially impacted soil and/or groundwater adjacent to or near the identified recognized environmental conditions (RECs) along the project alignment. This was done by following, to the extent feasible, processes described in the *American Society for Testing and Materials (ASTM) Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process (ASTM E-1903-97 Reapproved 2002)*. The Phase II ESA was also conducted in general accordance with TWEI's proposal P06-E102, revision 2, dated December 1, 2006.

2.1.1 Description of Work Performed

Twelve (12) soil borings were drilled with a direct-push drilling rig to obtain soil and groundwater samples for analytical testing. We evaluated the data to render an opinion regarding the possible releases of fuels, lubricants, and chlorinated solvents from the various current or previous establishments, which may have impacted subsurface media within the Project Alignment.

2.2 SPECIAL TERMS AND CONDITIONS

There were no special terms and conditions.

2.3 LIMITATIONS OF ASSESSMENT

The following were excluded from the scope-of-work for the Phase II ESA as stated in proposal P06-E102, revision 2, dated December 1, 2006:

- Radon;
- Lead-based paint;
- Wetlands determination;
- Lead in drinking water;
- Geologic faulting;
- Ecological resources;

3 BACKGROUND

Discussions of Project Alignment, description and features, physical setting, history and land use, adjacent property land use, and summary of previous assessments are included in the Tolunay-Wong Engineers, Inc. Phase I ESA Report No. 06.12.056, dated September 6, 2006.

4 PHASE II ESA ACTIVITIES

4.1 SCOPE OF ASSESSMENT

4.1.1 Supplemental Records Review

No additional records were reviewed.

4.1.2 Sampling Plan

The sampling plan consisted of installing twelve (12) borings to depths of 20 ft below grade surface (bgs) or to groundwater, whichever condition is shallower, in order to obtain twelve (12) soil samples and twelve (12) groundwater samples for testing. Boring locations are shown on Figure 1. Borings were placed approximately 50 ft to 75 ft apart at the priority RECs.

We notified Texas One Call and conducted a reconnaissance of the Project Alignment in the weeks before the drilling program to tentatively identify and clear the boring locations. The borings were installed on May 29, 2007, and May 30, 2007.

4.1.3 Chemical Testing Plan

TWEI submitted one (1) soil sample per boring location and, when possible, one (1) groundwater sample from each AOC for analytical analysis. Selection of the boring samples to be submitted was based on visual observations, screening with a photoionization detector (PID), and olfactory sensation.

Soil and groundwater samples submitted were analyzed for total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs). TPH was selected because it is a good, general indicator of gasoline, other fuels, lubricants, hydraulic oils, parts cleaning solvents, etc. VOC testing was selected because it is a good indicator of chlorinated solvents, a by-product of the dry cleaning process. Methyl-tert-butyl ether (MTBE), benzene, toluene, ethylbenzene, and xylenes (BTEX) analyses are included in VOC analysis. BTEX is a good indicator of gasoline, and MTBE is also an indicator of gasoline contamination.

4.2 FIELD EXPLORATION AND METHODS

4.2.1 Soil Borings

We used a direct-push drilling rig, thereby minimizing soil cuttings, at all boring locations. Upon completion of the sampling, the excess cuttings were packed into the borings. Borings were then backfilled to the bottom of the pavement with bentonite chips and then capped with concrete.

Groundwater was encountered at all of the boring locations with the exceptions of EB-4B, EB-5B, and EB-6B, which failed to produce any recoverable groundwater. Located groundwater was pumped to the surface with a peristaltic pump and clean, disposable tubing. Minimal volumes of purge water were produced, less than 1 liter (a de minimus condition), and were allowed to go to ground; therefore, disposal was not a concern. Groundwater samples were placed into laboratory-cleaned, 40-ml vials, and into an ice-filled chest for transport to Xenco Laboratories along with chain-of-custody documentation.

One hundred nineteen (119) soil samples were collected from twelve (12) borings and placed into laboratory-cleaned, 4-oz glass jars. The soil samples were handled in the same way as the groundwater samples. Headspace readings were obtained on all soil samples using a 10.6 eV photoionization detector calibrated to isobutylene. Hydrocarbon odors were noted in boring EB-3B from 6 feet to the bottom of the boring (20 ft). Based upon visual observations and vapor screening of the soil samples collected, a total of five (5) samples were selected and submitted to the laboratory for testing.

The push probe was detergent washed and rinsed with distilled water between borings to minimize the potential for cross contamination. New plastic sample liners were used for each push probe sampling interval.

4.3 SAMPLING AND CHEMICAL ANALYSES METHODS

4.3.1 Location of Sampling Points in Relation to Potential Sources

As shown on Figure 1, borings were strategically placed along the length of Bellaire Blvd. with respect to the identified RECs. The boring placements were designed to cover the linear distance of the project alignment RECs identified in our original Phase I ESA (Phase I ESA Report No. 06.12.056, dated September 6, 2006). The borings were placed within or very close to the predetermined project alignment. Addresses, locations, and potential contributors of COCs are shown in Table 1. It should be noted that only the general block location is identified and not the specific address for each potential contributor.

Table 1. Locations, identifications, and samples from AOC along project alignment.

Sample	Block & Street	Potential Source
EB-1B	4300 Bellaire	Premier Cleaners
EB-2B	4200 Bellaire	Former auto repair shop
EB-3B	4100 Bellaire	Diamond Shamrock Service Station
EB-4B	3700 Bellaire	Shell (Bellaire) E&P Technology
EB-5B	3700 Bellaire	Shell (Bellaire) E&P Technology
EB-6B	3600 Bellaire	Circle K Convience Store and Centerpoint Regulator Station
EB-1C	4100 Bellaire	Mohawk Company
EB-2C	4000 Bellaire	Pressley's Chevron
EB-3C	3900 Bellaire	Exxon Mobile
EB-4C	3900 Bellaire	Exxon Mobile and West U Cleaners
EB-5C	3900 Bellaire	West U Cleaners
EB-6C	3800 Bellaire	Sigmor Shamrock

4.3.2 Depths of Sampling

All borings were drilled to a depth of 20 ft. Sampling was conducted on continuous 4-ft pushes and visually logged on 2-ft intervals for soil type, color, and indications of contamination. Soil samples were selected for testing at the following depths: EB-1B, 10-12 ft; EB-2B, 12-14 ft; EB-3B, 14-16 ft; EB-2C, 8-10 ft; and EB-6C, 18-20 ft. Selected samples were chosen for their PID readings, odors, texture, and location.

Groundwater was collected from all borings with the exceptions of EB-4B, EB-5B, and EB-6B, which failed to produce groundwater. Groundwater samples selected for testing included EB-1B, EB-2B, EB-3B, EB-1C, EB-2C, EB-3C, EB-5C, and EB-6C.

4.3.3 Depths to Pertinent Strata

The soils generally consisted of gray clays that transitioned into reddish brown soils with a higher sand content at lower depths. Soil boring logs are presented in Appendix A.

4.3.4 Analytical Methods Used

The following lists the methods used for each type of analysis:

- TPH: Texas 1005
- VOC: SW-846 8260B
- BTEX-MTBE: SW 8260B

4.3.5 Results of Chemical Analyses

Headspace readings are shown on the boring logs recorded to one significant figure and typically indicate nominal readings of 10 ppm or less, with the exception of EB-1B, EB-2B, EB-3B, EB-2C, and EB-6C, where headspace readings ranged from 1 ppm to 600 ppm. (Table 2) Hydrocarbon odors were noted in samples collected from boring location EB-3B from six (6) feet through the lowest portion of the boring at twenty (20) feet.

Table 2. Results of analysis from a 10.6 eV photoionization detector (PID) calibrated to isobutylene from borings with readings above 10 ppm

Boring ID	**EB-1B**	**EB-2B**	**EB-3B**	**EB-2C**	**EB-6C**
Depth (ft)	PID Reading (ppm)	PID Reading (ppm)	PID Reading (ppm)	PID Reading (ppm)	PID Reading (ppm)
0--2	6	6	5	2	20
2--4	10	10	20	8	7
4--6	8	2	20	4	10
6--8	2	6	100*	10	9
8--10	3	10	400*	**30**	4
10--12	**20**	20	400*	4	9
12--14	8	**30**	500*	5	10
14--16	1	7	**600***	7	**20**
16--18	3	20	500*	1	1
18--20	4	20	300*	6	20

* - Hydrocarbon odors noted

Bold samples were submitted for chemical analysis at Xenco Laboratories Houston, TX

Chemical analysis detected TPHs in soils (14–16 ft) and groundwater of EB-3B. VOCs were detected in the groundwater of EB-1B, and EB-6C. Analytical results detected the presence of BTEX-MTBE within the soils and groundwater samples of EB-3B and within the groundwater sample of EB-2C. Appendix B presents the Xenco Laboratories Analytical Report. Results were compared to Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Limits (PCL), May 24, 2007, for the total soil combined, soil to groundwater ingestion, and soil to groundwater leaching for Class 1, 2, and 3 groundwater exposure pathways. Data in Table 3 summarizes the detected constituent concentrations in the sampled soil and compares the concentrations to TRRP Tier 1 PCLs appropriate for the sampled media. Table 4 summarizes the results for the detected constituent concentrations in the sampled groundwater and compares the concentrations to TRRP Tier 1 PCLs appropriate for the sampled media.

Table 3. Reportable results from collected soil samples.

Sample	COC	Results (mg/kg)	TRRP Tier 1 < 0.5 acres $^{Tot}Soil_{Comb}$ (mg/kg)	TRRP Tier 1 < 0.5 acres $^{GW}Soil_{Ing}$ (mg/kg)
EB-3B (14-16 ft)	Benzene	0.269*	32	0.026
	Toluene	451D*	6,000	8.2
	Ethylbenzene	158D*	5,000	7.6
	m,p-Xylene**	538D*	1,500	110
	o-Xylene	304D*	10,000	71
	TPH (C6-12)**	10,000D*	1,600	65
	TPH (C12-28)**	254D*	2,300	200

D- The result is from a diluted sample
*- Measured COC levels exceed a TRRP PCL
**- COC is speciated on TRRP tables, lowest value is reported

Table 4. Reportable results from collected groundwater samples.

Sample	COC	Results (mg/L)	TRRP Tier 1 < 0.5 acres $^{GW}GW_{Ing}$ (mg/L)	TRRP Tier 1 < 0.5 acre $^{GW}GW_{Class3}$ (mg/L)
EB-1B (water)	Tetrachloroethylene	0.258D*	0.005	0.5
	cis-1,2-Dichloroethylene	0.015	0.07	7
	Trichloroethylene	0.009*	0.005	0.5
EB-3B (water)	Benzene	2.273*	0.005	0.5
	Toluene	10.6*	1	100
	Ethylbenzene	1.44*	0.7	70
	m,p-Xylene**	3.621*	1	100
	o-Xylenes	2.062	10	100
	TPH (C6-12)*	21.3	0.98	98

Sample	COC	Results (mg/L)	TRRP Tier 1 < 0.5 acres $^{GW}GW_{Ing}$ (mg/L)	TRRP Tier 1 < 0.5 acre $^{GW}GW_{Class3}$ (mg/L)
EB-2C (water)	Benzene	0.01*	0.005	0.5
	Toluene	0.044	1	100
	Ethylbenzene	0.006	0.7	70
	m,p-Xylene**	0.016	1	100
	o-Xylenes	0.008	10	100
EB-6C (water)	Toluene	0.022	1	100

D- The result is from a diluted sample
*- Measured COC levels exceed a TRRP PCL
**- COC is speciated on TRRP tables (lowest value is reported)

5 FINDINGS AND CONCLUSIONS

As shown in Tables 3 and 4, several constituent concentrations exceed the TRRP Tier 1 residential PCLs. Analytical results indicate BTEX-MTBE, TPH and VOC contamination focused primarily around the known areas with petroleum storage tanks (PST), leaking petroleum storage tanks (LPST), and dry cleaning operations. According to the Xenco report, the positive TPH result is primarily from gasoline range hydrocarbons (~98%).

The identified concentrations of BTEX-MTBE and TPH from groundwater and soil samples EB-3B and EB-3B (14-16 ft) exceed the TRRP Tier 1 ingestion of class 1, 2, and 3 groundwater and total soil combined PCL. The source of contamination identified at boring EB-3B is likely from the LPST facility identified in the 4100 block of Bellaire Blvd. The identified facility located in the 4300 block of Bellaire Blvd., near boring EB-1B is possibly responsible for the presence of the detected tetrachloroethylene. Benzene concentrations identified in groundwater sample EB-2C may be the result of the known LPST located in the 4000 block of Bellaire Blvd.

Groundwater concentrations of tetrachloroethylene and trichloroethylene found at the EB-1B boring location is likely to have come from the dry cleaning facility that is located within the 4300 block of Bellaire Blvd.

Other contaminates were also identified but were found in concentrations that are below the Tier 1 PCLs (Tables 3 and 4).

The analytical results indicate the presence of impacted subsurface media and groundwater in the areas near EB-1B, EB-3B, EB-2C, and EB-6C. However, it is possible that the impacted media may not be restricted to the immediate areas that were sampled and may radiate outward from the potential sources.

6 RECOMMENDATIONS

It is our opinion that the data collected from the Phase II ESA indicate that subsurface media have been impacted by releases of petroleum substances BTEX-MTBE, and VOCs from one or more of the "recognized environmental condition" sites identified in the Phase I ESA. Based on our findings, it appears that the limits of the contaminated areas may extend beyond the immediate vicinity of boring locations EB-1B, EB-3B, EB-2C and EB-6C. We recommend that copies of this report be included in construction contractor bid packages as the conditions identified during the Phase II ESA could impact cost regarding worker safety, construction practices, and material disposal. We have no recommendations for additional study.

7 LIMITATIONS AND USER RELIANCE

7.1 LIMITATIONS

No ESA can eliminate all uncertainty. Even when Phase II work is executed with an appropriate site-specific standard of care, certain conditions present especially difficult detection problems. Such conditions may include, but are not limited to, complex geological settings, the fate and transport characteristics of certain hazardous substances and petroleum products, the distribution of existing contamination, physical limitations imposed by the location of utilities and other man-made objects, and the limitations of assessment technologies. Furthermore, any sample, either surface or subsurface, taken for chemical analysis may or may not be representative of a larger population.

This Phase II ESA does not purport to include the level of specificity required of technical standards that govern full characterization of a site's environmental conditions. It is not intended to satisfy the level of inquiry that may be necessary to support remedial solutions for a site.

7.2 USER RELIANCE

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client and the City of Southside Place, unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions, recommendations, and conclusions contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. Environmental conditions may exist at the

property that cannot be identified by visual observation. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

8 SIGNATURES OF ENVIRONMENTAL PROFESSIONALS

The material and data in this Phase II Environmental Site Assessment of the Bellaire Boulevard Project located in the City of Southside Place, Harris County, Texas, were prepared under the supervision and direction of the undersigned.

TWE Project Number 07.12.018

July 11, 2007

Keith Ross
Project Manager
Environmental Services Division

Paul R. Wild
Vice President
Environmental Services Division

9 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

The resumes of the environmental professionals who prepared this report are presented below.

KEITH ROSS
PROJECT MANAGER - ENVIRONMENTAL SERVICES

SPECIALIZATION

Mr. Ross has over 21 years of environmental experience including positions in project management, field services management and project consultation. This experience includes Phase I environmental site assessments, Phase II subsurface investigations, field services for State of Texas groundwater monitoring program, bioremediation of hydrocarbon-impacted soils, asbestos and lead-based paint consulting, mold inspection and consulting and air emissions sampling. His employment history includes service with Southwestern Laboratories, Huntingdon Engineering and Maxim Technologies.

EDUCATION

B.S. Environmental Science, Truman University - 1980

CERTIFICATION

Certified Lead-Based Paint Inspector/Corrective Action Specialist
Certified Mold Inspector and Remediation Planner
OSHA 40-Hour HAZWOPER Training

PAUL R. WILD
VICE PRESIDENT - ENVIRONMENTAL SERVICES DIVISION

SPECIALIZATION

Conducts technical reviews of environmental management systems, and directs environmental compliance audits, risk assessments, environmental site assessments, and asbestos surveys. Manages RCRA Facility Investigations and Corrective Measures Studies. Manages all phases of underground storage tank release evaluations from initial investigation to remediation. Conducts Environmental Assessments under the National Environmental Policy Act. Evaluates analytical testing data and oversees contract laboratory quality assurance, including on-site auditing. Supervises drilling and sampling operations at hazardous waste sites and provides assessment of soil and groundwater contamination. Conducts chemical literature research and assesses waste treatment methods. Evaluate applicable or relevant and appropriate requirements (ARARs) in relation to remedial actions and air/water/waste permitting. Develops health and safety plans and monitors health and safety plan compliance. Evaluates census tract data, property ownership records, aerial photography, house-to-house survey data, and other publicly available data, including interviews with regulatory and governmental agency personnel, to assess possible or probable social and economic impacts to communities from construction and remediation projects.

PROFESSIONAL HISTORY

Tolunay-Wong Engineers, Inc., Houston, Texas, 2002 to Present
Washington Group International, Houston, Texas, 1985 - 2002, Manager of Environmental Services
Resource Engineering, Inc. (ENSR), Houston, Texas, 1985, Staff Chemist
McBride-Ratcliff and Associates, Inc., Houston, Texas, 1984 - 1985, Field Technician

EDUCATION

B.S. Chemistry (Zoology minor): Marshall University, 1983

CERTIFICATION

OSHA Certified for Hazardous Waste Site Work (OSHA 29 CFR 1910.120)
OSHA 29 CFR 1910.120 Supervisor Training
Asbestos Hazard Emergency Response Act (AHERA) building inspector and management planner
Illinois Licensed Asbestos Inspector #100-7145
TCEQ Corrective Action Project Manager Reg. #CAPM00385

AFFILIATIONS

American Chemical Society

PUBLICATIONS

"A Contaminant-Resistant Slurry Trench," W. R. Tobin, co-author, presented at the First Annual Southern Regional Ground Water Conference, San Antonio, Texas, September 1985, pp. 193-208.
"Attapulgite: A Clay Liner Solution?" W. R. Tobin, co-author, Civil Engineering, Vol. 56, No. 2, February 1986, pp. 56-58.
"The Environmental Site Assessment as a Pre-Investment Security," presented at the Texas Section, American Society of Civil Engineers Spring Meeting, Dallas, Texas, April 1987.

10 REFERENCES AND SOURCES OF INFORMATION

Xenco Laboratories Report No. 283472, dated June 7, 2007.

Xenco Laboratories Report No. 283473, dated June 7, 2007.

FIGURE 1: ALIGNMENT LAYOUT AND BORING LOCATION MAP

Boring Locations (Bellaire Boulevard)

Lynn Stra Cener Stormwater Dept. 713 837 7450

Recognized Environmental Condition

EB-3B GW 16' Soil Cmt 6'

EB-1B 16' x 8'

depth?

