STUDY REPORT

For

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

Prepared For:

Harris County
Precinct 3
UPIN: 19103MF14F01

Prepared By:

r.g. miller engineers

Texas Firm Number: F-487
16340 Park Ten Place, Suite 350
Houston, Texas 77084
Phone: (713) 461-9600

STATE OF TEXAS
MARK T. ROTZ
133777
LICENSED PROFESSIONAL ENGINEER

10/07/2021

October 2021

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Executive Summary

Harris County identified approximately 23 and 84 single-family residential homes that were flooded during the April 2016 (Tax Day) and August 2017 (Hurricane Harvey) storm events, respectively. HDR Engineering completed a preliminary drainage study in 2019 and concluded that the cause of the structural flooding is due to the overflow from Little Cypress Creek during major storm events (1% annual chance or less). R. G. Miller Engineers has prepared this study report outlining the findings and recommendations to reduce structural flooding within the project area.

The project is located within Precinct 3 in Cypress Texas. It is generally bounded Huffmeister Road to the north and east, Spring Cypress Road to the south, and Northlake Forest Drive to the south. The proposed improvements are located within the Northlake Forest Subdivision. The project area is located in Key Map Grid 327Z.

The purpose of this project is to extend the existing storm network and upsize one existing outfall to address the existing flooding in the subdivision. The study phase included assessment of the existing flooding based on NOAA Atlas 14 rainfall data and recommend improvements to alleviate existing flooding within the subdivision.

Topographic survey, geotechnical investigation, and drainage analysis were conducted for this study report. The topographic survey provided all public and private utilities that were found through visible means or with Level B SUE investigations and was approved by Harris County Engineering Department (HCED) on May 17, 2021. The geotechnical investigation was conducted for this study report to outline the findings and recommendations for the proposed improvements and was approved by HCED on November 11, 2021. The drainage analysis was conducted for this project to analysis the existing storm sewer system and provide recommendations for the proposed storm sewer improvements and received Harris County Flood Control District (HCFCD) INO on June 4, 2021.

There have been multiple single-family homes that have been flooded during the April 2016 (Tax Day) and August 2017 (Hurricane Harvey) storm events. Approximately 25 structures and 84 structures were flooded during the Tax Day and Hurricane Harvey storm events, respectively. During the study of this project, it was identified that the cul-de-sacs adjacent to the pipeline corridor are poorly drained and collect water.

The recommendation to alleviate the flooding that is being experienced is to extend the storm sewer system along Clear Point Drive, Cortree Knolls, and Medlowe Court, upsize the existing inlets on Bach Springs Court, Light Springs Court, Fable Court, and Elinor Court, and upsize the existing storm sewer outfall into the detention basin near Arlington Place Street. These recommendations reduce ponding during the 2-year, 10-year, and 100-year storm events and have no adverse impact to the receiving waterways for storm events up to and including the NOAA Atlas 14 100-year storm event.

The preliminary cost estimate for this project is $494,807.00.

1.0 General Information

Northlake Forest Subdivision Drainage Improvements. UPIN: 19103MF14F01. Harris County Engineering Department, Precinct 3. Refer to Exhibit 1 for Project Location Key Map.

2.0 Authorization

R.G. Miller Engineers, Inc. (RGME) has been authorized to proceed with the Study, Design, and Bid Phase Engineering Services for Harris County Engineering Department (HCED), for the improvement of Northlake Subdivision Drainage Improvements on July 14, 2020.

3.0 Purpose and Scope

The purpose of this project is to extend the storm network and address existing flooding in the subdivision by upsizing 1 of the existing pond outfalls, installing a restrictor plate on the pipe's downstream end on the outfall, extending the currently existing storm network on streets that are prone to flooding based on NOAA Atlas 14 rainfall data. The proposed improvements will cause pavement restoration for half the existing road section.

4.0 Existing Conditions Analysis

A Utility Conflict Table is provided with the study report to outline existing public and private utilities (see Table 2)

4.1 Storm Sewer

The Northlake Forest Subdivision conveys stormwater runoff through a storm sewer system and curb and gutter streets as shown in Exhibit 2. The storm sewer system drains to a system of detention ponds within the neighborhood. The storm sewer network will be improved to accommodate Atlas 14 rainfall data.

4.2 Water

The Northlake Forest subdivision is served by Harris County Municipal Utility District #10. The MUD engineer is Van De Wiele and Volger, Inc. The existing water system is located within Harris County right-of-way along multiple roadways where the existing storm sewer system exists.

4.3 Sanitary Sewer

The Northlake Forest subdivision is served by Harris County Municipal Utility District #10. The MUD engineer is Van De Wiele and Volger, Inc. Record drawings of the existing potable water system within the subdivision were provided by the MUD engineer and was confirmed with information from the topographic survey. The existing water system is located within Harris County right-of-way along multiple roadways within the project area. The potable water system is not likely to be impacted by the construction of improvements for large storm events. However, the system may be impacted by localized improvements to the interior drainage system which may result in more efficient drainage during smaller storm events. The sanitary sewer system should not be impacted by the localized improvements to the existing storm sewer system.

4.4 Electric

The Northlake Forest subdivision is served by Centerpoint Energy. Overhead power lines are located along the west side of the subdivision, the pipeline easement, and the south side of Huffmeister Road. Existing streetlights may be affected, coordination between contractor, engineer and Centerpoint will be needed.

4.5 Gas

The Northlake Forest subdivision is served by Centerpoint Energy. Gas lines within the neighborhood are located along the back of lot lines within existing utility easements. It is not anticipated that gas service will be impacted by the construction of the proposed localized improvements to the storm network. A pipeline runs in the southwest to northeast direction through the subdivision. It crosses under Huffmeister Road. The recommended localized improvements avoid crossing the pipeline corridor and the pipeline should not be impacted by the proposed improvements.

4.6 Telecommunications

The Northlake Forest subdivision is served by Comcast and AT&T telecommunications. Existing utilities are located throughout the neighborhood along the back lots within Harris County right-of-way. Existing buried AT&T cables will be affected by the proposed improvements, coordination with AT&T will be required.

5.0 Topographic Survey and Existing ROW

A topographic Survey and Existing ROW maps were conducted by "Kuo and Associates" that were completed in May 2021 and approved by HCED on May 17, 2021. See Exhibit 5 for Topographic Survey and Appendix D for Existing ROW maps.

5.1 Topographic Survey

All public and private utilities were found through visible means or with Level B SUE through the One Call Services. The topographic survey was used for the design of the storm sewer extensions and outfall replacement at Arlington Place.

5.2 Existing ROW

The existing ROW of the subdivision consists of a 60-foot ROW with waterline and sanitary sewer easements throughout the subdivision. A pipeline easement runs northeast and southwest through the subdivision. All proposed improvements are within the existing ROW. See Exhibit 4 for existing typical cross sections.