EB-3B — feet from Weslayan 1.1" = 715' sta 2200

EB-1B from Weslayan 2.38" = 1547'

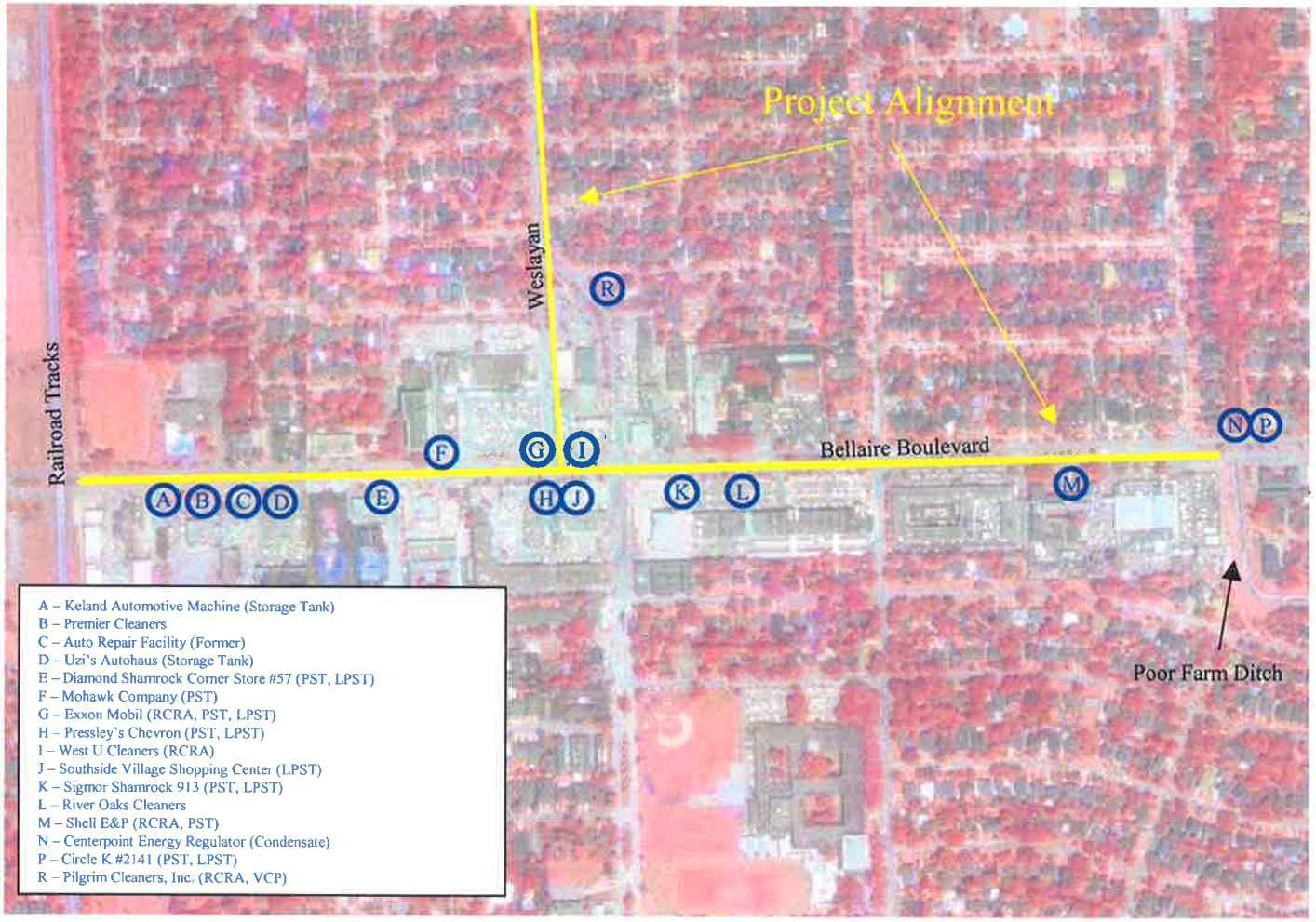
2400
1550
14450

Location + Depth of borings labeled "REC"

Project: Phase II ESA Boring Plan Bellaire Project Client: Claunch & Miller, Inc.	N ↑	Tolunay-Wong Engineers, Inc. Houston, Texas	Project No.: 07.12.018 Scale: 1"=~650'

FIGURE 2: RECOGNIZED ENVIRONMENTAL CONDITIONS LOCATION MAP

Recognized Environmental Conditions (Bellaire Boulevard)



Project: Phase II ESA Boring Plan **Bellaire Project** **Client: Claunch & Miller, Inc.**	**N**	**Tolunay-Wong Engineers, Inc.** **Houston, Texas**	**Project No.: 07.12.018** **Scale: 1"=~650'**

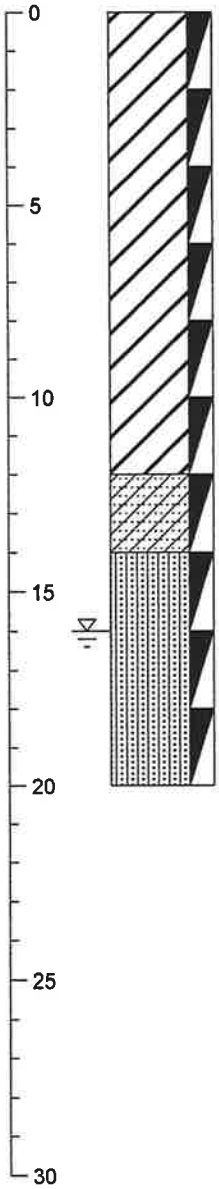
APPENDIX A: SOIL BORING LOGS

LOG OF BORING EB-1B

Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-29-07
Elevation:

Dry Augered: 0 **to** 20 **ft** **Free Water During Drilling at:** 16 ft
Washed Bored: **to** **ft** **Water at:** **Caving at:**



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
			Dark gray FAT CLAY (CH)		6	
					10	
					8	
			-gray @ 6'-12'		2	
					3	
					20	
			Gray SANDY LEAN CLAY (CL)		8	
			Brown SILTY SAND (SM)		1	
					3	
					4	
			Boring terminated @ 20 ft			

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-2B

Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-29-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 15 ft
Water at:

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Gray FAT CLAY (CH)		6	
					10	
5					2	
					6	
					10	
10			Gray SANDY LEAN CLAY (CL)		20	
			Gray SILTY SAND (SM)		30	
15					7	
					20	
					20	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-3B

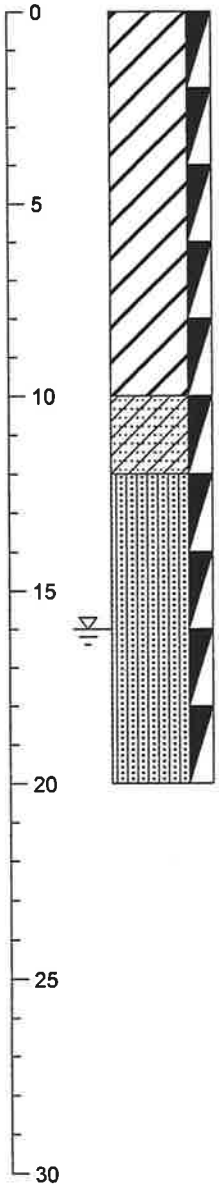
Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-29-07
Elevation:

Dry Augered: 0 to 20 ft
Washed Bored: to ft

Free Water During Drilling at: 16 ft
Water at:

Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
			Dark gray FAT CLAY (CH)		5	
			-gray @ 2'-10'		20	
					20	
			-odor @ 6'-10'		100	
					430	
			Gray SANDY LEAN CLAY (CL) odor		350	
			Brown SILTY SAND (SM) -odor below 12'		490	
					580	
					540	
					340	
			Boring terminated @ 20 ft			

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-4B

Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at:
Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Dark gray FAT CLAY (CH)		1	
			-gray @ 2'-10'		0	
					1	
5					0	
					0	
10			-reddish brown @ 10'-14'		0	
					0	
			-reddish brown & gray below 14'		0	
15					0	
					0	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

LOG OF BORING EB-5B

Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at:

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Gray FAT CLAY (CH)		0	
					0	
					0	
5					0	
					0	
10					0	
					0	
			-reddish brown & gray below 14'		0	
15					0	
					0	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-6B

Project: Phase II ESA, Bellaire Boulevard, City of Southside Place, Harris County, Texas
Client: Claunch & Miller, Inc. Houston, Texas

Project No.: 07.12.018
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: Dry
Water at:

Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Gray FAT CLAY (CH)		0	
					0	
					0	
5			-gray & tan @ 6'-10'		0	
					0	
10			-reddish brown & gray below 10'		0	
					0	
					0	
15					0	
					0	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

LOG OF BORING EB-1C

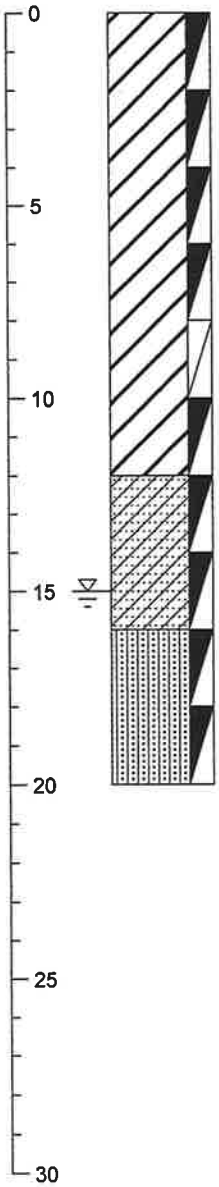
Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 15 ft
Water at:

Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
			Gray FAT CLAY (CH)		0	
					0	
					1	
					0	
			No recovery @ 8'-10'			
					0	
			Gray SANDY LEAN CLAY (CL)		1	
					2	
			Brown SILTY SAND (SM)		0	
					0	
			Boring terminated @ 20 ft			

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-2C

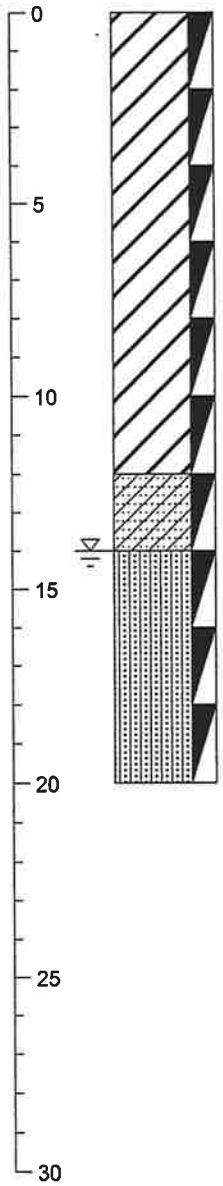
Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 14 ft
Water at:

Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
			Dark gray FAT CLAY (CH)		2	
					8	
					4	
			-gray @ 6'-12'		10	
					30	
					4	
			Brown SANDY LEAN CLAY (CL)		5	
			Brown SILTY SAND (SM)		7	
					1	
					6	
			Boring terminated @ 20 ft			

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

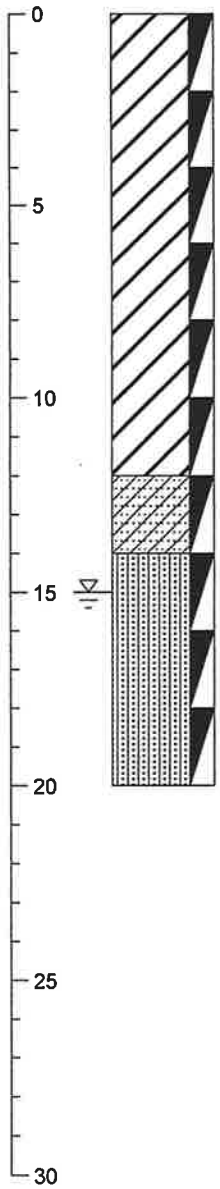
LOG OF BORING EB-3C

Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 15 ft
Water at:
Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Gray FAT CLAY (CH)		0	
					0	
					0	
5					1	
					0	
10					1	
			Gray & brown SANDY LEAN CLAY (CL)		1	
			Brown SILTY SAND (SM)		1	
15					0	
					0	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

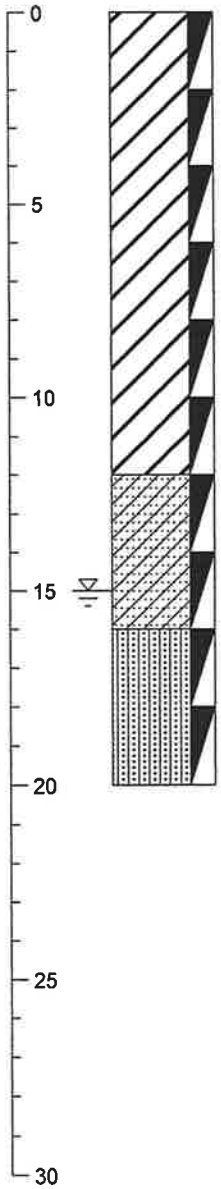
LOG OF BORING EB-4C

Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 15 ft
Water at:
Caving at:



ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
			Gray FAT CLAY (CH)		0	
					1	
					0	
					0	
					0	
					1	
			Gray SANDY LEAN CLAY (CL)		1	
					0	
			Brown SILTY SAND (SM)		0	
					0	
			Boring terminated @ 20 ft			

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING EB-5C

Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft** **Free Water During Drilling at:** 15 ft
Washed Bored: **to** **ft** **Water at:** **Caving at:**

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Gray FAT CLAY (CH)		0	
					1	
5					1	
					0	
			Gray SANDY LEAN CLAY (CL)		0	
10			-gray & brown @ 10'-14'		0	
					0	
			Gray & brown CLAYEY SAND (SC)		0	
15			Brown SILTY SAND (SM)		0	
					0	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

LOG OF BORING EB-6C

Project: Phase II ESA College Avenue
City of West University
Client: Claunch & Miller, Inc.
Houston, Texas

Project No.: 07.12.017
Date: 5-30-07
Elevation:

Dry Augered: 0 **to** 20 **ft**
Washed Bored: **to** **ft**

Free Water During Drilling at: 16 ft
Water at:
Caving at:

ELEVATION/ DEPTH	SOIL/SAMPLER SYMBOLS & FIELD DATA	POCKET PEN. (tsf) or SPT	DESCRIPTION	TPH (mg/kg)	PID (ppm)	BTEX (mg/kg)
0			Dark gray FAT CLAY (CH)		20	
					7	
			-gray @ 4'-14'		10	
5					9	
					4	
10					9	
					10	
			Gray & brown CLAYEY SAND (SC)		20	
15						
			Brown SILTY SAND (SM)		1	
					20	
20			Boring terminated @ 20 ft			
25						
30						

Note(s):

TOLUNAY-WONG ENGINEERS, INC.

APPENDIX B: XENCO LABORATORIES ANALYTICAL REPORT

Analytical Report 283473

for

Tolunay-Wong Engineers, Inc.

Project Manager: Keith Ross

Bellaire Blvd (II)

07.12.018

12-JUN-07

11381 Meadowglen, Suite L Houston, TX 77082 Ph:(281) 589-0692 Fax:(281) 589-0695

NELAC certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675

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12-JUN-07

Project Manager: **Keith Ross**
Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Parkway W.,
Suite 100
Houston, TX 77031

Reference: XENCO Report No: **283473**
Bellaire Blvd (II)
Project Address:

Keith Ross:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 283473. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 283473 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Carlos A. Castro, Ph.D., MBA

Managing Director, Texas

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Certificate of Analysis Summary 283473

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: Bellaire Blvd (II)

Project Id: 07.12.018
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested	*Lab Id:*	283473-001		283473-002		283473-003		283473-004	
	Field Id:	EB-1B		EB-2B		EB-3B		EB-1B	
	Depth:	10-12 ft		12-14 ft		14-16 ft			
	Matrix:	SOIL		SOIL		SOIL		WATER	
	Sampled:	May-29-07 10:37		May-29-07 12:14		May-29-07 00:00		May-29-07 10:37	
BTEX-MTBE by SW 8260B	*Extracted:*					Jun-06-07 13:18			
	Analyzed:					Jun-06-07 17:17			
	Units/RL:					mg/kg	RL		
MTBE						BRL	0.4845		
Benzene						0.2691	0.0969		
Toluene						451 D	1.938		
Ethylbenzene						158 D	1.938		
m,p-Xylene						538 D	3.876		
o-Xylene						304 D	1.938		
Total BTEX						1451			
Total Xylenes						842			
TPH by Texas1005	*Extracted:*	Jun-05-07 16:27		Jun-05-07 16:30		Jun-05-07 16:33		Jun-04-07 16:27	
	Analyzed:	Jun-05-07 21:36		Jun-05-07 22:10		Jun-05-07 22:44		Jun-04-07 21:28	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/L	RL
C6-C12 Gasoline Range Hydrocarbons		BRL	50.0	BRL	49.8	10000 D	99.9	BRL	4.60
C12-C28 Diesel Range Hydrocarbons		BRL	50.0	BRL	49.8	254	50.0	BRL	4.60
C28-C35 Oil Range Hydrocarbons		BRL	50.0	BRL	49.8	BRL	50.0	BRL	4.60
Total TPH 1005		BRL		BRL		10300		BRL	

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Certificate of Analysis Summary 283473

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: Bellaire Blvd (II)

Project Id: 07.12.018 | **Date Received in Lab:** May-31-07 04:16 pm
Contact: Keith Ross | **Report Date:** 12-JUN-07
Project Location: | **Project Manager:** Debbie Simmons

Analysis Requested	*Lab Id:*	283473-001		283473-002		283473-003	283473-004	
	Field Id:	EB-1B		EB-2B		EB-3B	EB-1B	
	Depth:	10-12 ft		12-14 ft		14-16 ft		
	Matrix:	SOIL		SOIL		SOIL	WATER	
	Sampled:	May-29-07 10:37		May-29-07 12:14		May-29-07 00:00	May-29-07 10:37	
VOAs by SW-846 8260B	*Extracted:*	Jun-05-07 15:02		Jun-05-07 11:24			Jun-04-07 15:45	
	Analyzed:	Jun-05-07 16:06		Jun-05-07 14:39			Jun-04-07 20:08	
	Units/RL:	mg/kg	RL	mg/kg	RL		mg/L	RL
Benzene		BRL	0.005	BRL	0.005		BRL	0.005
Bromobenzene		BRL	0.005	BRL	0.005		BRL	0.005
Bromochloromethane		BRL	0.005	BRL	0.005		BRL	0.005
Bromodichloromethane		BRL	0.005	BRL	0.005		BRL	0.005
Bromoform		BRL	0.005	BRL	0.005		BRL	0.005
Methyl bromide		BRL	0.005	BRL	0.005		BRL	0.005
MTBE		BRL	0.005	BRL	0.005		BRL	0.005
tert-Butylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Sec-Butylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
n-Butylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Carbon Tetrachloride		BRL	0.005	BRL	0.005		BRL	0.005
Chlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
Chloroethane		BRL	0.010	BRL	0.010		BRL	0.010
Chloroform		BRL	0.005	BRL	0.005		BRL	0.005
Methyl Chloride		BRL	0.010	BRL	0.010		BRL	0.010
2-Chlorotoluene		BRL	0.005	BRL	0.005		BRL	0.005
4-Chlorotoluene		BRL	0.005	BRL	0.005		BRL	0.005
p-Cymene (p-Isopropyltoluene)		BRL	0.005	BRL	0.005		BRL	0.005
1,2-Dibromo-3-Chloropropane		BRL	0.005	BRL	0.005		BRL	0.005
Dibromochloromethane		BRL	0.005	BRL	0.005		BRL	0.005
Methylene bromide		BRL	0.005	BRL	0.005		BRL	0.005
1,2-Dichlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
1,3-Dichlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
1,4-Dichlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
Dichlorodifluoromethane		BRL	0.005	BRL	0.005		BRL	0.005
1,2-Dichloroethane		BRL	0.005	BRL	0.005		BRL	0.005
1,1-Dichloroethane		BRL	0.005	BRL	0.005		BRL	0.005
trans-1,2-dichloroethylene		BRL	0.005	BRL	0.005		BRL	0.005
cis-1,2-Dichloroethylene		BRL	0.005	BRL	0.005		0.015	0.005
1,1-Dichloroethene		BRL	0.005	BRL	0.005		BRL	0.005
2,2-Dichloropropane		BRL	0.005	BRL	0.005		BRL	0.005
1,3-Dichloropropane		BRL	0.005	BRL	0.005		BRL	0.005
1,2-Dichloropropane		BRL	0.005	BRL	0.005		BRL	0.005
trans-1,3-dichloropropene		BRL	0.005	BRL	0.005		BRL	0.005

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Managing Director, Texas

Certificate of Analysis Summary 283473

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: Bellaire Blvd (II)

Project Id: 07.12.018
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested								
	Lab Id:	283473-001		283473-002		283473-003	283473-004	
	Field Id:	EB-1B		EB-2B		EB-3B	EB-1B	
	Depth:	10-12 ft		12-14 ft		14-16 ft		
	Matrix:	SOIL		SOIL		SOIL	WATER	
	Sampled:	May-29-07 10:37		May-29-07 12:14		May-29-07 00:00	May-29-07 10:37	
VOAs by SW-846 8260B	*Extracted:*	Jun-05-07 15:02		Jun-05-07 11:24			Jun-04-07 15:45	
	Analyzed:	Jun-05-07 16:06		Jun-05-07 14:39			Jun-04-07 20:08	
	Units/RL:	mg/kg	RL	mg/kg	RL		mg/L	RL
1,1-Dichloropropene		BRL	0.005	BRL	0.005		BRL	0.005
cis-1,3-Dichloropropene		BRL	0.005	BRL	0.005		BRL	0.005
Ethylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Hexachlorobutadiene		BRL	0.005	BRL	0.005		BRL	0.005
isopropylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Methylene Chloride		BRL	0.020	BRL	0.020		BRL	0.005
Naphthalene		BRL	0.010	BRL	0.010		BRL	0.010
n-Propylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Styrene		BRL	0.005	BRL	0.005		BRL	0.005
1,1,1,2-Tetrachloroethane		BRL	0.005	BRL	0.005		BRL	0.005
1,1,2,2-Tetrachloroethane		BRL	0.005	BRL	0.005		BRL	0.005
Tetrachloroethylene		BRL	0.005	BRL	0.005		0.258 D	0.025
Toluene		BRL	0.005	BRL	0.005		BRL	0.005
1,2,4-Trichlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
1,2,3-Trichlorobenzene		BRL	0.005	BRL	0.005		BRL	0.005
1,1,2-Trichloroethane		BRL	0.005	BRL	0.005		BRL	0.005
1,1,1-Trichloroethane		BRL	0.005	BRL	0.005		BRL	0.005
Trichloroethylene		BRL	0.005	BRL	0.005		0.009	0.005
Trichlorofluoromethane		BRL	0.005	BRL	0.005		BRL	0.005
1,2,3-Trichloropropane		BRL	0.005	BRL	0.005		BRL	0.005
1,2,4-Trimethylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
1,3,5-Trimethylbenzene		BRL	0.005	BRL	0.005		BRL	0.005
Vinyl Chloride		BRL	0.002	BRL	0.002		BRL	0.002
o-Xylene		BRL	0.005	BRL	0.005		BRL	0.005
m,p-Xylene		BRL	0.010	BRL	0.010		BRL	0.010

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Certificate of Analysis Summary 283473

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: Bellaire Blvd (II)

Project Id: 07.12.018
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested							
	Lab Id:	283473-005		283473-006			
	Field Id:	EB-2B		EB-3B			
	Depth:						
	Matrix:	WATER		WATER			
	Sampled:	May-29-07 12:14		May-29-07 00:00			
BTEX-MTBE by SW 8260B	*Extracted:*			Jun-04-07 09:16			
	Analyzed:			Jun-04-07 13:57			
	Units/RL:			mg/L	RL		
MTBE				BRL	0.2500		
Benzene				2.273	0.0500		
Toluene				10.60	0.0500		
Ethylbenzene				1.440	0.0500		
m,p-Xylene				3.621	0.1000		
o-Xylene				2.062	0.0500		
Total Xylenes				5.683			
Total BTEX				19.996			
TPH by Texas1005	*Extracted:*	Jun-04-07 16:30		Jun-04-07 16:33			
	Analyzed:	Jun-04-07 22:01		Jun-04-07 22:35			
	Units/RL:	mg/L	RL	mg/L	RL		
C6-C12 Gasoline Range Hydrocarbons		BRL	4.52	21.3	4.54		
C12-C28 Diesel Range Hydrocarbons		BRL	4.52	BRL	4.54		
C28-C35 Oil Range Hydrocarbons		BRL	4.52	BRL	4.54		
Total TPH 1005		BRL		21.3			

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Project Name: Bellaire Blvd (II)

Project Id: 07.12.018
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested						
	Lab Id:	283473-005		283473-006		
	Field Id:	EB-2B		EB-3B		
	Depth:					
	Matrix:	WATER		WATER		
	Sampled:	May-29-07 12:14		May-29-07 00:00		
VOAs by SW-846 8260B	*Extracted:*	Jun-04-07 15:45				
	Analyzed:	Jun-04-07 19:47				
	Units/RL:	mg/L	RL			
Benzene		BRL	0.005			
Bromobenzene		BRL	0.005			
Bromochloromethane		BRL	0.005			
Bromodichloromethane		BRL	0.005			
Bromoform		BRL	0.005			
Methyl bromide		BRL	0.005			
MTBE		BRL	0.005			
n-Butylbenzene		BRL	0.005			
Sec-Butylbenzene		BRL	0.005			
tert-Butylbenzene		BRL	0.005			
Carbon Tetrachloride		BRL	0.005			
Chlorobenzene		BRL	0.005			
Chloroethane		BRL	0.010			
Chloroform		BRL	0.005			
Methyl Chloride		BRL	0.010			
2-Chlorotoluene		BRL	0.005			
4-Chlorotoluene		BRL	0.005			
p-Cymene (p-Isopropyltoluene)		BRL	0.005			
Dibromochloromethane		BRL	0.005			
1,2-Dibromo-3-Chloropropane		BRL	0.005			
Methylene bromide		BRL	0.005			
1,2-Dichlorobenzene		BRL	0.005			
1,3-Dichlorobenzene		BRL	0.005			
1,4-Dichlorobenzene		BRL	0.005			
Dichlorodifluoromethane		BRL	0.005			
1,1-Dichloroethane		BRL	0.005			
1,2-Dichloroethane		BRL	0.005			
1,1-Dichloroethene		BRL	0.005			
cis-1,2-Dichloroethylene		BRL	0.005			
trans-1,2-dichloroethylene		BRL	0.005			
1,2-Dichloropropane		BRL	0.005			
1,3-Dichloropropane		BRL	0.005			
2,2-Dichloropropane		BRL	0.005			
1,1-Dichloropropene		BRL	0.005			

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Project Name: Bellaire Blvd (II)

Project Id: 07.12.018
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested					
	Lab Id:	283473-005	283473-006		
	Field Id:	EB-2B	EB-3B		
	Depth:				
	Matrix:	WATER	WATER		
	Sampled:	May-29-07 12:14	May-29-07 00:00		
VOAs by SW-846 8260B	***Extracted:***	Jun-04-07 15:45			
	Analyzed:	Jun-04-07 19:47			
	Units/RL:	mg/L RL			
cis-1,3-Dichloropropene		BRL 0.005			
trans-1,3-dichloropropene		BRL 0.005			
Ethylbenzene		BRL 0.005			
Hexachlorobutadiene		BRL 0.005			
isopropylbenzene		BRL 0.005			
Methylene Chloride		BRL 0.005			
Naphthalene		BRL 0.010			
n-Propylbenzene		BRL 0.005			
Styrene		BRL 0.005			
1,1,1,2-Tetrachloroethane		BRL 0.005			
1,1,2,2-Tetrachloroethane		BRL 0.005			
Tetrachloroethylene		BRL 0.005			
Toluene		BRL 0.005			
1,2,3-Trichlorobenzene		BRL 0.005			
1,2,4-Trichlorobenzene		BRL 0.005			
1,1,1-Trichloroethane		BRL 0.005			
1,1,2-Trichloroethane		BRL 0.005			
Trichloroethylene		BRL 0.005			
Trichlorofluoromethane		BRL 0.005			
1,2,3-Trichloropropane		BRL 0.005			
1,2,4-Trimethylbenzene		BRL 0.005			
1,3,5-Trimethylbenzene		BRL 0.005			
o-Xylene		BRL 0.005			
m,p-Xylene		BRL 0.010			
Vinyl Chloride		BRL 0.002			

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Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697790 **Sample:** 283334-001 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0493	0.0500	99	86-115	
Dibromofluoromethane	0.0521	0.0500	104	86-118	
1,2-Dichloroethane-D4	0.0540	0.0500	108	80-120	
Toluene-D8	0.0509	0.0500	102	88-110	

Lab Batch #: 697790 **Sample:** 283334-001 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0514	0.0500	103	86-115	
Dibromofluoromethane	0.0531	0.0500	106	86-118	
1,2-Dichloroethane-D4	0.0545	0.0500	109	80-120	
Toluene-D8	0.0462	0.0500	92	88-110	

Lab Batch #: 697790 **Sample:** 283473-006 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0538	0.0500	108	86-115	
Dibromofluoromethane	0.0542	0.0500	108	86-118	
1,2-Dichloroethane-D4	0.0521	0.0500	104	80-120	
Toluene-D8	0.0519	0.0500	104	88-110	

Lab Batch #: 697790 **Sample:** 495729-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0505	0.0500	101	86-115	
Dibromofluoromethane	0.0504	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0555	0.0500	111	80-120	
Toluene-D8	0.0510	0.0500	102	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697790 **Sample:** 495729-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0533	0.0500	107	86-115	
Dibromofluoromethane	0.0504	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0525	0.0500	105	80-120	
Toluene-D8	0.0539	0.0500	108	88-110	

Lab Batch #: 698068 **Sample:** 283408-008 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0466	0.0500	93	74-121	
Dibromofluoromethane	0.0503	0.0500	101	80-120	
1,2-Dichloroethane-D4	0.0501	0.0500	100	80-120	
Toluene-D8	0.0509	0.0500	102	81-117	

Lab Batch #: 698068 **Sample:** 283473-003 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0649	0.0500	130	74-121	**
Dibromofluoromethane	0.0491	0.0500	98	80-120	
1,2-Dichloroethane-D4	0.0580	0.0500	116	80-120	
Toluene-D8	0.0804	0.0500	161	81-117	**

Lab Batch #: 698068 **Sample:** 495883-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0488	0.0500	98	74-121	
Dibromofluoromethane	0.0486	0.0500	97	80-120	
1,2-Dichloroethane-D4	0.0515	0.0500	103	80-120	
Toluene-D8	0.0479	0.0500	96	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 698068 **Sample:** 495883-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0483	0.0500	97	74-121	
Dibromofluoromethane	0.0490	0.0500	98	80-120	
1,2-Dichloroethane-D4	0.0512	0.0500	102	80-120	
Toluene-D8	0.0512	0.0500	102	81-117	

Lab Batch #: 698189 **Sample:** 283450-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0624	0.0500	125	74-121	*
Dibromofluoromethane	0.0547	0.0500	109	80-120	
1,2-Dichloroethane-D4	0.0551	0.0500	110	80-120	
Toluene-D8	0.0521	0.0500	104	81-117	

Lab Batch #: 698189 **Sample:** 283450-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0566	0.0500	113	74-121	
Dibromofluoromethane	0.0544	0.0500	109	80-120	
1,2-Dichloroethane-D4	0.0587	0.0500	117	80-120	
Toluene-D8	0.0532	0.0500	106	81-117	

Lab Batch #: 698189 **Sample:** 283473-003 / DL **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0551	0.0500	110	74-121	
Dibromofluoromethane	0.0482	0.0500	96	80-120	
1,2-Dichloroethane-D4	0.0535	0.0500	107	80-120	
Toluene-D8	0.0527	0.0500	105	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 698189 **Sample:** 495973-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0468	0.0500	94	74-121	
Dibromofluoromethane	0.0499	0.0500	100	80-120	
1,2-Dichloroethane-D4	0.0493	0.0500	99	80-120	
Toluene-D8	0.0518	0.0500	104	81-117	

Lab Batch #: 698189 **Sample:** 495973-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0543	0.0500	109	74-121	
Dibromofluoromethane	0.0489	0.0500	98	80-120	
1,2-Dichloroethane-D4	0.0521	0.0500	104	80-120	
Toluene-D8	0.0530	0.0500	106	81-117	

Lab Batch #: 697868 **Sample:** 283473-004 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	6.48	9.20	70	70-135	
o-Terphenyl	3.66	4.60	80	70-135	

Lab Batch #: 697868 **Sample:** 283473-005 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	6.52	9.04	72	70-135	
o-Terphenyl	3.60	4.52	80	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697868 **Sample:** 283473-006 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	6.78	9.08	75	70-135	
o-Terphenyl	3.35	4.54	74	70-135	

Lab Batch #: 697868 **Sample:** 495769-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	8.45	10.0	85	70-135	
o-Terphenyl	4.17	5.00	83	70-135	

Lab Batch #: 697868 **Sample:** 495769-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	7.92	10.0	79	70-135	
o-Terphenyl	4.36	5.00	87	70-135	

Lab Batch #: 697868 **Sample:** 495769-1-BSD / BSD **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	8.67	10.0	87	70-135	
o-Terphenyl	4.26	5.00	85	70-135	

Lab Batch #: 697960 **Sample:** 283473-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	72.2	99.9	72	70-135	
o-Terphenyl	39.7	50.0	79	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697960 **Sample:** 283473-002 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	73.6	99.5	74	70-135	
o-Terphenyl	40.6	49.8	82	70-135	

Lab Batch #: 697960 **Sample:** 283473-003 / DL **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	116	99.9	116	70-135	
o-Terphenyl	54.8	50.0	110	70-135	

Lab Batch #: 697960 **Sample:** 283473-003 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	125	99.9	125	70-135	
o-Terphenyl	38.2	50.0	76	70-135	

Lab Batch #: 697960 **Sample:** 283565-003 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	82.5	99.8	83	70-135	
o-Terphenyl	38.6	49.9	77	70-135	

Lab Batch #: 697960 **Sample:** 283565-003 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	86.9	99.5	87	70-135	
o-Terphenyl	41.4	49.8	83	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697960 **Sample:** 495826-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	73.4	100	73	70-135	
o-Terphenyl	38.6	50.0	77	70-135	

Lab Batch #: 697960 **Sample:** 495826-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	71.5	100	72	70-135	
o-Terphenyl	41.3	50.0	83	70-135	

Lab Batch #: 697910 **Sample:** 283472-003 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0505	0.0500	101	86-115	
Dibromofluoromethane	0.0484	0.0500	97	86-118	
1,2-Dichloroethane-D4	0.0481	0.0500	96	80-120	
Toluene-D8	0.0506	0.0500	101	88-110	

Lab Batch #: 697910 **Sample:** 283472-003 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0498	0.0500	100	86-115	
Dibromofluoromethane	0.0485	0.0500	97	86-118	
1,2-Dichloroethane-D4	0.0476	0.0500	95	80-120	
Toluene-D8	0.0490	0.0500	98	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697910 **Sample:** 283473-004 / DL **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0533	0.0500	107	86-115	
Dibromofluoromethane	0.0479	0.0500	96	86-118	
1,2-Dichloroethane-D4	0.0481	0.0500	96	80-120	
Toluene-D8	0.0496	0.0500	99	88-110	

Lab Batch #: 697910 **Sample:** 283473-004 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0504	0.0500	101	86-115	
Dibromofluoromethane	0.0509	0.0500	102	86-118	
1,2-Dichloroethane-D4	0.0521	0.0500	104	80-120	
Toluene-D8	0.0500	0.0500	100	88-110	

Lab Batch #: 697910 **Sample:** 283473-005 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0511	0.0500	102	86-115	
Dibromofluoromethane	0.0489	0.0500	98	86-118	
1,2-Dichloroethane-D4	0.0478	0.0500	96	80-120	
Toluene-D8	0.0506	0.0500	101	88-110	

Lab Batch #: 697910 **Sample:** 495791-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0510	0.0500	102	86-115	
Dibromofluoromethane	0.0494	0.0500	99	86-118	
1,2-Dichloroethane-D4	0.0487	0.0500	97	80-120	
Toluene-D8	0.0497	0.0500	99	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697910 **Sample:** 495791-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0541	0.0500	108	86-115	
Dibromofluoromethane	0.0495	0.0500	99	86-118	
1,2-Dichloroethane-D4	0.0488	0.0500	98	80-120	
Toluene-D8	0.0514	0.0500	103	88-110	

Lab Batch #: 697951 **Sample:** 283473-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0448	0.0500	90	74-121	
Dibromofluoromethane	0.0432	0.0500	86	80-120	
1,2-Dichloroethane-D4	0.0502	0.0500	100	80-120	
Toluene-D8	0.0485	0.0500	97	81-117	

Lab Batch #: 697951 **Sample:** 283473-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0459	0.0500	92	74-121	
Dibromofluoromethane	0.0470	0.0500	94	80-120	
1,2-Dichloroethane-D4	0.0509	0.0500	102	80-120	
Toluene-D8	0.0493	0.0500	99	81-117	

Lab Batch #: 697951 **Sample:** 283473-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0508	0.0500	102	74-121	
Dibromofluoromethane	0.0445	0.0500	89	80-120	
1,2-Dichloroethane-D4	0.0516	0.0500	103	80-120	
Toluene-D8	0.0492	0.0500	98	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697951 **Sample:** 283473-002 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0454	0.0500	91	74-121	
Dibromofluoromethane	0.0470	0.0500	94	80-120	
1,2-Dichloroethane-D4	0.0494	0.0500	99	80-120	
Toluene-D8	0.0479	0.0500	96	81-117	

Lab Batch #: 697951 **Sample:** 495813-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0480	0.0500	96	74-121	
Dibromofluoromethane	0.0458	0.0500	92	80-120	
1,2-Dichloroethane-D4	0.0490	0.0500	98	80-120	
Toluene-D8	0.0491	0.0500	98	81-117	

Lab Batch #: 697951 **Sample:** 495813-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0488	0.0500	98	74-121	
Dibromofluoromethane	0.0456	0.0500	91	80-120	
1,2-Dichloroethane-D4	0.0506	0.0500	101	80-120	
Toluene-D8	0.0505	0.0500	101	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697790 **Sample:** 495729-1-BKS **Matrix:** Water
Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** BEC
Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX-MTBE by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
MTBE	<0.0050	0.5000	0.5053	101	65-135	
Benzene	<0.0010	0.1000	0.1073	107	66-142	
Toluene	<0.0010	0.1000	0.1052	105	59-139	
Ethylbenzene	<0.0010	0.1000	0.1019	102	75-125	
m,p-Xylene	<0.0020	0.2000	0.2052	103	75-125	
o-Xylene	<0.0010	0.1000	0.1037	104	75-125	

Lab Batch #: 698068 **Sample:** 495883-1-BKS **Matrix:** Solid
Date Analyzed: 06/06/2007 **Date Prepared:** 06/06/2007 **Analyst:** HDO
Reporting Units: mg/kg **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX-MTBE by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
MTBE	<0.0050	0.500	0.486	97	65-135	
Benzene	<0.0010	0.100	0.098	98	66-142	
Toluene	<0.0010	0.100	0.095	95	59-139	
Ethylbenzene	<0.0010	0.100	0.102	102	75-125	
m,p-Xylene	<0.0020	0.200	0.186	93	75-125	
o-Xylene	<0.0010	0.100	0.102	102	75-125	

Lab Batch #: 698189 **Sample:** 495973-1-BKS **Matrix:** Solid
Date Analyzed: 06/07/2007 **Date Prepared:** 06/07/2007 **Analyst:** HDO
Reporting Units: mg/kg **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX-MTBE by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
MTBE	<0.0050	0.5000	0.4601	92	65-135	
Benzene	<0.0010	0.1000	0.0795	80	66-142	
Toluene	<0.0010	0.1000	0.0854	85	59-139	
Ethylbenzene	<0.0010	0.1000	0.0853	85	75-125	
m,p-Xylene	<0.0020	0.2000	0.1647	82	75-125	
o-Xylene	<0.0010	0.1000	0.0828	83	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697960 **Sample:** 495826-1-BKS **Matrix:** Solid