6.0 Geotechnical Report

A geotechnical exploration study (attached in Appendix A) was conducted by "Geotech Engineering and Testing" in November 2020 and approved by HCED on November 11, 2020.

6.1 Underground Utilities

The soil stratigraphy and groundwater conditions along the project alignment were explored by conducting four (4) soil testing borings to the completions depths of 15' and 20', which consists of one (1) boring at each outfall, one boring close to the storm sewer tie in point on Light Falls Court, and one boring at the cul-de-sac on Clear Point Drive. The project alignments are generally flat and exhibit a topographic variation of less than 3'. In general, the vicinity of the project alignments consists of residential facilities. The soils along the project alignment appear to be uniform. Existing soil stratigraphy includes an existing concrete pavement 7" and 10" in thickness and sandy lean clay from 0'-20' beneath the existing pavement. The bedding and backfilling material for the proposed storm sewer should be constructed in accordance with the Harris County Specifications.

The results of the field explorations and laboratory testing indicate that unsatisfactory soils for excavation, such as soft clay soils, exist at various depths in the borings along the project alignments. If these conditions are encountered during the time of construction, suitable groundwater control measures should be implemented. Furthermore, the contractor may have to over excavate an additional 1-ft and remove unstable or unsuitable materials with approval by the geotechnical engineer, then place an equal depth of cement stabilization sand. Due to potential variability of the onsite soils, unstable trench conditions may still exist in the areas where borings were not conducted, if these conditions are encountered during the time of construction a stable trench should be provided to allow proper bedding and installation.

There was no groundwater encountered during the exploration and at 0.5-hour after drilling in the borings. If groundwater is encountered during construction, it is the geotechnical engineers' recommendation that groundwater should be lowered to a depth of at least three-ft below the deepest excavation grade in order to provide dry working conditions. Any minor water inflow in cohesive soil layers can probably be removed using a sump-pump or a trench sump-pump immediately. A wellpoint system can be used in the area where sands are present.

6.2 Outfall Structures

The reinforced concrete pipes should be placed on a well prepared, properly compacted working surface. The drainage outfall pipes can be supported on the natural soils, provided the subgrade is protected from construction disturbances and surface water is not allowed to pond within the excavation. In the event that potentially wet and unstable cohesionless soils are encountered during construction, these soils need to be stabilized by lowering the groundwater, excavate and replaced with cement stabilized sands.

6.3 Proposed Pavement

The proposed pavement shall be in accordance with Harris County Engineering Department standard sections for residential streets. RGME recommends replacing the existing pavement to the existing cross section which includes a depth of 8-inches of reinforced concrete and 8-inches of cement stabilized subgrade.

7.0 Drainage Analysis

A drainage analysis was conducted by HDR in April 2021 (attached in Appendix B) and approved on June 4, 2021. An INO was received from Harris County Flood Control District on June 4, 2021 and is provided in Appendix C.

The general topography of the subdivision slopes towards the southeast. The subdivision is currently mapped within FEMA effective Special Flood Hazard Area Shaded Zone X, which indicates that the entire subdivision lies within the 0.2% annual chance (500-year) floodplain of Little Cypress Creek, as shown in the floodplain map found in Appendix B Exhibit 2. Additionally, Appendix B Exhibit 5, Exhibit 6, and Exhibit 7 provide the pre-project conditions ponding maps for the 2-year, 10-year, and 100-year storm events within the Northlake Forest subdivision, respectively.

As a part of the study phase of the Northlake Forest subdivision project, HDR analyzed the existing storm sewer system and proposed improvements within Sections 1 and 3 of the Northlake Forest Subdivision. See Exhibit 2 for the existing storm sewer layout. Storm sewer improvements are proposed along Clear Point Drive, Bach Springs Court, Light Falls Court, Corktree Knolls, Medlowe Court, Elinor Court, and Fable Lane. The storm sewer improvements involve extending the existing storm sewer along Corktree Knolls, Clear Point Drive, and Medlowe Court., and upsizing the existing "B-B" inlets on Bach Springs Court, Light Springs Court, Fable Court, and Elinor Court to "C-1" Inlets. The purpose of the storm sewer extension and inlet replacements is to reduce ponding during the 2-year, 10-year, and 100-year storm events. The proposed storm sewers will be placed within the existing road right of way, underneath the pavement to avoid conflict with the existing water lines. Additionally, the storm sewer outfall near Arlington Place will be upsized to reduce the hydraulic grade line within the underground system throughout the subdivision. See Exhibit 3 for the proposed storm sewer layout.

The pre-project and proposed condition's peak flow rates were compared. 0.10 acre-foot of storage will be provided by upsizing the 5'x4' RCB outfall near Arlington Place St. to a proposed 6'x4' RCB and constructing a 5'x4' restrictor plate on the downstream end of the pipe.

Appendix B Exhibit 4 of the HDR drainage report provides a layout of the proposed storm sewer improvements. Additionally, Appendix B Exhibit 8, Exhibit 9, and Exhibit 10 of the HDR drainage report provide the proposed conditions ponding maps for the 2-year, 10-year, and 100-year storm events, respectively. The downstream boundary condition of the model used is based on a fixed backwater condition of the detention basin static water surface elevations and does not consider any overflows from Little Cypress Creek or the flood levels in Little Cypress Creek. The drainage analysis has been reviewed and approved by HCFCD. HCFCD INO (Project No. 2012100253) was received June 4, 2021 and is provided in Appendix C.

8.0 Subsurface Utility Engineering

Kuo and Associates conducted Level B SUE to locate private utilities within the ROW. Existing utility documents can be found in Exhibit 5.

9.0 Recommendations

During the April 2016 (Tax Day) and August 2017 (Hurricane Harvey) storm events, approximately 25 and 84 single-family residential homes respectively were flooded in the Northlake subdivision. In 2019, HDR Engineering Inc completed a preliminary drainage study and concluded the cause of flooding during large storm events (1% annual chance or less) to be overflow from Little Cypress Creek, while Harris County Flood Control District (HCFCD) has undertaken the Little Cypress Creek Frontier Program which will reduce the risk of structural flooding within the Little Cypress Creek watershed and the Northlake Forest subdivision, the drainage analysis done by HDR in 2020 shows street ponding during smaller storm events (50% annual chance or more) and proposed improvements within Section 1 and 3 of the Northlake Subdivision to reduce the risk of flooding and street ponding.