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JAH

Reporting Units: mg/kg **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

TPH by Texas1005 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
C6-C12 Gasoline Range Hydrocarbons	<50.0	1000	734	73	70-135	
C12-C28 Diesel Range Hydrocarbons	<50.0	1000	895	90	70-135	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697910 **Sample:** 495791-1-BKS **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	<0.005	0.050	0.054	108	66-142	
Bromobenzene	<0.005	0.050	0.056	112	75-125	
Bromochloromethane	<0.005	0.050	0.049	98	73-125	
Bromodichloromethane	<0.005	0.050	0.053	106	75-125	
Bromoform	<0.005	0.050	0.053	106	75-125	
Methyl bromide	<0.005	0.050	0.055	110	70-130	
MTBE	<0.005	0.050	0.060	120	75-125	
n-Butylbenzene	<0.005	0.050	0.056	112	75-125	
Sec-Butylbenzene	<0.005	0.050	0.058	116	75-125	
tert-Butylbenzene	<0.005	0.050	0.058	116	75-125	
Carbon Tetrachloride	<0.005	0.050	0.050	100	62-125	
Chlorobenzene	<0.005	0.050	0.053	106	60-133	
Chloroethane	<0.010	0.050	0.057	114	70-130	
Chloroform	<0.005	0.050	0.054	108	74-125	
Methyl Chloride	<0.010	0.050	0.060	120	70-130	
2-Chlorotoluene	<0.005	0.050	0.054	108	73-125	
4-Chlorotoluene	<0.005	0.050	0.054	108	74-125	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.057	114	75-125	
Dibromochloromethane	<0.005	0.050	0.053	106	73-125	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.054	108	59-125	
Methylene bromide	<0.005	0.050	0.056	112	69-127	
1,2-Dichlorobenzene	<0.005	0.050	0.056	112	75-125	
1,3-Dichlorobenzene	<0.005	0.050	0.056	112	75-125	
1,4-Dichlorobenzene	<0.005	0.050	0.053	106	75-125	
Dichlorodifluoromethane	<0.005	0.050	0.063	126	70-130	
1,1-Dichloroethane	<0.005	0.050	0.049	98	72-125	
1,2-Dichloroethane	<0.005	0.050	0.051	102	68-127	
1,1-Dichloroethene	<0.005	0.050	0.049	98	59-172	
cis-1,2-Dichloroethylene	<0.005	0.050	0.053	106	75-125	
trans-1,2-dichloroethylene	<0.005	0.050	0.046	92	75-125	
1,2-Dichloropropane	<0.005	0.050	0.054	108	74-125	
1,3-Dichloropropane	<0.005	0.050	0.053	106	75-125	
2,2-Dichloropropane	<0.005	0.050	0.050	100	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697910 **Sample:** 495791-1-BKS **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
1,1-Dichloropropene	<0.005	0.050	0.047	94	75-125	
cis-1,3-Dichloropropene	<0.005	0.050	0.051	102	74-125	
trans-1,3-dichloropropene	<0.005	0.050	0.052	104	66-125	
Ethylbenzene	<0.005	0.050	0.053	106	75-125	
Hexachlorobutadiene	<0.005	0.050	0.048	96	75-125	
isopropylbenzene	<0.005	0.050	0.061	122	75-125	
Methylene Chloride	<0.005	0.050	0.049	98	75-125	
Naphthalene	<0.010	0.050	0.058	116	75-125	
n-Propylbenzene	<0.005	0.050	0.055	110	75-125	
Styrene	<0.005	0.050	0.053	106	75-125	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.054	108	72-125	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.057	114	74-125	
Tetrachloroethylene	<0.005	0.050	0.046	92	71-125	
Toluene	<0.005	0.050	0.053	106	59-139	
1,2,3-Trichlorobenzene	<0.005	0.050	0.055	110	75-137	
1,2,4-Trichlorobenzene	<0.005	0.050	0.053	106	75-135	
1,1,1-Trichloroethane	<0.005	0.050	0.053	106	75-125	
1,1,2-Trichloroethane	<0.005	0.050	0.053	106	75-127	
Trichloroethylene	<0.005	0.050	0.050	100	62-137	
Trichlorofluoromethane	<0.005	0.050	0.054	108	67-125	
1,2,3-Trichloropropane	<0.005	0.050	0.061	122	75-125	
1,2,4-Trimethylbenzene	<0.005	0.050	0.055	110	75-125	
1,3,5-Trimethylbenzene	<0.005	0.050	0.056	112	70-125	
o-Xylene	<0.005	0.050	0.054	108	75-125	
m,p-Xylene	<0.010	0.100	0.110	110	75-125	
Vinyl Chloride	<0.002	0.050	0.052	104	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697951 **Sample:** 495813-1-BKS **Matrix:** Solid

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JLA

Reporting Units: mg/kg **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	<0.005	0.050	0.045	90	66-142	
Bromobenzene	<0.005	0.050	0.048	96	75-125	
Bromochloromethane	<0.005	0.050	0.043	86	73-125	
Bromodichloromethane	<0.005	0.050	0.045	90	75-125	
Bromoform	<0.005	0.050	0.044	88	75-125	
Methyl bromide	<0.005	0.050	0.038	76	65-135	
MTBE	<0.005	0.050	0.045	90	75-125	
tert-Butylbenzene	<0.005	0.050	0.049	98	75-125	
Sec-Butylbenzene	<0.005	0.050	0.048	96	75-125	
n-Butylbenzene	<0.005	0.050	0.048	96	75-125	
Carbon Tetrachloride	<0.005	0.050	0.039	78	62-125	
Chlorobenzene	<0.005	0.050	0.047	94	60-133	
Chloroethane	<0.010	0.050	0.040	80	65-135	
Chloroform	<0.005	0.050	0.044	88	74-125	
Methyl Chloride	<0.010	0.050	0.055	110	65-135	
2-Chlorotoluene	<0.005	0.050	0.047	94	73-125	
4-Chlorotoluene	<0.005	0.050	0.048	96	74-125	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.049	98	75-125	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.036	72	59-125	
Dibromochloromethane	<0.005	0.050	0.045	90	73-125	
Methylene bromide	<0.005	0.050	0.049	98	69-127	
1,2-Dichlorobenzene	<0.005	0.050	0.049	98	75-125	
1,3-Dichlorobenzene	<0.005	0.050	0.048	96	75-125	
1,4-Dichlorobenzene	<0.005	0.050	0.045	90	75-125	
Dichlorodifluoromethane	<0.005	0.050	0.046	92	65-135	
1,2-Dichloroethane	<0.005	0.050	0.041	82	68-127	
1,1-Dichloroethane	<0.005	0.050	0.041	82	72-125	
trans-1,2-dichloroethylene	<0.005	0.050	0.037	74	75-125	L
cis-1,2-Dichloroethylene	<0.005	0.050	0.043	86	75-125	
1,1-Dichloroethene	<0.005	0.050	0.037	74	59-172	
2,2-Dichloropropane	<0.005	0.050	0.045	90	75-125	
1,3-Dichloropropane	<0.005	0.050	0.046	92	75-125	
1,2-Dichloropropane	<0.005	0.050	0.048	96	74-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Lab Batch #: 697951 **Sample:** 495813-1-BKS **Matrix:** Solid

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JLA

Reporting Units: mg/kg **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
trans-1,3-dichloropropene	<0.005	0.050	0.045	90	66-125	
1,1-Dichloropropene	<0.005	0.050	0.036	72	75-125	L
cis-1,3-Dichloropropene	<0.005	0.050	0.043	86	74-125	
Ethylbenzene	<0.005	0.050	0.046	92	75-125	
Hexachlorobutadiene	<0.005	0.050	0.048	96	75-125	
isopropylbenzene	<0.005	0.050	0.053	106	75-125	
Methylene Chloride	<0.020	0.050	0.040	80	75-125	
Naphthalene	<0.010	0.050	0.051	102	75-125	
n-Propylbenzene	<0.005	0.050	0.047	94	75-125	
Styrene	<0.005	0.050	0.047	94	75-125	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.046	92	72-125	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.052	104	74-125	
Tetrachloroethylene	<0.005	0.050	0.043	86	71-125	
Toluene	<0.005	0.050	0.045	90	59-139	
1,2,4-Trichlorobenzene	<0.005	0.050	0.049	98	75-135	
1,2,3-Trichlorobenzene	<0.005	0.050	0.050	100	75-137	
1,1,2-Trichloroethane	<0.005	0.050	0.049	98	75-127	
1,1,1-Trichloroethane	<0.005	0.050	0.041	82	75-125	
Trichloroethylene	<0.005	0.050	0.040	80	62-137	
Trichlorofluoromethane	<0.005	0.050	0.037	74	67-125	
1,2,3-Trichloropropane	<0.005	0.050	0.050	100	75-125	
1,2,4-Trimethylbenzene	<0.005	0.050	0.046	92	75-125	
1,3,5-Trimethylbenzene	<0.005	0.050	0.047	94	70-130	
Vinyl Chloride	<0.002	0.050	0.046	92	65-135	
o-Xylene	<0.005	0.050	0.049	98	75-125	
m,p-Xylene	<0.010	0.100	0.093	93	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

BS / BSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473 **Project ID:** 07.12.018

Analyst: JAH **Date Prepared:** 06/04/2007 **Date Analyzed:** 06/04/2007

Lab Batch ID: 697868 **Sample:** 495769-1-BKS **Batch #:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY										
	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
C6-C12 Gasoline Range Hydrocarbons	<5.00	100	74.1	74	100.0	70.5	71	4	70-135	25	
C12-C28 Diesel Range Hydrocarbons	<5.00	100	76.9	77	100.0	76.5	77	0	70-135	25	

Relative Percent Difference RPD = 200*|(D-F)/(D+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Bellaire Blvd (II)

Work Order #: 283473
Lab Batch #: 698068
Date Analyzed: 06/06/2007
QC- Sample ID: 283408-008 S
Reporting Units: mg/kg

Project ID: 07.12.018
Date Prepared: 06/06/2007
Analyst: HDO
Batch #: 1
Matrix: Soil

MATRIX / MATRIX SPIKE RECOVERY STUDY

BTEX-MTBE by SW 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
MTBE	<0.0050	2.660	2.670	100	75-125	
Benzene	<0.0050	0.5310	0.5310	100	66-142	
Toluene	<0.0100	0.5310	0.5270	99	59-139	
Ethylbenzene	<0.0050	0.5310	0.5320	100	75-125	
m,p-Xylene	<0.0150	1.060	1.030	97	75-125	
o-Xylene	<0.0050	0.5310	0.5270	99	75-125	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697790 **QC- Sample ID:** 283334-001 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** BEC

Reporting Units: mg/L

BTEX-MTBE by SW 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
MTBE	0.0402	0.5000	0.5727	107	0.5000	0.5896	110	3	65-135	20	
Benzene	0.0027	0.1000	0.1056	103	0.1000	0.1094	107	4	66-142	20	
Toluene	<0.0010	0.1000	0.1028	103	0.1000	0.0954	95	8	59-139	20	
Ethylbenzene	<0.0010	0.1000	0.1011	101	0.1000	0.0973	97	4	75-125	20	
m,p-Xylene	<0.0020	0.2000	0.1981	99	0.2000	0.1811	91	8	75-125	20	
o-Xylene	<0.0010	0.1000	0.1013	101	0.1000	0.0977	98	3	75-125	20	

Lab Batch ID: 698189 **QC- Sample ID:** 283450-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/07/2007 **Date Prepared:** 06/07/2007 **Analyst:** HDO

Reporting Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
MTBE	<0.0240	2.427	2.505	103	2.212	2.417	109	6	65-135	25	
Benzene	<0.0048	0.4854	0.4095	84	0.4425	0.4037	91	8	66-142	25	
Toluene	<0.0048	0.4854	0.4469	92	0.4425	0.4282	97	5	59-139	25	
Ethylbenzene	<0.0048	0.4854	0.3905	80	0.4425	0.3744	85	6	75-125	25	
m,p-Xylene	<0.0096	0.9709	0.7559	78	0.8850	0.7094	80	3	75-125	25	
o-Xylene	<0.0048	0.4854	0.4158	86	0.4425	0.3918	89	3	75-125	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697960 **QC- Sample ID:** 283565-003 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/06/2007 **Date Prepared:** 06/05/2007 **Analyst:** JAH

Reporting Units: mg/kg

TPH by Texas1005 Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
C6-C12 Gasoline Range Hydrocarbons	<50.0	998	772	77	995	743	75	3	70-135	35	
C12-C28 Diesel Range Hydrocarbons	<50.0	998	735	74	995	726	73	1	70-135	35	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697910 **QC- Sample ID:** 283472-003 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.005	0.050	0.058	116	0.050	0.055	110	5	66-142	21	
Bromobenzene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
Bromochloromethane	<0.005	0.050	0.052	104	0.050	0.050	100	4	73-125	20	
Bromodichloromethane	<0.005	0.050	0.057	114	0.050	0.049	98	15	75-125	20	
Bromoform	<0.005	0.050	0.053	106	0.050	0.036	72	38	75-125	20	XF
Methyl bromide	<0.005	0.050	0.060	120	0.050	0.054	108	11	70-130	20	
MTBE	<0.005	0.050	0.064	128	0.050	0.060	120	6	75-125	20	X
n-Butylbenzene	<0.005	0.050	0.064	128	0.050	0.059	118	8	75-125	20	X
Sec-Butylbenzene	<0.005	0.050	0.065	130	0.050	0.060	120	8	75-125	20	X
tert-Butylbenzene	<0.005	0.050	0.064	128	0.050	0.059	118	8	75-125	20	X
Carbon Tetrachloride	<0.005	0.050	0.054	108	0.050	0.051	102	6	62-125	20	
Chlorobenzene	<0.005	0.050	0.056	112	0.050	0.053	106	6	60-133	21	
Chloroethane	<0.010	0.050	0.059	118	0.050	0.056	112	5	70-130	20	
Chloroform	<0.005	0.050	0.057	114	0.050	0.054	108	5	74-125	20	
Methyl Chloride	<0.010	0.050	0.066	132	0.050	0.068	136	3	70-130	20	X
2-Chlorotoluene	<0.005	0.050	0.058	116	0.050	0.055	110	5	73-125	20	
4-Chlorotoluene	<0.005	0.050	0.059	118	0.050	0.055	110	7	74-125	20	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.064	128	0.050	0.060	120	6	75-125	20	X
Dibromochloromethane	<0.005	0.050	0.056	112	0.050	0.043	86	26	73-125	20	F
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.058	116	0.050	0.049	98	17	59-125	28	
Methylene bromide	<0.005	0.050	0.059	118	0.050	0.056	112	5	69-127	23	
1,2-Dichlorobenzene	<0.005	0.050	0.061	122	0.050	0.056	112	9	75-125	20	
1,3-Dichlorobenzene	<0.005	0.050	0.060	120	0.050	0.056	112	7	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697910 **QC- Sample ID:** 283472-003 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
1,4-Dichlorobenzene	<0.005	0.050	0.058	116	0.050	0.054	108	7	75-125	20	
Dichlorodifluoromethane	<0.005	0.050	0.072	144	0.050	0.069	138	4	70-130	23	X
1,1-Dichloroethane	<0.005	0.050	0.055	110	0.050	0.052	104	6	72-125	20	
1,2-Dichloroethane	<0.005	0.050	0.058	116	0.050	0.054	108	7	68-127	20	
1,1-Dichloroethene	<0.005	0.050	0.051	102	0.050	0.049	98	4	59-172	22	
cis-1,2-Dichloroethylene	<0.005	0.050	0.056	112	0.050	0.053	106	6	75-125	20	
trans-1,2-dichloroethylene	<0.005	0.050	0.050	100	0.050	0.047	94	6	75-125	20	
1,2-Dichloropropane	<0.005	0.050	0.058	116	0.050	0.055	110	5	74-125	20	
1,3-Dichloropropane	<0.005	0.050	0.057	114	0.050	0.052	104	9	75-125	20	
2,2-Dichloropropane	<0.005	0.050	0.059	118	0.050	0.057	114	3	75-125	20	
1,1-Dichloropropene	<0.005	0.050	0.052	104	0.050	0.048	96	8	75-125	20	
cis-1,3-Dichloropropene	<0.005	0.050	0.054	108	0.050	0.048	96	12	74-125	20	
trans-1,3-dichloropropene	<0.005	0.050	0.056	112	0.050	0.051	102	9	66-125	20	
Ethylbenzene	<0.005	0.050	0.059	118	0.050	0.054	108	9	75-125	20	
Hexachlorobutadiene	<0.005	0.050	0.055	110	0.050	0.051	102	8	75-125	20	
isopropylbenzene	<0.005	0.050	0.066	132	0.050	0.062	124	6	75-125	20	X
Methylene Chloride	<0.005	0.050	0.051	102	0.050	0.048	96	6	75-125	35	
Naphthalene	<0.010	0.050	0.058	116	0.050	0.054	108	7	75-125	20	
n-Propylbenzene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
Styrene	<0.005	0.050	0.058	116	0.050	0.052	104	11	75-125	51	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.058	116	0.050	0.053	106	9	72-125	20	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.064	128	0.050	0.057	114	12	74-125	31	X
Tetrachloroethylene	<0.005	0.050	0.051	102	0.050	0.049	98	4	71-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697910 **QC- Sample ID:** 283472-003 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Toluene	<0.005	0.050	0.059	118	0.050	0.054	108	9	59-139	21	
1,2,3-Trichlorobenzene	<0.005	0.050	0.057	114	0.050	0.054	108	5	75-137	20	
1,2,4-Trichlorobenzene	<0.005	0.050	0.056	112	0.050	0.053	106	6	75-135	20	
1,1,1-Trichloroethane	<0.005	0.050	0.058	116	0.050	0.055	110	5	75-125	20	
1,1,2-Trichloroethane	<0.005	0.050	0.059	118	0.050	0.054	108	9	75-127	20	
Trichloroethylene	<0.005	0.050	0.052	104	0.050	0.048	96	8	62-137	24	
Trichlorofluoromethane	<0.005	0.050	0.052	104	0.050	0.051	102	2	67-125	20	
1,2,3-Trichloropropane	<0.005	0.050	0.064	128	0.050	0.057	114	12	75-125	20	X
1,2,4-Trimethylbenzene	<0.005	0.050	0.061	122	0.050	0.057	114	7	75-125	20	
1,3,5-Trimethylbenzene	<0.005	0.050	0.061	122	0.050	0.056	112	9	70-125	20	
o-Xylene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
m,p-Xylene	<0.010	0.100	0.121	121	0.100	0.112	112	8	75-125	20	
Vinyl Chloride	<0.002	0.050	0.060	120	0.050	0.059	118	2	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697951 **QC- Sample ID:** 283473-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.005	0.050	0.043	86	0.050	0.044	88	2	66-142	21	
Bromobenzene	<0.005	0.050	0.048	96	0.050	0.048	96	0	75-125	25	
Bromochloromethane	<0.005	0.050	0.040	80	0.050	0.039	78	3	73-125	20	
Bromodichloromethane	<0.005	0.050	0.043	86	0.050	0.041	82	5	75-125	20	
Bromoform	<0.005	0.050	0.047	94	0.050	0.040	80	16	75-125	20	
Methyl bromide	<0.005	0.050	0.036	72	0.050	0.041	82	13	65-135	20	
MTBE	<0.005	0.050	0.050	100	0.050	0.050	100	0	75-125	20	
tert-Butylbenzene	<0.005	0.050	0.051	102	0.050	0.060	120	16	75-125	25	
Sec-Butylbenzene	<0.005	0.050	0.051	102	0.050	0.062	124	19	75-125	25	
n-Butylbenzene	<0.005	0.050	0.048	96	0.050	0.057	114	17	75-125	25	
Carbon Tetrachloride	<0.005	0.050	0.039	78	0.050	0.043	86	10	62-125	20	
Chlorobenzene	<0.005	0.050	0.048	96	0.050	0.045	90	6	60-133	21	
Chloroethane	<0.010	0.050	0.039	78	0.050	0.043	86	10	65-135	20	
Chloroform	<0.005	0.050	0.041	82	0.050	0.040	80	2	74-125	20	
Methyl Chloride	<0.010	0.050	0.054	108	0.050	0.058	116	7	65-135	20	
2-Chlorotoluene	<0.005	0.050	0.048	96	0.050	0.053	106	10	73-125	25	
4-Chlorotoluene	<0.005	0.050	0.048	96	0.050	0.050	100	4	74-125	25	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.050	100	0.050	0.060	120	18	75-125	25	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.047	94	0.050	0.049	98	4	59-125	28	
Dibromochloromethane	<0.005	0.050	0.046	92	0.050	0.038	76	19	73-125	25	
Methylene bromide	<0.005	0.050	0.051	102	0.050	0.050	100	2	69-127	23	
1,2-Dichlorobenzene	<0.005	0.050	0.050	100	0.050	0.052	104	4	75-125	25	
1,3-Dichlorobenzene	<0.005	0.050	0.047	94	0.050	0.051	102	8	75-125	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697951 **QC- Sample ID:** 283473-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
1,4-Dichlorobenzene	<0.005	0.050	0.046	92	0.050	0.050	100	8	75-125	25	
Dichlorodifluoromethane	<0.005	0.050	0.047	94	0.050	0.050	100	6	65-135	23	
1,2-Dichloroethane	<0.005	0.050	0.039	78	0.050	0.037	74	5	68-127	20	
1,1-Dichloroethane	<0.005	0.050	0.040	80	0.050	0.041	82	2	72-125	20	
trans-1,2-dichloroethylene	<0.005	0.050	0.035	70	0.050	0.037	74	6	75-125	20	X
cis-1,2-Dichloroethylene	<0.005	0.050	0.040	80	0.050	0.041	82	2	75-125	20	
1,1-Dichloroethene	<0.005	0.050	0.037	74	0.050	0.039	78	5	59-172	22	
2,2-Dichloropropane	<0.005	0.050	0.043	86	0.050	0.052	104	19	75-125	25	
1,3-Dichloropropane	<0.005	0.050	0.049	98	0.050	0.046	92	6	75-125	25	
1,2-Dichloropropane	<0.005	0.050	0.045	90	0.050	0.046	92	2	74-125	20	
trans-1,3-dichloropropene	<0.005	0.050	0.042	84	0.050	0.039	78	7	66-125	20	
1,1-Dichloropropene	<0.005	0.050	0.035	70	0.050	0.038	76	8	75-125	25	X
cis-1,3-Dichloropropene	<0.005	0.050	0.041	82	0.050	0.039	78	5	74-125	20	
Ethylbenzene	<0.005	0.050	0.047	94	0.050	0.045	90	4	75-125	20	
Hexachlorobutadiene	<0.005	0.050	0.048	96	0.050	0.060	120	22	75-125	25	
isopropylbenzene	<0.005	0.050	0.054	108	0.050	0.058	116	7	75-125	25	
Methylene Chloride	<0.020	0.050	0.038	76	0.050	0.037	74	3	75-125	35	X
Naphthalene	<0.010	0.050	0.057	114	0.050	0.062	124	8	75-125	25	
n-Propylbenzene	<0.005	0.050	0.049	98	0.050	0.056	112	13	75-125	25	
Styrene	<0.005	0.050	0.048	96	0.050	0.043	86	11	75-125	51	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.043	86	0.050	0.044	88	2	72-125	20	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.057	114	0.050	0.049	98	15	74-125	31	
Tetrachloroethylene	<0.005	0.050	0.046	92	0.050	0.045	90	2	71-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: Bellaire Blvd (II)

Work Order # : 283473 **Project ID:** 07.12.018

Lab Batch ID: 697951 **QC- Sample ID:** 283473-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Toluene	<0.005	0.050	0.045	90	0.050	0.044	88	2	59-139	21	
1,2,4-Trichlorobenzene	<0.005	0.050	0.048	96	0.050	0.056	112	15	75-135	25	
1,2,3-Trichlorobenzene	<0.005	0.050	0.050	100	0.050	0.055	110	10	75-137	25	
1,1,2-Trichloroethane	<0.005	0.050	0.052	104	0.050	0.046	92	12	75-127	20	
1,1,1-Trichloroethane	<0.005	0.050	0.039	78	0.050	0.044	88	12	75-125	20	
Trichloroethylene	<0.005	0.050	0.040	80	0.050	0.043	86	7	62-137	24	
Trichlorofluoromethane	<0.005	0.050	0.038	76	0.050	0.047	94	21	67-125	20	F
1,2,3-Trichloropropane	<0.005	0.050	0.059	118	0.050	0.055	110	7	75-125	20	
1,2,4-Trimethylbenzene	<0.005	0.050	0.047	94	0.050	0.051	102	8	75-125	25	
1,3,5-Trimethylbenzene	<0.005	0.050	0.047	94	0.050	0.056	112	17	70-130	25	
Vinyl Chloride	<0.002	0.050	0.046	92	0.050	0.048	96	4	65-135	20	
o-Xylene	<0.005	0.050	0.050	100	0.050	0.048	96	4	75-125	20	
m,p-Xylene	<0.010	0.100	0.095	95	0.100	0.091	91	4	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

XENCO Laboratories

☐ 11381 Meadowglen, Suite L, Houston, TX 77082 281-589-0692
☐ 5309 Wurzbach, Suite 104, San Antonio, TX 78238 210-509-3334
☐ 9700 Harry Hines Blvd., Dallas, TX 75220 972-902-0300

ANALYSIS REQUEST & CHAIN OF CUSTODY RECORD

☐ 5757 N.W. 158th Street, Miami Lakes, Fl 33014 305-823-8500
☐ 3016 US Highway 301 N., Suite 900, Tampa, Fl 33619 813-620-2000

LAB ONLY: 283473-H

Serial #: 204427 Page 1 of 1

Company-City: Tolunay-Wong Engineers, Inc. Phone:

TAT: 5h 12h 24h 48h 3d 5d 7d 10d 21d Standard TAT is project specific.
It is typically 5-7 Working Days for level II and 10+ Working days for level III and IV data.

Project Name ☐ Previously performed at XENCO: Bellaire Blvd. (II) Site:

Project ID: 07.12.018

Proj. Manager (PM): Keith Ross

Fax Results to ☐ PM or e-mail to: kross@tweinc.com Fax No:

Invoice to ☐ Accounting ☐ Inc. Invoice with Final Report ☐ Invoice must have a P.O
Bill to:

Quote No: P.O No: ☐ Call for a P.O.

Reg Program: CLP AFCEE TRRP DW UST State Other:

Target DLs (DW CRDL TRRP QAPP MDLs See Lab PM Attached Call)

TRRP PCLs: Tier 1 Tier 2 Residential Industrial

LPST No.:(Required)

Sampler Name: Matt Brumm Signature: Matt Brumm

	Sample ID	Sampling Date	Time	Depth ft' In" m	Matrix	Composite	Grab	# Containers	Container Size	Container Type	Preservatives	BTEX by 8021 8260 602 624 Other	BTEX-MTBE by 8021 624 Other	TPH by TX1005 FL-Pro 1664 8015GRO 8015DRO 418.1	PAHs by 8270 8310	Metals by 6020 200.8 8RCRA Tot Pb TCLP8 13PP 23TAL	VOCs by 8021 8260 624 VOA VOH PPs TCL	SVOCs by 8270 625 PAHs BN&A TCL PPs	FL Preburn - Revised: Virgin Non-Virgin	TAT 5h 12h 24h 48h 3d 5d 7d 10d 21d	Addn: PAH above mg/L W, mg/Kg S Highest Hit	Hold Disposal Hold Analysis (Surcharges will apply)	Sample Clean-ups are pre-approved	Remarks
1	EB-1B, 10-12	5.29.07	10:37	10-12	S		✓	1	4	C	C			X			X							
2	EB-2B, 12-14	5.29.07	12:14	12-14	S		✓	1	4	C	C			X			X							
3	EB-3B, 14-16	5.29.07		14-16	S		✓	1	4	C	C		X	X										
4	EB-1B	5.29.07	10:37	NA	W		✓	5	V	A/C	H			X			X							
5	EB-2B	5.29.07	1214	NA	W		✓	5	V	A/C	H			X			X							
6	EB-3B	5.29.07		NA	W		✓	5	V	A/C	H		X	X										
7																								
8																								
9																								
10																								

	Relinquished by (Initials and Sign)	Date & Time	Relinquished to (Initials and Sign)	Date & Time
1	MB Matt Brumm	5.31.07 330p	CSW C Shane Wood	5.31.07 330
2				
3			Lab: [signature]	5/31/07 16:16

Rush Charges are Pre-Approved upon requesting them.
Instructions:
All XENCO Standard Terms and Conditions Apply.
Containers Received: 18 Cooler Temperature: 3.0°C

Preservatives: Various (V), HCl pH<2 (H), H2SO4 pH<2 (S), HNO3 pH<2 (N), Asbc Acid&NaOH (A), ZnAc&NaOH (Z), (Cool,<4C) (C), None (NA), See Label (L), Other (O) _____
Cont. Size: 4oz (4), 8oz (8), 32oz (32), 40ml VOA (V), 1L (1), 500ml (5), Tedlar Bag (B), Wipe (W), Other _____ **Cont. Type:** Glass Amb (A), Glass Clear (C), Plastic (P), Other (O) _____

Matrix: Air (A), Product (P), Solid(S), Water (W)

SDBE Committed to Excellence in Service and Quality since 1990 www.xenco.com

283473-H

XENCO Laboratories

Prelogin/Nonconformance Report- Sample Log-In

Client: FWE

Date/ Time: 5/31/7

Lab ID # : 783473-T1

Initials: AJ

Sample Receipt Checklist

#1 Temperature of container/ cooler?	Yes	No	N/A	3.0°C
#2 Shipping container in good condition?	Yes	No	None	
#3 Samples received on ice?	Yes	No	N/A	Blue/Water
#4 Custody Seals intact on shipping container/ cooler?	Yes	No	N/A	
#5 Custody Seals intact on sample bottles/ container?	Yes	No		
#6 Chain of Custody present?	Yes	No		
#7 Sample instructions complete of Chain of Custody?	Yes	No		
#8 Any missing/extra samples?	Yes	No		
#9 Chain of Custody signed when relinquished/ received?	Yes	No		
#10 Chain of Custody agrees with sample label(s)?	Yes	No		
#11 Container label(s) legible and intact?	Yes	No		
#12 Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#13 Samples in proper container/ bottle?	Yes	No		
#14 Samples properly preserved?	Yes	No	N/A	
#15 Sample container intact?	Yes	No		
#16 Sufficient sample amount for indicated test(s)?	Yes	No		
#17 All samples received within sufficient hold time?	Yes	No		
#18 Subcontract of sample(s)?	Yes	No	N/A	
#19 VOC samples have zero headspace?	Yes	No	N/A	

Nonconformance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken:

_____

Check all that Apply:

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event

Analytical Report 283472

for

Tolunay-Wong Engineers, Inc.

Project Manager: Keith Ross

College Ave (II)

07.12.017

12-JUN-07

11381 Meadowglen, Suite L Houston, TX 77082 Ph:(281) 589-0692 Fax:(281) 589-0695

NELAC certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675

Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America

12-JUN-07

Project Manager: **Keith Ross**
Tolunay-Wong Engineers, Inc.
10710 S. Sam Houston Parkway W.,
Suite 100
Houston, TX 77031

Reference: XENCO Report No: **283472**
College Ave (II)
Project Address:

Keith Ross:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 283472. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 283472 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Carlos A. Castro, Ph.D., MBA
Managing Director, Texas

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Certificate of Analysis Summary 283472

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: College Ave (II)

Project Id: 07.12.017
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested	*Lab Id:*	283472-001		283472-002		283472-003		283472-004	
	Field Id:	EB-1C		EB-2C		EB-3C		EB-5C	
	Depth:								
	Matrix:	WATER		WATER		WATER		WATER	
	Sampled:	May-30-07 00:00		May-29-07 15:45		May-30-07 00:00		May-30-07 00:00	
BTEX-MTBE by SW 8260B	*Extracted:*			Jun-04-07 09:14					
	Analyzed:			Jun-04-07 13:36					
	Units/RL:			mg/L	RL				
MTBE				BRL	0.0050				
Benzene				0.0103	0.0010				
Toluene				0.0443	0.0010				
Ethylbenzene				0.0061	0.0010				
m,p-Xylene				0.0168	0.0020				
o-Xylene				0.0084	0.0010				
Total Xylenes				0.0252					
Total BTEX				0.0859					
TPH by Texas1005	*Extracted:*	Jun-01-07 10:48		Jun-01-07 10:51		Jun-01-07 10:54		Jun-01-07 10:57	
	Analyzed:	Jun-01-07 14:48		Jun-01-07 15:18		Jun-01-07 16:46		Jun-01-07 17:15	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
C6-C12 Gasoline Range Hydrocarbons		BRL	4.58	BRL	4.51	BRL	4.62	BRL	4.66
C12-C28 Diesel Range Hydrocarbons		BRL	4.58	BRL	4.51	BRL	4.62	BRL	4.66
C28-C35 Oil Range Hydrocarbons		BRL	4.58	BRL	4.51	BRL	4.62	BRL	4.66
Total TPH 1005		BRL		BRL		BRL		BRL	

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Project Id: 07.12.017
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested	*Lab Id:*	283472-001		283472-002	283472-003		283472-004	
	Field Id:	EB-1C		EB-2C	EB-3C		EB-5C	
	Depth:							
	Matrix:	WATER		WATER	WATER		WATER	
	Sampled:	May-30-07 00:00		May-29-07 15:45	May-30-07 00:00		May-30-07 00:00	
VOAs by SW-846 8260B	*Extracted:*	Jun-01-07 11:16			Jun-04-07 15:45		Jun-04-07 15:45	
	Analyzed:	Jun-01-07 13:48			Jun-04-07 16:19		Jun-04-07 18:04	
	Units/RL:	mg/L	RL		mg/L	RL	mg/L	RL
Benzene		BRL	0.005		BRL	0.005	BRL	0.005
Bromobenzene		BRL	0.005		BRL	0.005	BRL	0.005
Bromochloromethane		BRL	0.005		BRL	0.005	BRL	0.005
Bromodichloromethane		BRL	0.005		BRL	0.005	BRL	0.005
Bromoform		BRL	0.005		BRL	0.005	BRL	0.005
Methyl bromide		BRL	0.005		BRL	0.005	BRL	0.005
MTBE		BRL	0.005		BRL	0.005	BRL	0.005
n-Butylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
Sec-Butylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
tert-Butylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
Carbon Tetrachloride		BRL	0.005		BRL	0.005	BRL	0.005
Chlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
Chloroethane		BRL	0.010		BRL	0.010	BRL	0.010
Chloroform		BRL	0.005		BRL	0.005	BRL	0.005
Methyl Chloride		BRL	0.010		BRL	0.010	BRL	0.010
2-Chlorotoluene		BRL	0.005		BRL	0.005	BRL	0.005
4-Chlorotoluene		BRL	0.005		BRL	0.005	BRL	0.005
p-Cymene (p-Isopropyltoluene)		BRL	0.005		BRL	0.005	BRL	0.005
Dibromochloromethane		BRL	0.005		BRL	0.005	BRL	0.005
1,2-Dibromo-3-Chloropropane		BRL	0.005		BRL	0.005	BRL	0.005
Methylene bromide		BRL	0.005		BRL	0.005	BRL	0.005
1,2-Dichlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
1,3-Dichlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
1,4-Dichlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
Dichlorodifluoromethane		BRL	0.005		BRL	0.005	BRL	0.005
1,1-Dichloroethane		BRL	0.005		BRL	0.005	BRL	0.005
1,2-Dichloroethane		BRL	0.005		BRL	0.005	BRL	0.005
1,1-Dichloroethene		BRL	0.005		BRL	0.005	BRL	0.005
cis-1,2-Dichloroethylene		BRL	0.005		BRL	0.005	BRL	0.005
trans-1,2-dichloroethylene		BRL	0.005		BRL	0.005	BRL	0.005
1,2-Dichloropropane		BRL	0.005		BRL	0.005	BRL	0.005
1,3-Dichloropropane		BRL	0.005		BRL	0.005	BRL	0.005
2,2-Dichloropropane		BRL	0.005		BRL	0.005	BRL	0.005
1,1-Dichloropropene		BRL	0.005		BRL	0.005	BRL	0.005

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Managing Director, Texas

Certificate of Analysis Summary 283472

Tolunay-Wong Engineers, Inc., Houston, TX

Project Name: College Ave (II)

Project Id: 07.12.017 | **Date Received in Lab:** May-31-07 04:16 pm

Contact: Keith Ross | **Report Date:** 12-JUN-07

Project Location: | **Project Manager:** Debbie Simmons

Analysis Requested	*Lab Id:*	283472-001		283472-002	283472-003		283472-004	
	Field Id:	EB-1C		EB-2C	EB-3C		EB-5C	
	Depth:							
	Matrix:	WATER		WATER	WATER		WATER	
	Sampled:	May-30-07 00:00		May-29-07 15:45	May-30-07 00:00		May-30-07 00:00	
VOAs by SW-846 8260B	*Extracted:*	Jun-01-07 11:16			Jun-04-07 15:45		Jun-04-07 15:45	
	Analyzed:	Jun-01-07 13:48			Jun-04-07 16:19		Jun-04-07 18:04	
	Units/RL:	mg/L	RL		mg/L	RL	mg/L	RL
cis-1,3-Dichloropropene		BRL	0.005		BRL	0.005	BRL	0.005
trans-1,3-dichloropropene		BRL	0.005		BRL	0.005	BRL	0.005
Ethylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
Hexachlorobutadiene		BRL	0.005		BRL	0.005	BRL	0.005
isopropylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
Methylene Chloride		BRL	0.005		BRL	0.005	BRL	0.005
Naphthalene		BRL	0.010		BRL	0.010	BRL	0.010
n-Propylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
Styrene		BRL	0.005		BRL	0.005	BRL	0.005
1,1,1,2-Tetrachloroethane		BRL	0.005		BRL	0.005	BRL	0.005
1,1,2,2-Tetrachloroethane		BRL	0.005		BRL	0.005	BRL	0.005
Tetrachloroethylene		BRL	0.005		BRL	0.005	BRL	0.005
Toluene		BRL	0.005		BRL	0.005	BRL	0.005
1,2,3-Trichlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
1,2,4-Trichlorobenzene		BRL	0.005		BRL	0.005	BRL	0.005
1,1,1-Trichloroethane		BRL	0.005		BRL	0.005	BRL	0.005
1,1,2-Trichloroethane		BRL	0.005		BRL	0.005	BRL	0.005
Trichloroethylene		BRL	0.005		BRL	0.005	BRL	0.005
Trichlorofluoromethane		BRL	0.005		BRL	0.005	BRL	0.005
1,2,3-Trichloropropane		BRL	0.005		BRL	0.005	BRL	0.005
1,2,4-Trimethylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
1,3,5-Trimethylbenzene		BRL	0.005		BRL	0.005	BRL	0.005
o-Xylene		BRL	0.005		BRL	0.005	BRL	0.005
m,p-Xylene		BRL	0.010		BRL	0.010	BRL	0.010
Vinyl Chloride		BRL	0.002		BRL	0.002	BRL	0.002

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Project Id: 07.12.017
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested								
	Lab Id:	283472-005		283472-006		283472-007		
	Field Id:	EB-6C		EB-2C		EB-6C		
	Depth:			8-10 ft		18-20 ft		
	Matrix:	WATER		SOIL		SOIL		
	Sampled:	May-29-07 17:27		May-29-07 15:45		May-29-07 17:27		
BTEX-MTBE by SW 8260B	*Extracted:*			Jun-06-07 13:14				
	Analyzed:			Jun-06-07 16:36				
	Units/RL:			mg/kg	RL			
MTBE				BRL	0.0225			
Benzene				BRL	0.0045			
Toluene				BRL	0.0045			
Ethylbenzene				BRL	0.0045			
m,p-Xylene				BRL	0.0090			
o-Xylene				BRL	0.0045			
Total BTEX				BRL				
Total Xylenes				BRL				
TPH by Texas1005	*Extracted:*	Jun-01-07 11:00		Jun-05-07 16:21		Jun-05-07 16:24		
	Analyzed:	Jun-01-07 17:45		Jun-05-07 20:32		Jun-05-07 21:03		
	Units/RL:	mg/L	RL	mg/kg	RL	mg/kg	RL	
C6-C12 Gasoline Range Hydrocarbons		BRL	4.66	BRL	49.8	BRL	49.9	
C12-C28 Diesel Range Hydrocarbons		BRL	4.66	BRL	49.8	BRL	49.9	
C28-C35 Oil Range Hydrocarbons		BRL	4.66	BRL	49.8	BRL	49.9	
Total TPH 1005		BRL		BRL		BRL		

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Project Id: 07.12.017
Contact: Keith Ross
Project Location:

Date Received in Lab: May-31-07 04:16 pm
Report Date: 12-JUN-07
Project Manager: Debbie Simmons