Storm sewer improvements are proposed along Clear Point Drive, Corktree Knolls, and Medlowe Court, and upsizing the existing "B-B" inlets on Bach Springs Court, Light Springs Court, Fable Court, and Elinor Court to "C-1" Inlets. The storm sewer improvements involve extending the existing storm sewer toward the end of each respective cul-de-sac to provide inlet capacity. The proposed storm sewer will be placed underneath one side of the street pavement to avoid conflict with existing waterlines. Additionally, the storm sewer outfall to the detention basin near Arlington Place Street will be upsized and a restrictor plate will be added. The existing detention basin is a wet bottom basin. The contractor shall ensure dry conditions at the outfall with the use of, but not limited to, pumps and coffer dams.

The proposed pavement for pavement replacement shall be in accordance with Harris County Engineering Department standard section for residential streets. RGME recommends replacing the existing pavement to the existing cross section which includes a depth of 8-inches of reinforced concrete pavement and 8-inches of cement stabilized subgrade.

10.0 Construction Cost Estimate

The preliminary cost estimate for this project is $494,807.00 (See Table 1).

EXHIBIT 1

PROJECT LOCATION KEY MAP

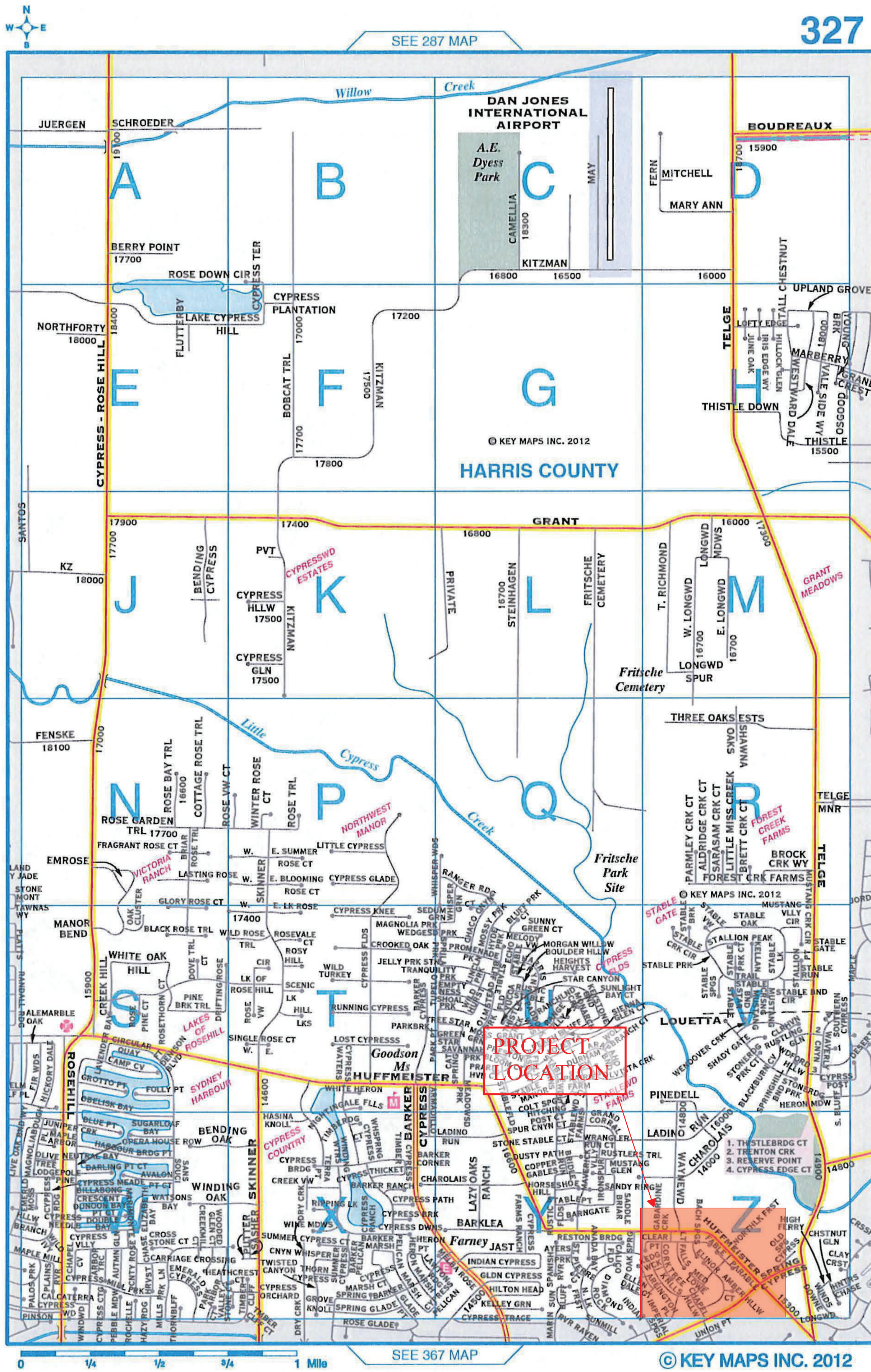
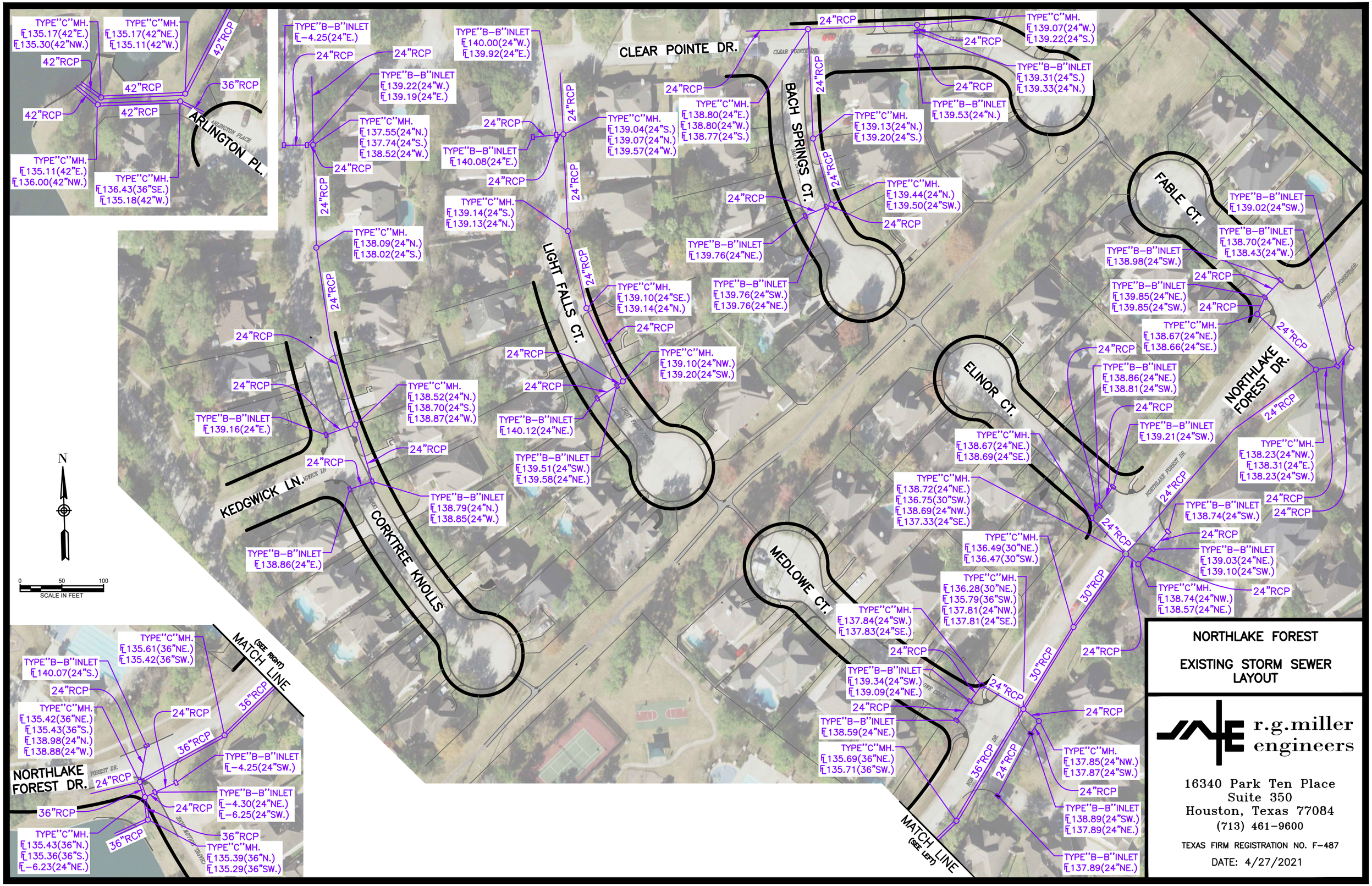

327
SEE 287 MAP
SEE 328 MAP
SEE 367 MAP
DAN JONES INTERNATIONAL AIRPORT
A.E. Dyess Park
HARRIS COUNTY
© KEY MAPS INC. 2012
Willow Creek
Little Cypress Creek
Fritsche Cemetery
Fritsche Park Site
Goodson Ms
Farney
PROJECT LOCATION
JUERGEN
SCHROEDER
BOUDREAUX
MITCHELL
MARY ANN
KITZMAN
BERRY POINT
ROSE DOWN CIR
CYPRESS PLANTATION
LAKE CYPRESS HILL
NORTHFORTY
CYPRESS - ROSE HILL
BOBCAT TRL
UPLAND GROVE
THISTLE DOWN
GRANT
TELGE
CYPRESSWD ESTATES
GRANT MEADOWS
FENSKE
THREE OAKS ESTS
NORTHWEST MANOR
VICTORIA RANCH
FOREST CREEK FARMS
STABLE GATE
LAKES OF ROSEHILL
SYDNEY HARBOUR
HUFFMEISTER
LOUETTA
PINEDELL
CYPRESS COUNTRY
BARKER CYPRESS
SKINNER
ROSEHILL
WINDING OAK
BENDING OAK
BARKLEA
CHAROLAIS
LADINO RUN
UNION PT
LONGWD
0 1/4 1/2 3/4 1 Mile
© KEY MAPS INC. 2012

EXHIBIT 2

EXISTING STORM SEWER LAYOUT



NORTHLAKE FOREST

EXISTING STORM SEWER LAYOUT

r.g.miller engineers

16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600

TEXAS FIRM REGISTRATION NO. F-487

DATE: 4/27/2021

EXHIBIT 3

PROPOSED STORM SEWER LAYOUT

EXIST. STORM
8'X8' JUNC. BOX
℄135.16(6'X4'W.)
℄135.16(42"S.)
6'X4'RCB
TYPE"C"MH.
℄135.26(42"N.)
6'X4'RCB
5'x4'
RESTRICTOR
ARLINGTON PL.
MH. ON RCB BEND @140°
℄135.08(6'X4'E.)
℄135.08(6'X4'NW.)

CLEAR POINTE DR.
EXIST. STORM
BACH SPRINGS CT.
TYPE"C"MH.
℄139.38(24"E.)
℄139.38(24"S.)
℄139.38(24"N.)
24"RCP
TYPE"B-B"INLET
℄139.61(24"SW.)
24"RCP
24"RCP
TYPE"C"MH.
℄139.60(24"W.)
℄139.60(24"NE.)
℄139.60(24"SW.)
24"RCP
TYPE"C"MH.
℄139.49(24"W.)
℄139.49(24"E.)
TYPE"B-B"INLET
℄139.63(24"NE.)
FABLE CT.

EXIST. STORM
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
EXIST. STORM
LIGHT FALLS CT.
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET

ELINOR CT.
NORTHLAKE FOREST DR.
EXIST. STORM
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET

TYPE"C"MH.
℄138.85(24"SE.)
℄138.85(24"W.)
KEDGWICK LN.
24"RCP
CORKTREE KNOLLS
TYPE"C"MH.
℄139.12(24"NW.)
℄139.12(24"SE.)
24"RCP
TYPE"B-B"INLET
℄139.25(24"S.)
24"RCP
TYPE"C"MH.
℄139.23(24"NW.)
℄139.23(24"SW.)
℄139.23(24"N.)
24"RCP
TYPE"B-B"INLET
℄139.28(24"NE.)

24"RCP
TYPE"B-B"INLET
℄138.86(24"W.)
MEDLOWE CT.
24"RCP
TYPE"C"MH.
℄138.84(24"SE.)
℄138.84(24"E.)
℄138.84(24"SW.)
TYPE"C"MH.
℄138.60(24"SE.)
℄138.60(24"NW.)
24"RCP
TYPE"B-B"INLET
℄138.88(24"NE.)
24"RCP
TYPE"C"MH.
℄138.41(24"NW.)
℄138.41(24"SW.)
℄138.41(24"NE.)