Analysis Requested	*Lab Id:*	283472-005		283472-006	283472-007		
	Field Id:	EB-6C		EB-2C	EB-6C		
	Depth:			8-10 ft	18-20 ft		
	Matrix:	WATER		SOIL	SOIL		
	Sampled:	May-29-07 17:27		May-29-07 15:45	May-29-07 17:27		
VOAs by SW-846 8260B	*Extracted:*	Jun-04-07 15:45			Jun-07-07 15:38		
	Analyzed:	Jun-04-07 18:24			Jun-07-07 17:53		
	Units/RL:	mg/L	RL		mg/kg	RL	
Benzene		BRL	0.005		BRL	0.005	
Bromobenzene		BRL	0.005		BRL	0.005	
Bromochloromethane		BRL	0.005		BRL	0.005	
Bromodichloromethane		BRL	0.005		BRL	0.005	
Bromoform		BRL	0.005		BRL	0.005	
Methyl bromide		BRL	0.005		BRL	0.005	
MTBE		BRL	0.005		BRL	0.005	
n-Butylbenzene		BRL	0.005		BRL	0.005	
Sec-Butylbenzene		BRL	0.005		BRL	0.005	
tert-Butylbenzene		BRL	0.005		BRL	0.005	
Carbon Tetrachloride		BRL	0.005		BRL	0.005	
Chlorobenzene		BRL	0.005		BRL	0.005	
Chloroethane		BRL	0.010		BRL	0.010	
Chloroform		BRL	0.005		BRL	0.005	
Methyl Chloride		BRL	0.010		BRL	0.010	
2-Chlorotoluene		BRL	0.005		BRL	0.005	
4-Chlorotoluene		BRL	0.005		BRL	0.005	
p-Cymene (p-Isopropyltoluene)		BRL	0.005		BRL	0.005	
Dibromochloromethane		BRL	0.005		BRL	0.005	
1,2-Dibromo-3-Chloropropane		BRL	0.005		BRL	0.005	
Methylene bromide		BRL	0.005		BRL	0.005	
1,2-Dichlorobenzene		BRL	0.005		BRL	0.005	
1,3-Dichlorobenzene		BRL	0.005		BRL	0.005	
1,4-Dichlorobenzene		BRL	0.005		BRL	0.005	
Dichlorodifluoromethane		BRL	0.005		BRL	0.005	
1,1-Dichloroethane		BRL	0.005		BRL	0.005	
1,2-Dichloroethane		BRL	0.005		BRL	0.005	
1,1-Dichloroethene		BRL	0.005		BRL	0.005	
cis-1,2-Dichloroethylene		BRL	0.005		BRL	0.005	
trans-1,2-dichloroethylene		BRL	0.005		BRL	0.005	
1,2-Dichloropropane		BRL	0.005		BRL	0.005	
1,3-Dichloropropane		BRL	0.005		BRL	0.005	
2,2-Dichloropropane		BRL	0.005		BRL	0.005	
1,1-Dichloropropene		BRL	0.005		BRL	0.005	

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Contact: Keith Ross | **Report Date:** 12-JUN-07

Project Location: | **Project Manager:** Debbie Simmons

Analysis Requested							
	Lab Id:	283472-005		283472-006	283472-007		
	Field Id:	EB-6C		EB-2C	EB-6C		
	Depth:			8-10 ft	18-20 ft		
	Matrix:	WATER		SOIL	SOIL		
	Sampled:	May-29-07 17:27		May-29-07 15:45	May-29-07 17:27		
VOAs by SW-846 8260B	*Extracted:*	Jun-04-07 15:45			Jun-07-07 15:38		
	Analyzed:	Jun-04-07 18:24			Jun-07-07 17:53		
	Units/RL:	mg/L	RL		mg/kg	RL	
cis-1,3-Dichloropropene		BRL	0.005		BRL	0.005	
trans-1,3-dichloropropene		BRL	0.005		BRL	0.005	
Ethylbenzene		BRL	0.005		BRL	0.005	
Hexachlorobutadiene		BRL	0.005		BRL	0.005	
isopropylbenzene		BRL	0.005		BRL	0.005	
Methylene Chloride		BRL	0.005		BRL	0.020	
Naphthalene		BRL	0.010		BRL	0.010	
n-Propylbenzene		BRL	0.005		BRL	0.005	
Styrene		BRL	0.005		BRL	0.005	
1,1,1,2-Tetrachloroethane		BRL	0.005		BRL	0.005	
1,1,2,2-Tetrachloroethane		BRL	0.005		BRL	0.005	
Tetrachloroethylene		BRL	0.005		BRL	0.005	
Toluene		0.022	0.005		BRL	0.005	
1,2,3-Trichlorobenzene		BRL	0.005		BRL	0.005	
1,2,4-Trichlorobenzene		BRL	0.005		BRL	0.005	
1,1,1-Trichloroethane		BRL	0.005		BRL	0.005	
1,1,2-Trichloroethane		BRL	0.005		BRL	0.005	
Trichloroethylene		BRL	0.005		BRL	0.005	
Trichlorofluoromethane		BRL	0.005		BRL	0.005	
1,2,3-Trichloropropane		BRL	0.005		BRL	0.005	
1,2,4-Trimethylbenzene		BRL	0.005		BRL	0.005	
1,3,5-Trimethylbenzene		BRL	0.005		BRL	0.005	
o-Xylene		BRL	0.005		BRL	0.005	
m,p-Xylene		BRL	0.010		BRL	0.010	
Vinyl Chloride		BRL	0.002		BRL	0.002	

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Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697790 **Sample:** 283334-001 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0493	0.0500	99	86-115	
Dibromofluoromethane	0.0521	0.0500	104	86-118	
1,2-Dichloroethane-D4	0.0540	0.0500	108	80-120	
Toluene-D8	0.0509	0.0500	102	88-110	

Lab Batch #: 697790 **Sample:** 283334-001 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0514	0.0500	103	86-115	
Dibromofluoromethane	0.0531	0.0500	106	86-118	
1,2-Dichloroethane-D4	0.0545	0.0500	109	80-120	
Toluene-D8	0.0462	0.0500	92	88-110	

Lab Batch #: 697790 **Sample:** 283472-002 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0523	0.0500	105	86-115	
Dibromofluoromethane	0.0539	0.0500	108	86-118	
1,2-Dichloroethane-D4	0.0515	0.0500	103	80-120	
Toluene-D8	0.0527	0.0500	105	88-110	

Lab Batch #: 697790 **Sample:** 495729-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0505	0.0500	101	86-115	
Dibromofluoromethane	0.0504	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0555	0.0500	111	80-120	
Toluene-D8	0.0510	0.0500	102	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697790 **Sample:** 495729-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0533	0.0500	107	86-115	
Dibromofluoromethane	0.0504	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0525	0.0500	105	80-120	
Toluene-D8	0.0539	0.0500	108	88-110	

Lab Batch #: 698068 **Sample:** 283408-008 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0466	0.0500	93	74-121	
Dibromofluoromethane	0.0503	0.0500	101	80-120	
1,2-Dichloroethane-D4	0.0501	0.0500	100	80-120	
Toluene-D8	0.0509	0.0500	102	81-117	

Lab Batch #: 698068 **Sample:** 283472-006 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0551	0.0500	110	74-121	
Dibromofluoromethane	0.0516	0.0500	103	80-120	
1,2-Dichloroethane-D4	0.0522	0.0500	104	80-120	
Toluene-D8	0.0497	0.0500	99	81-117	

Lab Batch #: 698068 **Sample:** 495883-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0488	0.0500	98	74-121	
Dibromofluoromethane	0.0486	0.0500	97	80-120	
1,2-Dichloroethane-D4	0.0515	0.0500	103	80-120	
Toluene-D8	0.0479	0.0500	96	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 698068 **Sample:** 495883-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX-MTBE by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0483	0.0500	97	74-121	
Dibromofluoromethane	0.0490	0.0500	98	80-120	
1,2-Dichloroethane-D4	0.0512	0.0500	102	80-120	
Toluene-D8	0.0512	0.0500	102	81-117	

Lab Batch #: 697789 **Sample:** 283472-001 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	10.1	9.16	110	70-135	
o-Terphenyl	5.37	4.58	117	70-135	

Lab Batch #: 697789 **Sample:** 283472-002 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.12	9.02	101	70-135	
o-Terphenyl	5.04	4.51	112	70-135	

Lab Batch #: 697789 **Sample:** 283472-003 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.02	9.24	98	70-135	
o-Terphenyl	5.06	4.62	110	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697789 **Sample:** 283472-004 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.08	9.32	97	70-135	
o-Terphenyl	5.07	4.66	109	70-135	

Lab Batch #: 697789 **Sample:** 283472-005 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.70	9.33	104	70-135	
o-Terphenyl	5.41	4.66	116	70-135	

Lab Batch #: 697789 **Sample:** 495726-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	11.3	10.0	113	70-135	
o-Terphenyl	4.77	5.00	95	70-135	

Lab Batch #: 697789 **Sample:** 495726-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.51	10.0	95	70-135	
o-Terphenyl	4.92	5.00	98	70-135	

Lab Batch #: 697789 **Sample:** 495726-1-BSD / BSD **Batch:** 1 **Matrix:** Water

Units: mg/L

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	9.67	10.0	97	70-135	
o-Terphenyl	4.86	5.00	97	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697960 **Sample:** 283472-006 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	71.7	99.6	72	70-135	
o-Terphenyl	39.6	49.8	80	70-135	

Lab Batch #: 697960 **Sample:** 283472-007 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	73.9	99.8	74	70-135	
o-Terphenyl	41.6	49.9	83	70-135	

Lab Batch #: 697960 **Sample:** 283565-003 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	82.5	99.8	83	70-135	
o-Terphenyl	38.6	49.9	77	70-135	

Lab Batch #: 697960 **Sample:** 283565-003 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	86.9	99.5	87	70-135	
o-Terphenyl	41.4	49.8	83	70-135	

Lab Batch #: 697960 **Sample:** 495826-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	73.4	100	73	70-135	
o-Terphenyl	38.6	50.0	77	70-135	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697960 **Sample:** 495826-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

TPH by Texas1005 Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
1-Chlorooctane	71.5	100	72	70-135	
o-Terphenyl	41.3	50.0	83	70-135	

Lab Batch #: 697819 **Sample:** 283472-001 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0477	0.0500	95	86-115	
Dibromofluoromethane	0.0506	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0472	0.0500	94	80-120	
Toluene-D8	0.0498	0.0500	100	88-110	

Lab Batch #: 697819 **Sample:** 283472-001 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0498	0.0500	100	86-115	
Dibromofluoromethane	0.0518	0.0500	104	86-118	
1,2-Dichloroethane-D4	0.0528	0.0500	106	80-120	
Toluene-D8	0.0485	0.0500	97	88-110	

Lab Batch #: 697819 **Sample:** 283472-001 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0516	0.0500	103	86-115	
Dibromofluoromethane	0.0505	0.0500	101	86-118	
1,2-Dichloroethane-D4	0.0507	0.0500	101	80-120	
Toluene-D8	0.0484	0.0500	97	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697819 **Sample:** 495746-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0494	0.0500	99	86-115	
Dibromofluoromethane	0.0470	0.0500	94	86-118	
1,2-Dichloroethane-D4	0.0459	0.0500	92	80-120	
Toluene-D8	0.0487	0.0500	97	88-110	

Lab Batch #: 697819 **Sample:** 495746-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0512	0.0500	102	86-115	
Dibromofluoromethane	0.0482	0.0500	96	86-118	
1,2-Dichloroethane-D4	0.0497	0.0500	99	80-120	
Toluene-D8	0.0489	0.0500	98	88-110	

Lab Batch #: 697910 **Sample:** 283472-003 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0516	0.0500	103	86-115	
Dibromofluoromethane	0.0493	0.0500	99	86-118	
1,2-Dichloroethane-D4	0.0489	0.0500	98	80-120	
Toluene-D8	0.0510	0.0500	102	88-110	

Lab Batch #: 697910 **Sample:** 283472-003 S / MS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0505	0.0500	101	86-115	
Dibromofluoromethane	0.0484	0.0500	97	86-118	
1,2-Dichloroethane-D4	0.0481	0.0500	96	80-120	
Toluene-D8	0.0506	0.0500	101	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697910 **Sample:** 283472-003 SD / MSD **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0498	0.0500	100	86-115	
Dibromofluoromethane	0.0485	0.0500	97	86-118	
1,2-Dichloroethane-D4	0.0476	0.0500	95	80-120	
Toluene-D8	0.0490	0.0500	98	88-110	

Lab Batch #: 697910 **Sample:** 283472-004 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0519	0.0500	104	86-115	
Dibromofluoromethane	0.0490	0.0500	98	86-118	
1,2-Dichloroethane-D4	0.0484	0.0500	97	80-120	
Toluene-D8	0.0502	0.0500	100	88-110	

Lab Batch #: 697910 **Sample:** 283472-005 / SMP **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0522	0.0500	104	86-115	
Dibromofluoromethane	0.0474	0.0500	95	86-118	
1,2-Dichloroethane-D4	0.0491	0.0500	98	80-120	
Toluene-D8	0.0507	0.0500	101	88-110	

Lab Batch #: 697910 **Sample:** 495791-1-BKS / BKS **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0510	0.0500	102	86-115	
Dibromofluoromethane	0.0494	0.0500	99	86-118	
1,2-Dichloroethane-D4	0.0487	0.0500	97	80-120	
Toluene-D8	0.0497	0.0500	99	88-110	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697910 **Sample:** 495791-1-BLK / BLK **Batch:** 1 **Matrix:** Water

Units: mg/L

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0541	0.0500	108	86-115	
Dibromofluoromethane	0.0495	0.0500	99	86-118	
1,2-Dichloroethane-D4	0.0488	0.0500	98	80-120	
Toluene-D8	0.0514	0.0500	103	88-110	

Lab Batch #: 698058 **Sample:** 283424-003 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0459	0.0500	92	74-121	
Dibromofluoromethane	0.0245	0.0500	49	80-120	*
1,2-Dichloroethane-D4	0.0301	0.0500	60	80-120	*
Toluene-D8	0.0539	0.0500	108	81-117	

Lab Batch #: 698058 **Sample:** 283424-003 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0436	0.0500	87	74-121	
Dibromofluoromethane	0.0242	0.0500	48	80-120	*
1,2-Dichloroethane-D4	0.0263	0.0500	53	80-120	*
Toluene-D8	0.0563	0.0500	113	81-117	

Lab Batch #: 698058 **Sample:** 283472-007 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0425	0.0500	85	74-121	
Dibromofluoromethane	0.0462	0.0500	92	80-120	
1,2-Dichloroethane-D4	0.0485	0.0500	97	80-120	
Toluene-D8	0.0469	0.0500	94	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 698058 **Sample:** 495891-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0454	0.0500	91	74-121	
Dibromofluoromethane	0.0448	0.0500	90	80-120	
1,2-Dichloroethane-D4	0.0475	0.0500	95	80-120	
Toluene-D8	0.0478	0.0500	96	81-117	

Lab Batch #: 698058 **Sample:** 495891-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

VOAs by SW-846 8260B Analytes	SURROGATE RECOVERY STUDY				
	Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0424	0.0500	85	74-121	
Dibromofluoromethane	0.0459	0.0500	92	80-120	
1,2-Dichloroethane-D4	0.0518	0.0500	104	80-120	
Toluene-D8	0.0475	0.0500	95	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis
*** Poor recoveries due to dilution
Surrogate Recovery [D] = 100 * A / B
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697790 **Sample:** 495729-1-BKS **Matrix:** Water
Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** BEC
Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX-MTBE by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
MTBE	<0.0050	0.5000	0.5053	101	65-135	
Benzene	<0.0010	0.1000	0.1073	107	66-142	
Toluene	<0.0010	0.1000	0.1052	105	59-139	
Ethylbenzene	<0.0010	0.1000	0.1019	102	75-125	
m,p-Xylene	<0.0020	0.2000	0.2052	103	75-125	
o-Xylene	<0.0010	0.1000	0.1037	104	75-125	

Lab Batch #: 698068 **Sample:** 495883-1-BKS **Matrix:** Solid
Date Analyzed: 06/06/2007 **Date Prepared:** 06/06/2007 **Analyst:** HDO
Reporting Units: mg/kg **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

BTEX-MTBE by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
MTBE	<0.0050	0.500	0.486	97	65-135	
Benzene	<0.0010	0.100	0.098	98	66-142	
Toluene	<0.0010	0.100	0.095	95	59-139	
Ethylbenzene	<0.0010	0.100	0.102	102	75-125	
m,p-Xylene	<0.0020	0.200	0.186	93	75-125	
o-Xylene	<0.0010	0.100	0.102	102	75-125	

Lab Batch #: 697960 **Sample:** 495826-1-BKS **Matrix:** Solid
Date Analyzed: 06/05/2007 **Date Prepared:** 06/05/2007 **Analyst:** JAH
Reporting Units: mg/kg **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

TPH by Texas1005 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
C6-C12 Gasoline Range Hydrocarbons	<50.0	1000	734	73	70-135	
C12-C28 Diesel Range Hydrocarbons	<50.0	1000	895	90	70-135	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697819 **Sample:** 495746-1-BKS **Matrix:** Water

Date Analyzed: 06/01/2007 **Date Prepared:** 06/01/2007 **Analyst:** JLA

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	<0.005	0.050	0.052	104	66-142	
Bromobenzene	<0.005	0.050	0.055	110	75-125	
Bromochloromethane	<0.005	0.050	0.041	82	73-125	
Bromodichloromethane	<0.005	0.050	0.045	90	75-125	
Bromoform	<0.005	0.050	0.046	92	75-125	
Methyl bromide	<0.005	0.050	0.046	92	70-130	
MTBE	<0.005	0.050	0.050	100	75-125	
n-Butylbenzene	<0.005	0.050	0.060	120	75-125	
Sec-Butylbenzene	<0.005	0.050	0.057	114	75-125	
tert-Butylbenzene	<0.005	0.050	0.058	116	75-125	
Carbon Tetrachloride	<0.005	0.050	0.046	92	62-125	
Chlorobenzene	<0.005	0.050	0.054	108	60-133	
Chloroethane	<0.010	0.050	0.049	98	70-130	
Chloroform	<0.005	0.050	0.045	90	74-125	
Methyl Chloride	<0.010	0.050	0.063	126	70-130	
2-Chlorotoluene	<0.005	0.050	0.055	110	73-125	
4-Chlorotoluene	<0.005	0.050	0.053	106	74-125	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.061	122	75-125	
Dibromochloromethane	<0.005	0.050	0.046	92	73-125	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.046	92	59-125	
Methylene bromide	<0.005	0.050	0.050	100	69-127	
1,2-Dichlorobenzene	<0.005	0.050	0.056	112	75-125	
1,3-Dichlorobenzene	<0.005	0.050	0.055	110	75-125	
1,4-Dichlorobenzene	<0.005	0.050	0.052	104	75-125	
Dichlorodifluoromethane	<0.005	0.050	0.047	94	70-130	
1,1-Dichloroethane	<0.005	0.050	0.049	98	72-125	
1,2-Dichloroethane	<0.005	0.050	0.043	86	68-127	
1,1-Dichloroethene	<0.005	0.050	0.049	98	59-172	
cis-1,2-Dichloroethylene	<0.005	0.050	0.049	98	75-125	
trans-1,2-dichloroethylene	<0.005	0.050	0.047	94	75-125	
1,2-Dichloropropane	<0.005	0.050	0.055	110	74-125	
1,3-Dichloropropane	<0.005	0.050	0.050	100	75-125	
2,2-Dichloropropane	<0.005	0.050	0.047	94	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697819 **Sample:** 495746-1-BKS **Matrix:** Water