N
0 50 100
SCALE IN FEET

MATCH LINE (SEE RIGHT)
EXIST. STORM
NORTHLAKE FOREST DR.
MATCH LINE (SEE LEFT)
EXIST. STORM

NORTHLAKE FOREST

PROPOSED STORM SEWER LAYOUT

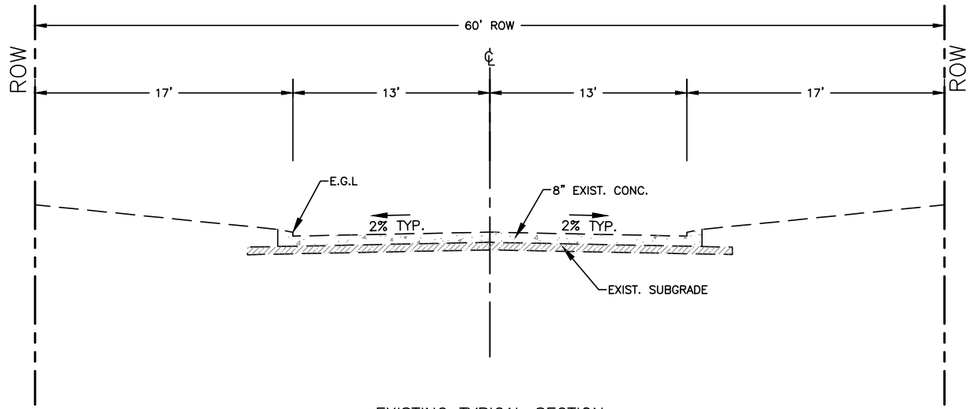
r.g.miller engineers
16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600
TEXAS FIRM REGISTRATION NO. F-487

DATE: 9/16/2021

M:\04636.000 NORTHLAKE FOREST\CAD\EXHIBITS\EXH - COMBINED STORM SEWER ALT. 2.DWG | SAVED: Thursday, September 16, 2021 12:54:33 PM | PLOTTED: Thursday, September 16, 2021 3:28:17 PM

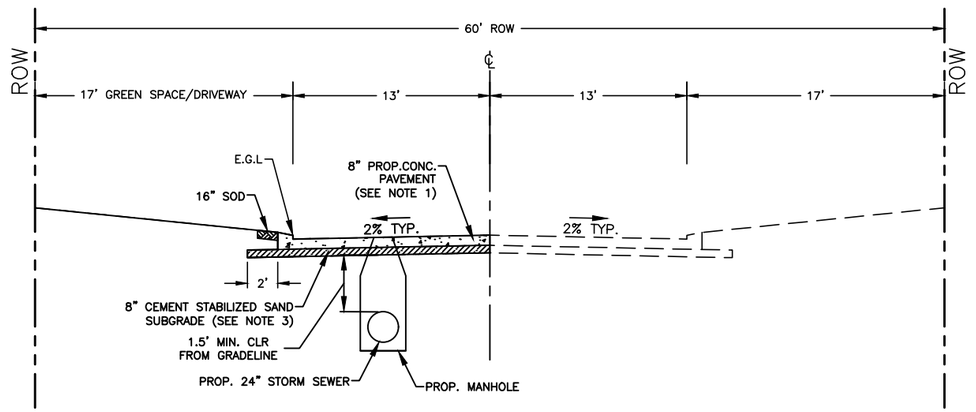
EXHIBIT 4

EXISTING & PROPOSED TYPICAL CROSS SECTIONS



EXISTING TYPICAL SECTION

N.T.S



PROPOSED TYPICAL SECTION

N.T.S

0 5 10

SCALE IN FEET

NOTE:

1. CONCRETE PAVING SHALL CONFORM TO SECTION 7 IN HARRIS COUNTY INFRASTRUCTURE REGULATIONS.
2. REINFORCEMENT TO BE INSTALLED PER DETAIL ON SHT. 29
3. SUBGRADE SHALL CONFORM TO HCED SPECIFICATION ITEM 222, PORTLAND CEMENT STABILIZED SUBGRADE
4. CONCRETE PAVEMENT SHALL BE CLASS C WITH A MIN COMPRESSIVE STRENGTH OF 3,000 PSE @ 28 DAYS AND SHALL MEET THE REQUIREMENT IN ITEM 360 CONRETE PAVEMENT.
5. ALL REINFORCEMENT BARS SHALL BE GRADE 60 STEEL

NORTHLAKE FOREST

TYPICAL CROSS SECTIONS

r.g.miller engineers

16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600

TEXAS FIRM REGISTRATION NO. F-487

DATE: 9/22/2021

EXHIBIT 5

TOPOGRAPHIC SURVEY

HARRIS COUNTY ENGINEERING DEPARTMENT

EXISTING TOPOGRAPHIC SURVEY
NORTHLAKE FOREST SUBDIVISION
DRAINAGE IMPROVEMENTS - 2018

UPIN NO. 19103MF14F01

HARRIS COUNTY ROAD LOG IDENTIFIER NO.

Clear Pointe Drive 0305601
Bach Springs Court 0305501
Light Falls Court 0305401
Corktree Knolls 0305201
Northlake Forest Drive 3603101
Fable Court 0304201
Elinor Court 0304401
Medlowe Court 0304601
Kedgwick Lane 0305001
Chapel Hollow Lane 0304701

INDEX OF DRAWINGS

RODNEY ELLIS
COMMISSIONER — PRECINCT 1

ADRIAN GARCIA
COMMISSIONER — PRECINCT 2

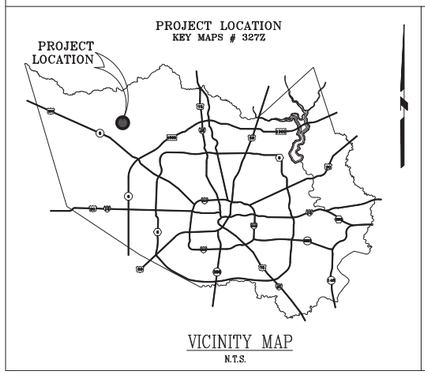
MICHAEL POST, CPA
COUNTY AUDITOR

LINA HIDALGO
COUNTY JUDGE

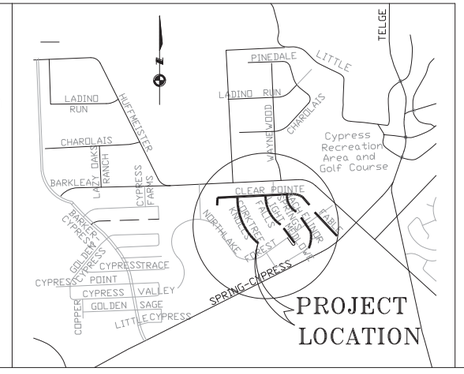
STEVE RADACK
COMMISSIONER — PRECINCT 3

R. JACK CAGLE
COMMISSIONER — PRECINCT 4

JOHN R. BLOUNT, P.E.
COUNTY ENGINEER



VICINITY MAP
N.T.S.



MAY 2021
PRECINCT 3
Harris County, Texas

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Consulting Engineers & Surveyors
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Houston, TX 77042
Tel: (713) 975-8769
Fax: (713) 975-0920
www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

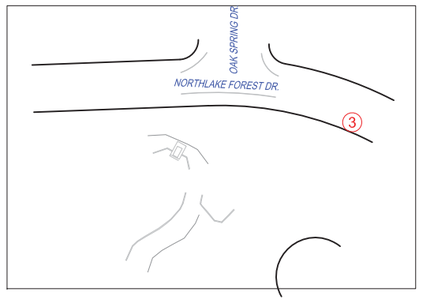
APPROVED: _____
HCED—Permit Group
Flood Plain Management

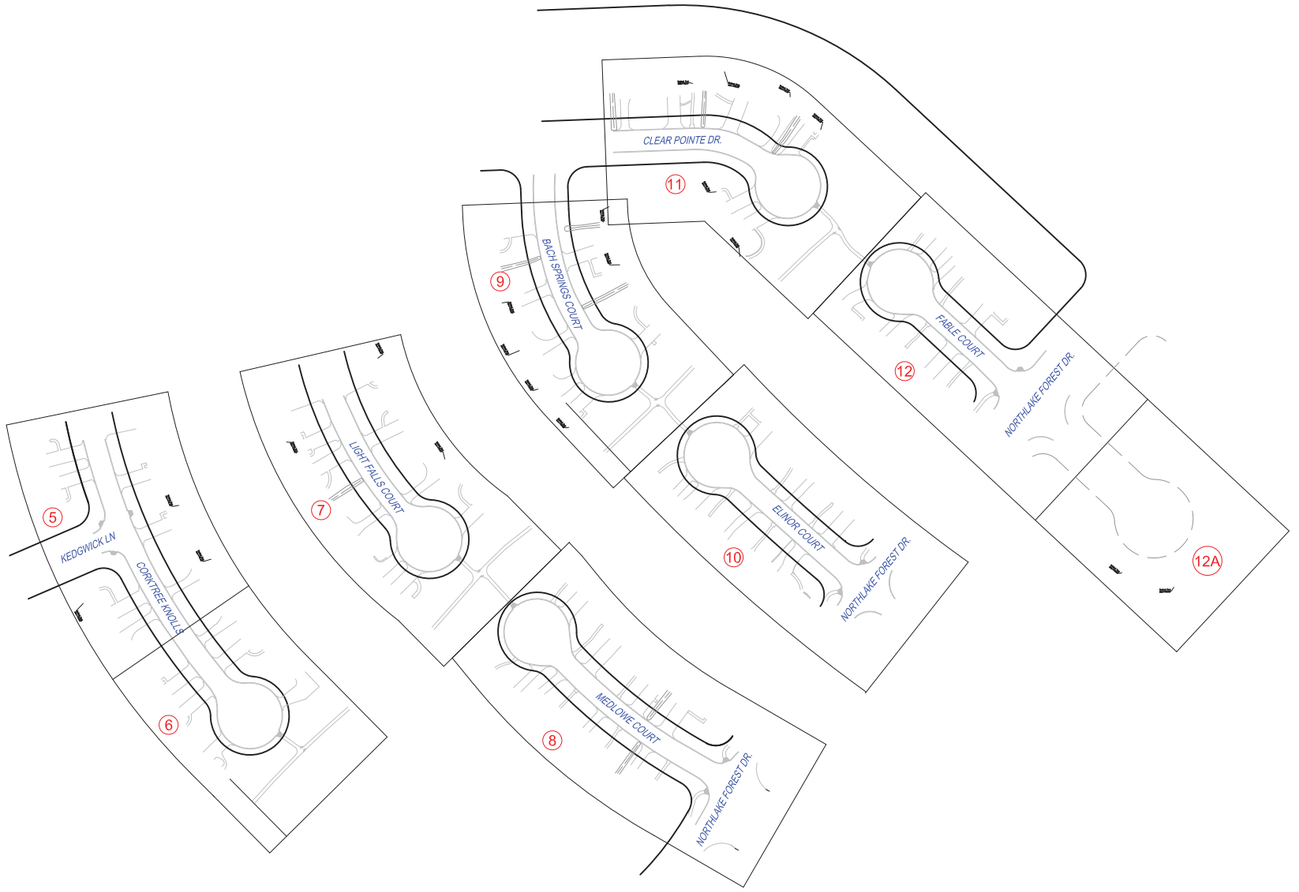
CIVIL STANDARD PCS

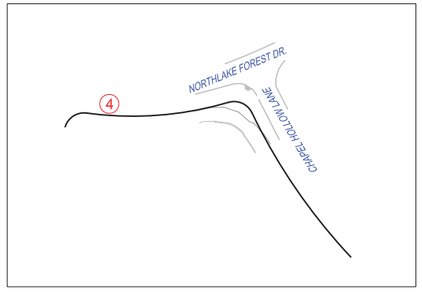
W:\Proj-2020\20109 (NORTHLAKE FOREST)\Dwgs\HCED CVR SHT-topo.dwg

NOTE:

1. BY GRAPHIC REPRESENTATION ONLY, THE LIMITS OF THIS PROJECT APPEAR TO BE LOCATED WITHIN ZONE X (SHADED) OF THE FEMA FIRM PANEL MAP NO. 48201C0410M. DATED REVISED OCT. 16, 2013.
2. SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF CITY OF HOUSTON BUILDING LINE ORDINANCE AS RECORDED UNDER HARRIS COUNTY CLERKS FILE NO. N253886 O.P.R.R.P.H.C.
3. THE TOPOGRAPHIC SURVEY INFORMATION SHOWN HEREON SUBSTANTIALLY CONFORMS TO THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION II SURVEY.
4. THE FIELD WORK WAS COMPLETED ON DEC. 11, 2020.







BENCHMARK:

FLOODPLAIN REFERENCE MARK NUMBER 110960 IS AN HCFCD ALUMINUM ROD STAMPED 110960 LOCATED ON EAST SIDE 90 DEGREE BEND IN DITCH APPROXIMATELY 0.2 MILES FROM THE INTERSECTION OF LADINO RUN STREET WEST OF WAYNEWOOD DRIVE IN KEYMAP 327Y IN THE CYPREESS CREEK WATERSHED

ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

HORIZONTAL DATUM:

ALL HORIZONTAL COORDINATES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83. THE COORDINATES & DISTANCES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A SCALE FACTOR OF 0.999870017.

EXISTING UTILITY NOTE:

EXISTING UNDERGROUND UTILITY INFORMATION (TYPE, SIZE & OWNERSHIP) ARE SHOWN APPROXIMATELY BASED ON THE AVAILABLE RECORD DRAWINGS AND FIELD VERIFICATION (WHERE FEASIBLE) WITHOUT PROBING AND EXCAVATION. NO WARRANTY IS MADE AS TO THE ACCURACY OR COMPLETENESS OF UTILITY LOCATION SHOWN ON THE DRAWING. CAUTION SHOULD BE EXERCISED WHEN EXCAVATING OR BORE AND JACKING IN THE VICINITY OF UNDERGROUND UTILITIES. OWNERS OF THE UTILITIES SHOULD BE NOTIFIED PRIOR TO SUCH ACTIVITIES. CALL UTILITY COORDINATING COMMITTEE AT 713-223-4567, AT LEAST 48 HOURS PRIOR TO EXCAVATING IN THE STREET RIGHT-OF-WAY.