Date Analyzed: 06/01/2007 **Date Prepared:** 06/01/2007 **Analyst:** JLA

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
1,1-Dichloropropene	<0.005	0.050	0.048	96	75-125	
cis-1,3-Dichloropropene	<0.005	0.050	0.052	104	74-125	
trans-1,3-dichloropropene	<0.005	0.050	0.046	92	66-125	
Ethylbenzene	<0.005	0.050	0.055	110	75-125	
Hexachlorobutadiene	<0.005	0.050	0.048	96	75-125	
isopropylbenzene	<0.005	0.050	0.062	124	75-125	
Methylene Chloride	<0.005	0.050	0.046	92	75-125	
Naphthalene	<0.010	0.050	0.057	114	75-125	
n-Propylbenzene	<0.005	0.050	0.059	118	75-125	
Styrene	<0.005	0.050	0.054	108	75-125	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.047	94	72-125	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.050	100	74-125	
Tetrachloroethylene	<0.005	0.050	0.052	104	71-125	
Toluene	<0.005	0.050	0.053	106	59-139	
1,2,3-Trichlorobenzene	<0.005	0.050	0.057	114	75-137	
1,2,4-Trichlorobenzene	<0.005	0.050	0.056	112	75-135	
1,1,1-Trichloroethane	<0.005	0.050	0.045	90	75-125	
1,1,2-Trichloroethane	<0.005	0.050	0.048	96	75-127	
Trichloroethylene	<0.005	0.050	0.047	94	62-137	
Trichlorofluoromethane	<0.005	0.050	0.039	78	67-125	
1,2,3-Trichloropropane	<0.005	0.050	0.053	106	75-125	
1,2,4-Trimethylbenzene	<0.005	0.050	0.056	112	75-125	
1,3,5-Trimethylbenzene	<0.005	0.050	0.061	122	70-125	
o-Xylene	<0.005	0.050	0.057	114	75-125	
m,p-Xylene	<0.010	0.100	0.114	114	75-125	
Vinyl Chloride	<0.002	0.050	0.052	104	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697910 **Sample:** 495791-1-BKS **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	<0.005	0.050	0.054	108	66-142	
Bromobenzene	<0.005	0.050	0.056	112	75-125	
Bromochloromethane	<0.005	0.050	0.049	98	73-125	
Bromodichloromethane	<0.005	0.050	0.053	106	75-125	
Bromoform	<0.005	0.050	0.053	106	75-125	
Methyl bromide	<0.005	0.050	0.055	110	70-130	
MTBE	<0.005	0.050	0.060	120	75-125	
n-Butylbenzene	<0.005	0.050	0.056	112	75-125	
Sec-Butylbenzene	<0.005	0.050	0.058	116	75-125	
tert-Butylbenzene	<0.005	0.050	0.058	116	75-125	
Carbon Tetrachloride	<0.005	0.050	0.050	100	62-125	
Chlorobenzene	<0.005	0.050	0.053	106	60-133	
Chloroethane	<0.010	0.050	0.057	114	70-130	
Chloroform	<0.005	0.050	0.054	108	74-125	
Methyl Chloride	<0.010	0.050	0.060	120	70-130	
2-Chlorotoluene	<0.005	0.050	0.054	108	73-125	
4-Chlorotoluene	<0.005	0.050	0.054	108	74-125	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.057	114	75-125	
Dibromochloromethane	<0.005	0.050	0.053	106	73-125	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.054	108	59-125	
Methylene bromide	<0.005	0.050	0.056	112	69-127	
1,2-Dichlorobenzene	<0.005	0.050	0.056	112	75-125	
1,3-Dichlorobenzene	<0.005	0.050	0.056	112	75-125	
1,4-Dichlorobenzene	<0.005	0.050	0.053	106	75-125	
Dichlorodifluoromethane	<0.005	0.050	0.063	126	70-130	
1,1-Dichloroethane	<0.005	0.050	0.049	98	72-125	
1,2-Dichloroethane	<0.005	0.050	0.051	102	68-127	
1,1-Dichloroethene	<0.005	0.050	0.049	98	59-172	
cis-1,2-Dichloroethylene	<0.005	0.050	0.053	106	75-125	
trans-1,2-dichloroethylene	<0.005	0.050	0.046	92	75-125	
1,2-Dichloropropane	<0.005	0.050	0.054	108	74-125	
1,3-Dichloropropane	<0.005	0.050	0.053	106	75-125	
2,2-Dichloropropane	<0.005	0.050	0.050	100	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 697910 **Sample:** 495791-1-BKS **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
1,1-Dichloropropene	<0.005	0.050	0.047	94	75-125	
cis-1,3-Dichloropropene	<0.005	0.050	0.051	102	74-125	
trans-1,3-dichloropropene	<0.005	0.050	0.052	104	66-125	
Ethylbenzene	<0.005	0.050	0.053	106	75-125	
Hexachlorobutadiene	<0.005	0.050	0.048	96	75-125	
isopropylbenzene	<0.005	0.050	0.061	122	75-125	
Methylene Chloride	<0.005	0.050	0.049	98	75-125	
Naphthalene	<0.010	0.050	0.058	116	75-125	
n-Propylbenzene	<0.005	0.050	0.055	110	75-125	
Styrene	<0.005	0.050	0.053	106	75-125	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.054	108	72-125	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.057	114	74-125	
Tetrachloroethylene	<0.005	0.050	0.046	92	71-125	
Toluene	<0.005	0.050	0.053	106	59-139	
1,2,3-Trichlorobenzene	<0.005	0.050	0.055	110	75-137	
1,2,4-Trichlorobenzene	<0.005	0.050	0.053	106	75-135	
1,1,1-Trichloroethane	<0.005	0.050	0.053	106	75-125	
1,1,2-Trichloroethane	<0.005	0.050	0.053	106	75-127	
Trichloroethylene	<0.005	0.050	0.050	100	62-137	
Trichlorofluoromethane	<0.005	0.050	0.054	108	67-125	
1,2,3-Trichloropropane	<0.005	0.050	0.061	122	75-125	
1,2,4-Trimethylbenzene	<0.005	0.050	0.055	110	75-125	
1,3,5-Trimethylbenzene	<0.005	0.050	0.056	112	70-125	
o-Xylene	<0.005	0.050	0.054	108	75-125	
m,p-Xylene	<0.010	0.100	0.110	110	75-125	
Vinyl Chloride	<0.002	0.050	0.052	104	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 698058 **Sample:** 495891-1-BKS **Matrix:** Solid

Date Analyzed: 06/07/2007 **Date Prepared:** 06/07/2007 **Analyst:** JLA

Reporting Units: mg/kg **Batch #:** 1 **BLANK /BLANK SPIKE RECOVERY STUDY**

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Benzene	<0.005	0.050	0.049	98	66-142	
Bromobenzene	<0.005	0.050	0.055	110	75-125	
Bromochloromethane	<0.005	0.050	0.048	96	73-125	
Bromodichloromethane	<0.005	0.050	0.048	96	75-125	
Bromoform	<0.005	0.050	0.053	106	75-125	
Methyl bromide	<0.005	0.050	0.037	74	65-135	
MTBE	<0.005	0.050	0.050	100	75-125	
tert-Butylbenzene	<0.005	0.050	0.054	108	75-125	
Sec-Butylbenzene	<0.005	0.050	0.054	108	75-125	
n-Butylbenzene	<0.005	0.050	0.053	106	75-125	
Carbon Tetrachloride	<0.005	0.050	0.046	92	62-125	
Chlorobenzene	<0.005	0.050	0.053	106	60-133	
Chloroethane	<0.010	0.050	0.039	78	65-135	
Chloroform	<0.005	0.050	0.048	96	74-125	
Methyl Chloride	<0.010	0.050	0.067	134	65-135	
2-Chlorotoluene	<0.005	0.050	0.055	110	73-125	
4-Chlorotoluene	<0.005	0.050	0.055	110	74-125	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.056	112	75-125	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.039	78	59-125	
Dibromochloromethane	<0.005	0.050	0.049	98	73-125	
Methylene bromide	<0.005	0.050	0.057	114	69-127	
1,2-Dichlorobenzene	<0.005	0.050	0.057	114	75-125	
1,3-Dichlorobenzene	<0.005	0.050	0.054	108	75-125	
1,4-Dichlorobenzene	<0.005	0.050	0.053	106	75-125	
Dichlorodifluoromethane	<0.005	0.050	0.045	90	65-135	
1,2-Dichloroethane	<0.005	0.050	0.046	92	68-127	
1,1-Dichloroethane	<0.005	0.050	0.047	94	72-125	
trans-1,2-dichloroethylene	<0.005	0.050	0.041	82	75-125	
cis-1,2-Dichloroethylene	<0.005	0.050	0.047	94	75-125	
1,1-Dichloroethene	<0.005	0.050	0.043	86	59-172	
2,2-Dichloropropane	<0.005	0.050	0.050	100	75-125	
1,3-Dichloropropane	<0.005	0.050	0.050	100	75-125	
1,2-Dichloropropane	<0.005	0.050	0.055	110	74-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: College Ave (II)

Work Order #: 283472 **Project ID:** 07.12.017

Lab Batch #: 698058 **Sample:** 495891-1-BKS **Matrix:** Solid

Date Analyzed: 06/07/2007 **Date Prepared:** 06/07/2007 **Analyst:** JLA

Reporting Units: mg/kg **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

VOAs by SW-846 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
trans-1,3-dichloropropene	<0.005	0.050	0.047	94	66-125	
1,1-Dichloropropene	<0.005	0.050	0.040	80	75-125	
cis-1,3-Dichloropropene	<0.005	0.050	0.049	98	74-125	
Ethylbenzene	<0.005	0.050	0.051	102	75-125	
Hexachlorobutadiene	<0.005	0.050	0.055	110	75-125	
isopropylbenzene	<0.005	0.050	0.058	116	75-125	
Methylene Chloride	<0.020	0.050	0.047	94	75-125	
Naphthalene	<0.010	0.050	0.058	116	75-125	
n-Propylbenzene	<0.005	0.050	0.054	108	75-125	
Styrene	<0.005	0.050	0.053	106	75-125	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.051	102	72-125	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.059	118	74-125	
Tetrachloroethylene	<0.005	0.050	0.051	102	71-125	
Toluene	<0.005	0.050	0.052	104	59-139	
1,2,4-Trichlorobenzene	<0.005	0.050	0.058	116	75-135	
1,2,3-Trichlorobenzene	<0.005	0.050	0.057	114	75-137	
1,1,2-Trichloroethane	<0.005	0.050	0.050	100	75-127	
1,1,1-Trichloroethane	<0.005	0.050	0.045	90	75-125	
Trichloroethylene	<0.005	0.050	0.044	88	62-137	
Trichlorofluoromethane	<0.005	0.050	0.040	80	67-125	
1,2,3-Trichloropropane	<0.005	0.050	0.056	112	75-125	
1,2,4-Trimethylbenzene	<0.005	0.050	0.051	102	75-125	
1,3,5-Trimethylbenzene	<0.005	0.050	0.054	108	70-130	
Vinyl Chloride	<0.002	0.050	0.045	90	65-135	
o-Xylene	<0.005	0.050	0.054	108	75-125	
m,p-Xylene	<0.010	0.100	0.106	106	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

BS / BSD Recoveries

Project Name: College Ave (II)

Work Order #: 283472

Project ID: 07.12.017

Analyst: JAH

Date Prepared: 06/01/2007

Date Analyzed: 06/01/2007

Lab Batch ID: 697789

Sample: 495726-1-BKS

Batch #: 1

Matrix: Water

Units: mg/L

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TPH by Texas1005 Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
C6-C12 Gasoline Range Hydrocarbons	<5.00	100	103	103	100.0	101	101	2	70-135	25	
C12-C28 Diesel Range Hydrocarbons	<5.00	100	96.1	96	100.0	91.5	92	4	70-135	25	

Relative Percent Difference RPD = 200*|(D-F)/(D+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: College Ave (II)

Work Order #: 283472
Lab Batch #: 698068
Date Analyzed: 06/06/2007
QC- Sample ID: 283408-008 S
Reporting Units: mg/kg

Date Prepared: 06/06/2007
Batch #: 1

Project ID: 07.12.017
Analyst: HDO
Matrix: Soil

MATRIX / MATRIX SPIKE RECOVERY STUDY

BTEX-MTBE by SW 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
MTBE	<0.0050	2.660	2.670	100	75-125	
Benzene	<0.0050	0.5310	0.5310	100	66-142	
Toluene	<0.0100	0.5310	0.5270	99	59-139	
Ethylbenzene	<0.0050	0.5310	0.5320	100	75-125	
m,p-Xylene	<0.0150	1.060	1.030	97	75-125	
o-Xylene	<0.0050	0.5310	0.5270	99	75-125	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697790 **QC- Sample ID:** 283334-001 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** BEC

Reporting Units: mg/L

BTEX-MTBE by SW 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
MTBE	0.0402	0.5000	0.5727	107	0.5000	0.5896	110	3	65-135	20	
Benzene	0.0027	0.1000	0.1056	103	0.1000	0.1094	107	4	66-142	20	
Toluene	<0.0010	0.1000	0.1028	103	0.1000	0.0954	95	8	59-139	20	
Ethylbenzene	<0.0010	0.1000	0.1011	101	0.1000	0.0973	97	4	75-125	20	
m,p-Xylene	<0.0020	0.2000	0.1981	99	0.2000	0.1811	91	8	75-125	20	
o-Xylene	<0.0010	0.1000	0.1013	101	0.1000	0.0977	98	3	75-125	20	

Lab Batch ID: 697960 **QC- Sample ID:** 283565-003 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/06/2007 **Date Prepared:** 06/05/2007 **Analyst:** JAH

Reporting Units: mg/kg

TPH by Texas1005 Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
C6-C12 Gasoline Range Hydrocarbons	<50.0	998	772	77	995	743	75	3	70-135	35	
C12-C28 Diesel Range Hydrocarbons	<50.0	998	735	74	995	726	73	1	70-135	35	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697819 **QC- Sample ID:** 283472-001 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/01/2007 **Date Prepared:** 06/01/2007 **Analyst:** JLA

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.005	0.050	0.056	112	0.050	0.056	112	0	66-142	21	
Bromobenzene	<0.005	0.050	0.055	110	0.050	0.057	114	4	75-125	20	
Bromochloromethane	<0.005	0.050	0.049	98	0.050	0.052	104	6	73-125	20	
Bromodichloromethane	<0.005	0.050	0.051	102	0.050	0.052	104	2	75-125	20	
Bromoform	<0.005	0.050	0.050	100	0.050	0.048	96	4	75-125	20	
Methyl bromide	<0.005	0.050	0.046	92	0.050	0.048	96	4	70-130	20	
MTBE	<0.005	0.050	0.057	114	0.050	0.060	120	5	75-125	20	
n-Butylbenzene	<0.005	0.050	0.056	112	0.050	0.059	118	5	75-125	20	
Sec-Butylbenzene	<0.005	0.050	0.055	110	0.050	0.055	110	0	75-125	20	
tert-Butylbenzene	<0.005	0.050	0.054	108	0.050	0.056	112	4	75-125	20	
Carbon Tetrachloride	<0.005	0.050	0.048	96	0.050	0.050	100	4	62-125	20	
Chlorobenzene	<0.005	0.050	0.054	108	0.050	0.053	106	2	60-133	21	
Chloroethane	<0.010	0.050	0.046	92	0.050	0.050	100	8	70-130	20	
Chloroform	<0.005	0.050	0.050	100	0.050	0.051	102	2	74-125	20	
Methyl Chloride	<0.010	0.050	0.062	124	0.050	0.067	134	8	70-130	20	X
2-Chlorotoluene	<0.005	0.050	0.056	112	0.050	0.057	114	2	73-125	20	
4-Chlorotoluene	<0.005	0.050	0.052	104	0.050	0.057	114	9	74-125	20	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.059	118	0.050	0.057	114	3	75-125	20	
Dibromochloromethane	<0.005	0.050	0.050	100	0.050	0.048	96	4	73-125	20	
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.044	88	0.050	0.045	90	2	59-125	28	
Methylene bromide	<0.005	0.050	0.056	112	0.050	0.057	114	2	69-127	23	
1,2-Dichlorobenzene	<0.005	0.050	0.054	108	0.050	0.056	112	4	75-125	20	
1,3-Dichlorobenzene	<0.005	0.050	0.053	106	0.050	0.057	114	7	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697819 **QC- Sample ID:** 283472-001 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/01/2007 **Date Prepared:** 06/01/2007 **Analyst:** JLA

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
1,4-Dichlorobenzene	<0.005	0.050	0.052	104	0.050	0.052	104	0	75-125	20	
Dichlorodifluoromethane	<0.005	0.050	0.051	102	0.050	0.053	106	4	70-130	23	
1,1-Dichloroethane	<0.005	0.050	0.049	98	0.050	0.051	102	4	72-125	20	
1,2-Dichloroethane	<0.005	0.050	0.048	96	0.050	0.051	102	6	68-127	20	
1,1-Dichloroethene	<0.005	0.050	0.049	98	0.050	0.051	102	4	59-172	22	
cis-1,2-Dichloroethylene	<0.005	0.050	0.055	110	0.050	0.056	112	2	75-125	20	
trans-1,2-dichloroethylene	<0.005	0.050	0.048	96	0.050	0.050	100	4	75-125	20	
1,2-Dichloropropane	<0.005	0.050	0.056	112	0.050	0.058	116	4	74-125	20	
1,3-Dichloropropane	<0.005	0.050	0.050	100	0.050	0.054	108	8	75-125	20	
2,2-Dichloropropane	<0.005	0.050	0.047	94	0.050	0.050	100	6	75-125	20	
1,1-Dichloropropene	<0.005	0.050	0.049	98	0.050	0.050	100	2	75-125	20	
cis-1,3-Dichloropropene	<0.005	0.050	0.055	110	0.050	0.053	106	4	74-125	20	
trans-1,3-dichloropropene	<0.005	0.050	0.051	102	0.050	0.049	98	4	66-125	20	
Ethylbenzene	<0.005	0.050	0.054	108	0.050	0.054	108	0	75-125	20	
Hexachlorobutadiene	<0.005	0.050	0.047	94	0.050	0.050	100	6	75-125	20	
isopropylbenzene	<0.005	0.050	0.063	126	0.050	0.063	126	0	75-125	20	X
Methylene Chloride	<0.005	0.050	0.049	98	0.050	0.051	102	4	75-125	35	
Naphthalene	<0.010	0.050	0.055	110	0.050	0.054	108	2	75-125	20	
n-Propylbenzene	<0.005	0.050	0.057	114	0.050	0.057	114	0	75-125	20	
Styrene	<0.005	0.050	0.062	124	0.050	0.054	108	14	75-125	51	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.052	104	0.050	0.050	100	4	72-125	20	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.052	104	0.050	0.053	106	2	74-125	31	
Tetrachloroethylene	<0.005	0.050	0.047	94	0.050	0.050	100	6	71-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697819 **QC- Sample ID:** 283472-001 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/01/2007 **Date Prepared:** 06/01/2007 **Analyst:** JLA

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Toluene	<0.005	0.050	0.054	108	0.050	0.056	112	4	59-139	21	
1,2,3-Trichlorobenzene	<0.005	0.050	0.056	112	0.050	0.056	112	0	75-137	20	
1,2,4-Trichlorobenzene	<0.005	0.050	0.054	108	0.050	0.055	110	2	75-135	20	
1,1,1-Trichloroethane	<0.005	0.050	0.049	98	0.050	0.049	98	0	75-125	20	
1,1,2-Trichloroethane	<0.005	0.050	0.049	98	0.050	0.053	106	8	75-127	20	
Trichloroethylene	<0.005	0.050	0.047	94	0.050	0.049	98	4	62-137	24	
Trichlorofluoromethane	<0.005	0.050	0.042	84	0.050	0.043	86	2	67-125	20	
1,2,3-Trichloropropane	<0.005	0.050	0.052	104	0.050	0.051	102	2	75-125	20	
1,2,4-Trimethylbenzene	<0.005	0.050	0.056	112	0.050	0.059	118	5	75-125	20	
1,3,5-Trimethylbenzene	<0.005	0.050	0.054	108	0.050	0.058	116	7	70-125	20	
o-Xylene	<0.005	0.050	0.059	118	0.050	0.058	116	2	75-125	20	
m,p-Xylene	<0.010	0.100	0.112	112	0.100	0.113	113	1	75-125	20	
Vinyl Chloride	<0.002	0.050	0.051	102	0.050	0.052	104	2	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472