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC MAP CORRECTLY REPRESENTS THE FACTS FOUND AS A RESULT OF AN ACTUAL SURVEY CONDUCTED UNDER MY SUPERVISION FROM 08/24/2020 TO 09/10/2020. THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION 2 SURVEY

05/13/2021

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL LAND SURVEYOR

NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

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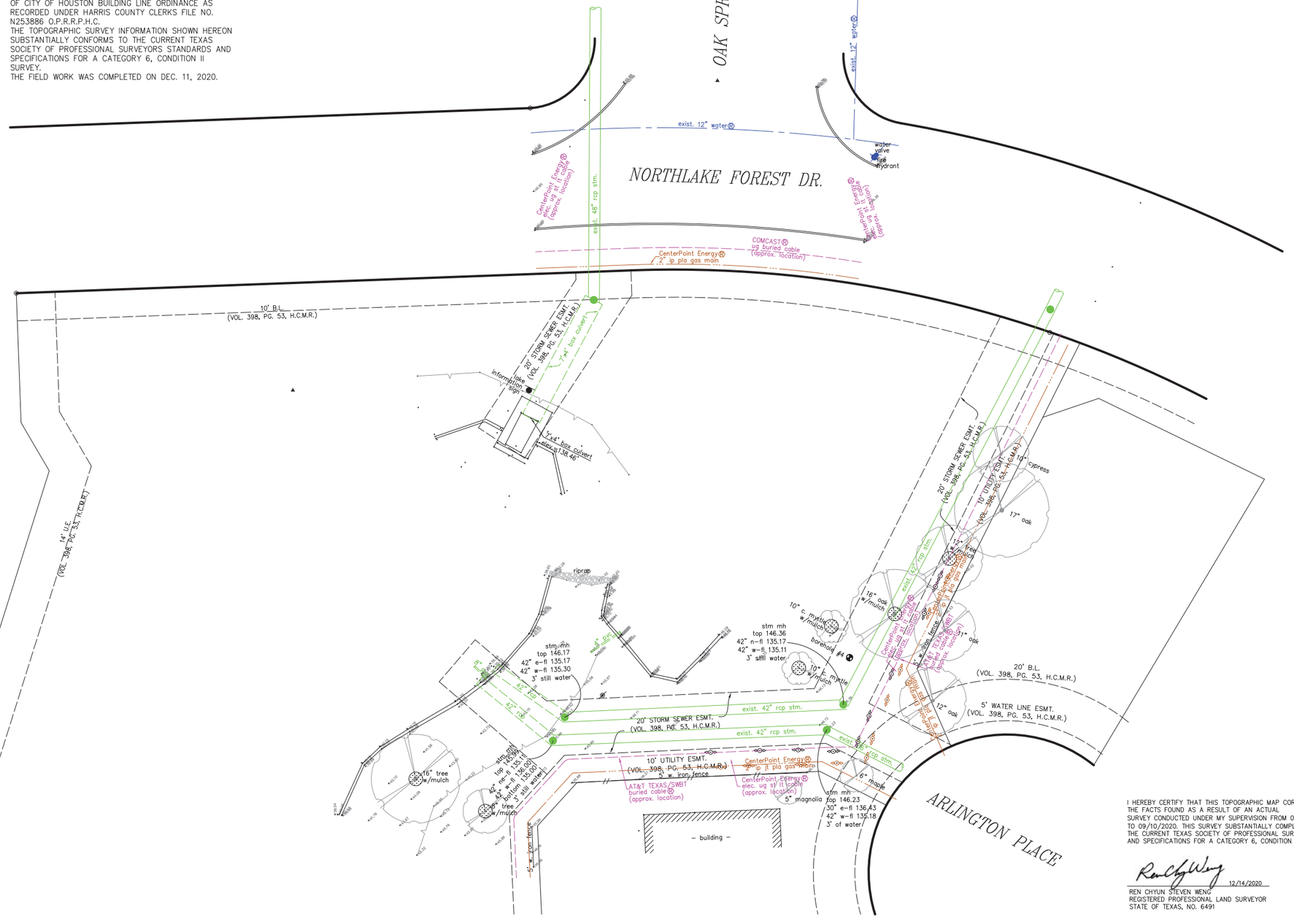
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

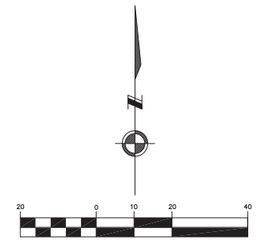
PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS		
DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	LAYOUT	
SCALE: N.T.S.		SHEET NO: 2 / 12
DATE: 05/13/2021	APPROVED BY:	

$DATE$
$FILEA$

NOTE:

1. BY GRAPHIC REPRESENTATION ONLY, THE LIMITS OF THIS PROJECT APPEAR TO BE LOCATED WITHIN ZONE X (SHADED) OF THE FEMA FIRM PANEL MAP NO. 48201C0410M. DATED REVISED OCT. 16, 2013.
2. SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF CITY OF HOUSTON BUILDING LINE ORDINANCE AS RECORDED UNDER HARRIS COUNTY CLERKS FILE NO. N253886 O.P.R.R.P.H.C.
3. THE TOPOGRAPHIC SURVEY INFORMATION SHOWN HEREON SUBSTANTIALLY CONFORMS TO THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION II SURVEY.
4. THE FIELD WORK WAS COMPLETED ON DEC. 11, 2020.





SCALE: 1" = 20'-0" FEET FOR 22"X34" SHEET
SCALE: 1" = 40'-0" FEET FOR 11"X17" SHEET

BENCHMARK:

FLOODPLAIN REFERENCE MARK NUMBER 110960 IS AN HCFCD ALUMINUM ROD STAMPED 110960 LOCATED ON EAST SIDE 90 DEGREE BEND IN DITCH APPROXIMATELY 0.2 MILES FROM THE INTERSECTION OF LADINO RUN STREET WEST OF WAYNEWOOD DRIVE IN KEYMAP 327Y IN THE CYPREESS CREEK WATERSHED

ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

HORIZONTAL DATUM:

ALL HORIZONTAL COORDINATES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83. THE COORDINATES & DISTANCES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A SCALE FACTOR OF 0.999870017.