Project ID: 07.12.017

Lab Batch ID: 697910

QC- Sample ID: 283472-003 S

Batch #: 1

Matrix: Water

Date Analyzed: 06/04/2007

Date Prepared: 06/04/2007

Analyst: CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.005	0.050	0.058	116	0.050	0.055	110	5	66-142	21	
Bromobenzene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
Bromochloromethane	<0.005	0.050	0.052	104	0.050	0.050	100	4	73-125	20	
Bromodichloromethane	<0.005	0.050	0.057	114	0.050	0.049	98	15	75-125	20	
Bromoform	<0.005	0.050	0.053	106	0.050	0.036	72	38	75-125	20	XF
Methyl bromide	<0.005	0.050	0.060	120	0.050	0.054	108	11	70-130	20	
MTBE	<0.005	0.050	0.064	128	0.050	0.060	120	6	75-125	20	X
n-Butylbenzene	<0.005	0.050	0.064	128	0.050	0.059	118	8	75-125	20	X
Sec-Butylbenzene	<0.005	0.050	0.065	130	0.050	0.060	120	8	75-125	20	X
tert-Butylbenzene	<0.005	0.050	0.064	128	0.050	0.059	118	8	75-125	20	X
Carbon Tetrachloride	<0.005	0.050	0.054	108	0.050	0.051	102	6	62-125	20	
Chlorobenzene	<0.005	0.050	0.056	112	0.050	0.053	106	6	60-133	21	
Chloroethane	<0.010	0.050	0.059	118	0.050	0.056	112	5	70-130	20	
Chloroform	<0.005	0.050	0.057	114	0.050	0.054	108	5	74-125	20	
Methyl Chloride	<0.010	0.050	0.066	132	0.050	0.068	136	3	70-130	20	X
2-Chlorotoluene	<0.005	0.050	0.058	116	0.050	0.055	110	5	73-125	20	
4-Chlorotoluene	<0.005	0.050	0.059	118	0.050	0.055	110	7	74-125	20	
p-Cymene (p-Isopropyltoluene)	<0.005	0.050	0.064	128	0.050	0.060	120	6	75-125	20	X
Dibromochloromethane	<0.005	0.050	0.056	112	0.050	0.043	86	26	73-125	20	F
1,2-Dibromo-3-Chloropropane	<0.005	0.050	0.058	116	0.050	0.049	98	17	59-125	28	
Methylene bromide	<0.005	0.050	0.059	118	0.050	0.056	112	5	69-127	23	
1,2-Dichlorobenzene	<0.005	0.050	0.061	122	0.050	0.056	112	9	75-125	20	
1,3-Dichlorobenzene	<0.005	0.050	0.060	120	0.050	0.056	112	7	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

Relative Percent Difference RPD = 200*(D-G)/(D+G)

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697910 **QC- Sample ID:** 283472-003 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
1,4-Dichlorobenzene	<0.005	0.050	0.058	116	0.050	0.054	108	7	75-125	20	
Dichlorodifluoromethane	<0.005	0.050	0.072	144	0.050	0.069	138	4	70-130	23	X
1,1-Dichloroethane	<0.005	0.050	0.055	110	0.050	0.052	104	6	72-125	20	
1,2-Dichloroethane	<0.005	0.050	0.058	116	0.050	0.054	108	7	68-127	20	
1,1-Dichloroethene	<0.005	0.050	0.051	102	0.050	0.049	98	4	59-172	22	
cis-1,2-Dichloroethylene	<0.005	0.050	0.056	112	0.050	0.053	106	6	75-125	20	
trans-1,2-dichloroethylene	<0.005	0.050	0.050	100	0.050	0.047	94	6	75-125	20	
1,2-Dichloropropane	<0.005	0.050	0.058	116	0.050	0.055	110	5	74-125	20	
1,3-Dichloropropane	<0.005	0.050	0.057	114	0.050	0.052	104	9	75-125	20	
2,2-Dichloropropane	<0.005	0.050	0.059	118	0.050	0.057	114	3	75-125	20	
1,1-Dichloropropene	<0.005	0.050	0.052	104	0.050	0.048	96	8	75-125	20	
cis-1,3-Dichloropropene	<0.005	0.050	0.054	108	0.050	0.048	96	12	74-125	20	
trans-1,3-dichloropropene	<0.005	0.050	0.056	112	0.050	0.051	102	9	66-125	20	
Ethylbenzene	<0.005	0.050	0.059	118	0.050	0.054	108	9	75-125	20	
Hexachlorobutadiene	<0.005	0.050	0.055	110	0.050	0.051	102	8	75-125	20	
isopropylbenzene	<0.005	0.050	0.066	132	0.050	0.062	124	6	75-125	20	X
Methylene Chloride	<0.005	0.050	0.051	102	0.050	0.048	96	6	75-125	35	
Naphthalene	<0.010	0.050	0.058	116	0.050	0.054	108	7	75-125	20	
n-Propylbenzene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
Styrene	<0.005	0.050	0.058	116	0.050	0.052	104	11	75-125	51	
1,1,1,2-Tetrachloroethane	<0.005	0.050	0.058	116	0.050	0.053	106	9	72-125	20	
1,1,2,2-Tetrachloroethane	<0.005	0.050	0.064	128	0.050	0.057	114	12	74-125	31	X
Tetrachloroethylene	<0.005	0.050	0.051	102	0.050	0.049	98	4	71-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472 **Project ID:** 07.12.017

Lab Batch ID: 697910 **QC- Sample ID:** 283472-003 S **Batch #:** 1 **Matrix:** Water

Date Analyzed: 06/04/2007 **Date Prepared:** 06/04/2007 **Analyst:** CYE

Reporting Units: mg/L

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Toluene	<0.005	0.050	0.059	118	0.050	0.054	108	9	59-139	21	
1,2,3-Trichlorobenzene	<0.005	0.050	0.057	114	0.050	0.054	108	5	75-137	20	
1,2,4-Trichlorobenzene	<0.005	0.050	0.056	112	0.050	0.053	106	6	75-135	20	
1,1,1-Trichloroethane	<0.005	0.050	0.058	116	0.050	0.055	110	5	75-125	20	
1,1,2-Trichloroethane	<0.005	0.050	0.059	118	0.050	0.054	108	9	75-127	20	
Trichloroethylene	<0.005	0.050	0.052	104	0.050	0.048	96	8	62-137	24	
Trichlorofluoromethane	<0.005	0.050	0.052	104	0.050	0.051	102	2	67-125	20	
1,2,3-Trichloropropane	<0.005	0.050	0.064	128	0.050	0.057	114	12	75-125	20	X
1,2,4-Trimethylbenzene	<0.005	0.050	0.061	122	0.050	0.057	114	7	75-125	20	
1,3,5-Trimethylbenzene	<0.005	0.050	0.061	122	0.050	0.056	112	9	70-125	20	
o-Xylene	<0.005	0.050	0.060	120	0.050	0.055	110	9	75-125	20	
m,p-Xylene	<0.010	0.100	0.121	121	0.100	0.112	112	8	75-125	20	
Vinyl Chloride	<0.002	0.050	0.060	120	0.050	0.059	118	2	75-125	20	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472

Project ID: 07.12.017

Lab Batch ID: 698058

QC- Sample ID: 283424-003 S

Batch #: 1

Matrix: Soil

Date Analyzed: 06/07/2007

Date Prepared: 06/07/2007

Analyst: JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	<0.006	0.055	0.052	95	0.056	0.051	91	4	66-142	21	
Bromobenzene	<0.006	0.055	0.060	109	0.056	0.056	100	9	75-125	25	
Bromochloromethane	<0.006	0.055	0.027	49	0.056	0.021	38	25	73-125	20	XF
Bromodichloromethane	<0.006	0.055	0.034	62	0.056	0.034	61	2	75-125	20	X
Bromoform	<0.006	0.055	0.032	58	0.056	0.030	54	7	75-125	20	X
Methyl bromide	<0.006	0.055	0.031	56	0.056	0.027	48	15	65-135	20	X
MTBE	<0.006	0.055	0.022	40	0.056	0.022	39	3	75-125	20	X
tert-Butylbenzene	<0.006	0.055	0.097	176	0.056	0.098	175	1	75-125	25	X
Sec-Butylbenzene	<0.006	0.055	0.103	187	0.056	0.102	182	3	75-125	25	X
n-Butylbenzene	<0.006	0.055	0.096	175	0.056	0.096	171	2	75-125	25	X
Carbon Tetrachloride	<0.006	0.055	0.069	125	0.056	0.066	118	6	62-125	20	
Chlorobenzene	<0.006	0.055	0.057	104	0.056	0.061	109	5	60-133	21	
Chloroethane	<0.011	0.055	0.039	71	0.056	0.037	66	7	65-135	20	
Chloroform	<0.006	0.055	0.031	56	0.056	0.032	57	2	74-125	20	X
Methyl Chloride	<0.011	0.055	0.060	109	0.056	0.056	100	9	65-135	20	
2-Chlorotoluene	<0.006	0.055	0.072	131	0.056	0.072	129	2	73-125	25	X
4-Chlorotoluene	<0.006	0.055	0.067	122	0.056	0.068	121	1	74-125	25	
p-Cymene (p-Isopropyltoluene)	<0.006	0.055	0.098	178	0.056	0.101	180	1	75-125	25	X
1,2-Dibromo-3-Chloropropane	<0.006	0.055	0.047	85	0.056	0.044	79	7	59-125	28	
Dibromochloromethane	<0.006	0.055	0.034	62	0.056	0.034	61	2	73-125	25	X
Methylene bromide	<0.006	0.055	0.036	65	0.056	0.035	63	3	69-127	23	X
1,2-Dichlorobenzene	<0.006	0.055	0.053	96	0.056	0.052	93	3	75-125	25	
1,3-Dichlorobenzene	<0.006	0.055	0.064	116	0.056	0.061	109	6	75-125	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472

Project ID: 07.12.017

Lab Batch ID: 698058

QC- Sample ID: 283424-003 S

Batch #: 1

Matrix: Soil

Date Analyzed: 06/07/2007

Date Prepared: 06/07/2007

Analyst: JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
1,4-Dichlorobenzene	<0.006	0.055	0.056	102	0.056	0.058	104	2	75-125	25	
Dichlorodifluoromethane	<0.006	0.055	0.067	122	0.056	0.063	113	8	65-135	23	
1,2-Dichloroethane	<0.006	0.055	0.021	38	0.056	0.022	39	3	68-127	20	X
1,1-Dichloroethane	<0.006	0.055	0.035	64	0.056	0.035	63	2	72-125	20	X
trans-1,2-dichloroethylene	<0.006	0.055	0.037	67	0.056	0.040	71	6	75-125	20	X
cis-1,2-Dichloroethylene	<0.006	0.055	0.032	58	0.056	0.032	57	2	75-125	20	X
1,1-Dichloroethene	<0.006	0.055	0.049	89	0.056	0.049	88	1	59-172	22	
2,2-Dichloropropane	<0.006	0.055	0.044	80	0.056	0.045	80	0	75-125	25	
1,3-Dichloropropane	<0.006	0.055	0.040	73	0.056	0.040	71	3	75-125	25	X
1,2-Dichloropropane	<0.006	0.055	0.044	80	0.056	0.041	73	9	74-125	20	X
trans-1,3-dichloropropene	<0.006	0.055	0.033	60	0.056	0.033	59	2	66-125	20	X
1,1-Dichloropropene	<0.006	0.055	0.043	78	0.056	0.044	79	1	75-125	25	
cis-1,3-Dichloropropene	<0.006	0.055	0.031	56	0.056	0.029	52	7	74-125	20	X
Ethylbenzene	<0.006	0.055	0.070	127	0.056	0.072	129	2	75-125	20	X
Hexachlorobutadiene	<0.006	0.055	0.108	196	0.056	0.102	182	7	75-125	25	X
isopropylbenzene	<0.006	0.055	0.092	167	0.056	0.092	164	2	75-125	25	X
Methylene Chloride	<0.022	0.055	0.027	49	0.056	0.028	50	2	75-125	35	X
Naphthalene	<0.011	0.055	0.049	89	0.056	0.049	88	1	75-125	25	
n-Propylbenzene	<0.006	0.055	0.096	175	0.056	0.100	179	2	75-125	25	X
Styrene	<0.006	0.055	0.051	93	0.056	0.052	93	0	75-125	51	
1,1,1,2-Tetrachloroethane	<0.006	0.055	0.040	73	0.056	0.044	79	8	72-125	20	
1,1,2,2-Tetrachloroethane	<0.006	0.055	0.043	78	0.056	0.045	80	3	74-125	31	
Tetrachloroethylene	<0.006	0.055	0.091	165	0.056	0.093	166	1	71-125	20	X

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Form 3 - MS / MSD Recoveries

Project Name: College Ave (II)

Work Order # : 283472

Project ID: 07.12.017

Lab Batch ID: 698058

QC- Sample ID: 283424-003 S

Batch #: 1

Matrix: Soil

Date Analyzed: 06/07/2007

Date Prepared: 06/07/2007

Analyst: JLA

Reporting Units: mg/kg

VOAs by SW-846 8260B Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Toluene	<0.006	0.055	0.066	120	0.056	0.068	121	1	59-139	21	
1,2,4-Trichlorobenzene	<0.006	0.055	0.053	96	0.056	0.052	93	3	75-135	25	
1,2,3-Trichlorobenzene	<0.006	0.055	0.051	93	0.056	0.050	89	4	75-137	25	
1,1,2-Trichloroethane	<0.006	0.055	0.043	78	0.056	0.042	75	4	75-127	20	
1,1,1-Trichloroethane	<0.006	0.055	0.047	85	0.056	0.044	79	7	75-125	20	
Trichloroethylene	<0.006	0.055	0.058	105	0.056	0.055	98	7	62-137	24	
Trichlorofluoromethane	<0.006	0.055	0.051	93	0.056	0.047	84	10	67-125	20	
1,2,3-Trichloropropane	<0.006	0.055	0.044	80	0.056	0.047	84	5	75-125	20	
1,2,4-Trimethylbenzene	<0.006	0.055	0.067	122	0.056	0.069	123	1	75-125	25	
1,3,5-Trimethylbenzene	<0.006	0.055	0.078	142	0.056	0.081	145	2	70-130	25	X
Vinyl Chloride	<0.002	0.055	0.052	95	0.056	0.053	95	0	65-135	20	
o-Xylene	<0.006	0.055	0.063	115	0.056	0.066	118	3	75-125	20	
m,p-Xylene	<0.011	0.111	0.144	130	0.111	0.151	136	5	75-125	20	X

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

XENCO laboratories

☒ 11381 Meadowglen, Suite L, Houston, TX 77082 **281-589-0692**
☐ 5309 Wurzbach, Suite 104, San Antonio, TX 78238 **210-509-3334**
☐ 9700 Harry Hines Blvd., Dallas, TX 75220 **972-902-0300**

ANALYSIS REQUEST & CHAIN OF CUSTODY RECORD

☐ 5757 N.W. 158th Street, Miami Lakes, Fl 33014 **305-823-8500**
☐ 3016 US Highway 301 N., Suite 900, Tampa, Fl 33619 **813-620-2000**

LAB ONLY: 28 3472-H

Serial #: 204426 Page of

Company-City: Tolunay-Wong Engineers, Inc. **Phone:** 713-541-4723

TAT: 5h 12h 24h 48h 3d 5d (7d) 10d 21d Standard TAT is project specific.
It is typically 5-7 Working Days for level II and 10+ Working days for level III and IV data.

Project Name ☐ Previously performed at XENCO: College Ave. (II) **Site:**

Project ID: 07.12.017

Proj. Manager (PM): Keith Ross

Fax Results to ☐ PM or **Fax No:**
e-mail to: ~~kross@twainc.com~~ kross@twainc.com

Invoice to ☐ Accounting ☐ Inc. Invoice with Final Report ☐ Invoice must have a P.O
Bill to:

Quote No: **P.O No:** ☐ Call for a P.O.

Reg Program: CLP AFCEE TRRP DW UST State Other:

Target DLs (DW CRDL TRRP QAPP MDLs See Lab PM Attached Call)

TRRP PCLs: Tier 1 Tier 2 Residential Industrial

LPST No.:(Required)

Sampler Name: Matt Brumm Signature: [signature]

	Sample ID	Sampling Date	Time	Depth ft' in" m	Matrix	Composite	Grab	# Containers	Container Size	Container Type	Preservatives	BTEX by 8021 8260 602 624 Other	BTEX-MTBE by (8021) 8260 624 Other	TPH by (TX1005) FL-Pro 1664 8015GRO 8015DRO 418.1	PAHs by 8270 8310	Metals by 6020 200.8 8RCRA Tot Pb TCLP8 13PP 23TAL	VOCs by 8021 (8260) 624 VOA VOH PPs TCL	SVOCs by 8270 625 PAHs BN&A TCL PPs	FL Preburn - Revised: Virgin Non-Virgin	TAT 5h 12h 24h 48h 3d 5d 7d 10d 21d	Addn: PAH above mg/L W, mg/Kg S Highest Hit	Hold Disposal Hold Analysis (Surcharges will apply)	Remarks: Sample Clean-ups are pre-approved
1	EB-1C	5.30.07			W		X	5	V	A/C	H			X			X						
2	EB-2C	5.29.07	345		W		X	5	V	A/C	H		X	X									
3	EB-3C	5.30.07			W		X	5	V	A/C	H			X			X						
4	EB-5C	5.30.07			W		X	5	V	A/C	H			X			X						
5	EB-6C	5.29.07	527		W		X	5	V	A/C	H			X			X						
6	EB-2C, 8-10	5.29.07	345	8-10	S		X	1	4	C	C		X	X									
7	EB-6C, 18-20	5.29.07	527	18-20	S		X	1	4	C	C			X			X						
8																							
9																							
10																							

	Relinquished by (Initials and Sign)	Date & Time	Relinquished to (Initials and Sign)	Date & Time
1	MB [signature]	5.31.07 330p	CSW [signature]	5.31.07 330
2				
3			Lab: [signature] 5/31/07 16:16	

Rush Charges are Pre-Approved upon requesting them.
Instructions:
All XENCO Standard Terms and Conditions Apply.
Containers Received: 27 Cooler Temperature: 3-0°C

Preservatives: Various (V), HCl pH<2 (H), H2SO4 pH<2 (S), HNO3 pH<2 (N), Asbc ~~Acid&NaOH~~ (A), ZnAc&NaOH (Z), (Cool,<4C) (C), None (NA), See Label (L), Other (O) _____
Cont. Size: 4oz (4), 8oz (8), 32oz (32), 40ml VOA (V), 1L (1), 500ml (5), Tedlar Bag (B), Wipe (W), Other _____ **Cont. Type:** Glass Amb (A), Glass Clear (C), Plastic (P), Other (O) _____

Matrix: Air (A), Product (P), Solid(S), Water (W)

SDBE Committed to Excellence in Service and Quality since 1990 www.xenco.com

28 3472-H

XENCO Laboratories

Prelogin/Nonconformance Report- Sample Log-In

Client: TWB

Date/ Time: 5/31/17

Lab ID # : 283472-01

Initials:

Sample Receipt Checklist

#1 Temperature of container/ cooler?	Yes	No	N/A	3.0 °C
#2 Shipping container in good condition?	Yes	No	None	
#3 Samples received on ice?	Yes	No	N/A	Blue/Water
#4 Custody Seals intact on shipping container/ cooler?	Yes	No	N/A	
#5 Custody Seals intact on sample bottles/ container?	Yes	No		
#6 Chain of Custody present?	Yes	No		
#7 Sample instructions complete of Chain of Custody?	Yes	No		
#8 Any missing/extra samples?	Yes	No		
#9 Chain of Custody signed when relinquished/ received?	Yes	No		
#10 Chain of Custody agrees with sample label(s)?	Yes	No		
#11 Container label(s) legible and intact?	Yes	No		
#12 Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#13 Samples in proper container/ bottle?	Yes	No		
#14 Samples properly preserved?	Yes	No	N/A	
#15 Sample container intact?	Yes	No		
#16 Sufficient sample amount for indicated test(s)?	Yes	No		
#17 All samples received within sufficient hold time?	Yes	No		
#18 Subcontract of sample(s)?	Yes	No	N/A	
#19 VOC samples have zero headspace?	Yes	No	N/A	

Nonconformance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken:

Check all that Apply:

☐ Client understands and would like to proceed with analysis

☐ Cooling process had begun shortly after sampling event