EXISTING UTILITY NOTE:

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LEGEND:

ASPHALT SYMBOL	PLANTER
B OR BB INLET	POWER POLE
BUSH	POWER POLE W/LT.
C INLET	REFERENCE INFORMATION (FROM RECORD DRAWING)
CLEANOUT	SBC MANHOLE
COLUMN	SIGN
DOWN GUY	SIGNAL POLE
E INLET	SPRINKER VALVE
ELEC MANHOLE	SPRINKLER HEAD
FIRE HYDRANT	STREET LIGHT/FLOOD LIGHT
GAS METER	STREET LIGHT/PARKING LIGHT
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GATE	TREE STUMP
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GRATE INLET	TREE-PINE
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MANHOLE	WATER VALVE
BOREHOLE	WATERLINE REDUCER

BRUSH ROW	
DITCH/SWALE CENTER LINE	
EASEMENT OR BUILDING LINE	
FENCE	
GAS LINE	
GUARD RAIL	
HEDGE ROW OR TREE LINE	
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SANITARY FORCE MAIN	
STORM LINE	
TELEPHONE LINE	
UG STREET LIGHT CABLE	
WATER LINE	

ABBREVIATIONS:

E./ESMT.	EASEMENT	I.R.	IRON ROD
B.L.	BUILDING LINE	I.P.	IRON PIPE
STM.	STORM	CONC.	CONCRETE
SAN.	SANITARY	LT	LIGHT
SWR.	SEWER	UG	UNDER GROUND
N.F.I.F.	NOT FOUND IN FIELD		

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC MAP CORRECTLY REPRESENTS THE FACTS FOUND AS A RESULT OF AN ACTUAL SURVEY CONDUCTED UNDER MY SUPERVISION FROM 08/24/2020 TO 09/10/2020. THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION 2 SURVEY

12/14/2020

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL LAND SURVEYOR

NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

HARRIS COUNTY TEXAS 1836

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Fax: (713) 975-0920
www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	ARLINGTON PLACE	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'		SHEET NO: 3 / 12
DATE: 12/14/2020	APPROVED BY:	

$DATE$
$FILEA$

NOTE:

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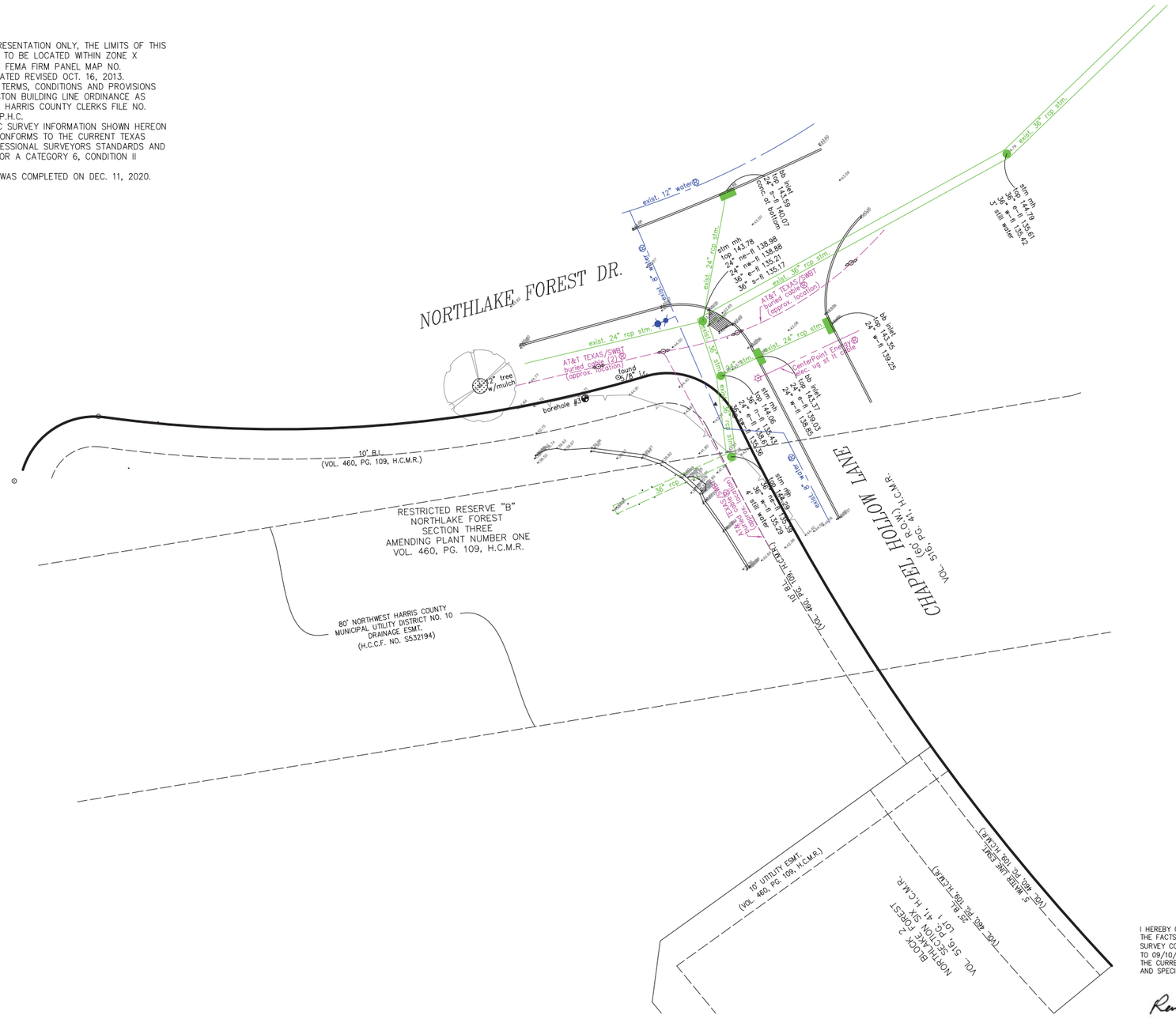

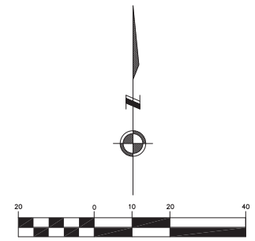

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ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

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LEGEND:

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BUSH	POWER POLE W/LT.
C INLET	REFERENCE INFORMATION (FROM RECORD DRAWING)
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COLUMN	SIGN
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ELEC MANHOLE	SPRINKLER HEAD
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12/14/2020

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG 6491 PROFESSIONAL LAND SURVEYOR

ABBREVIATIONS:

E./ESMT.	EASEMENT	I.R.	IRON ROD
B.L.	BUILDING LINE	I.P.	IRON PIPE
STM.	STORM	CONC.	CONCRETE
SAN.	SANITARY	LT	LIGHT
SWR.	SEWER	UG	UNDER GROUND
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NO.	REVISIONS	DATE	APP

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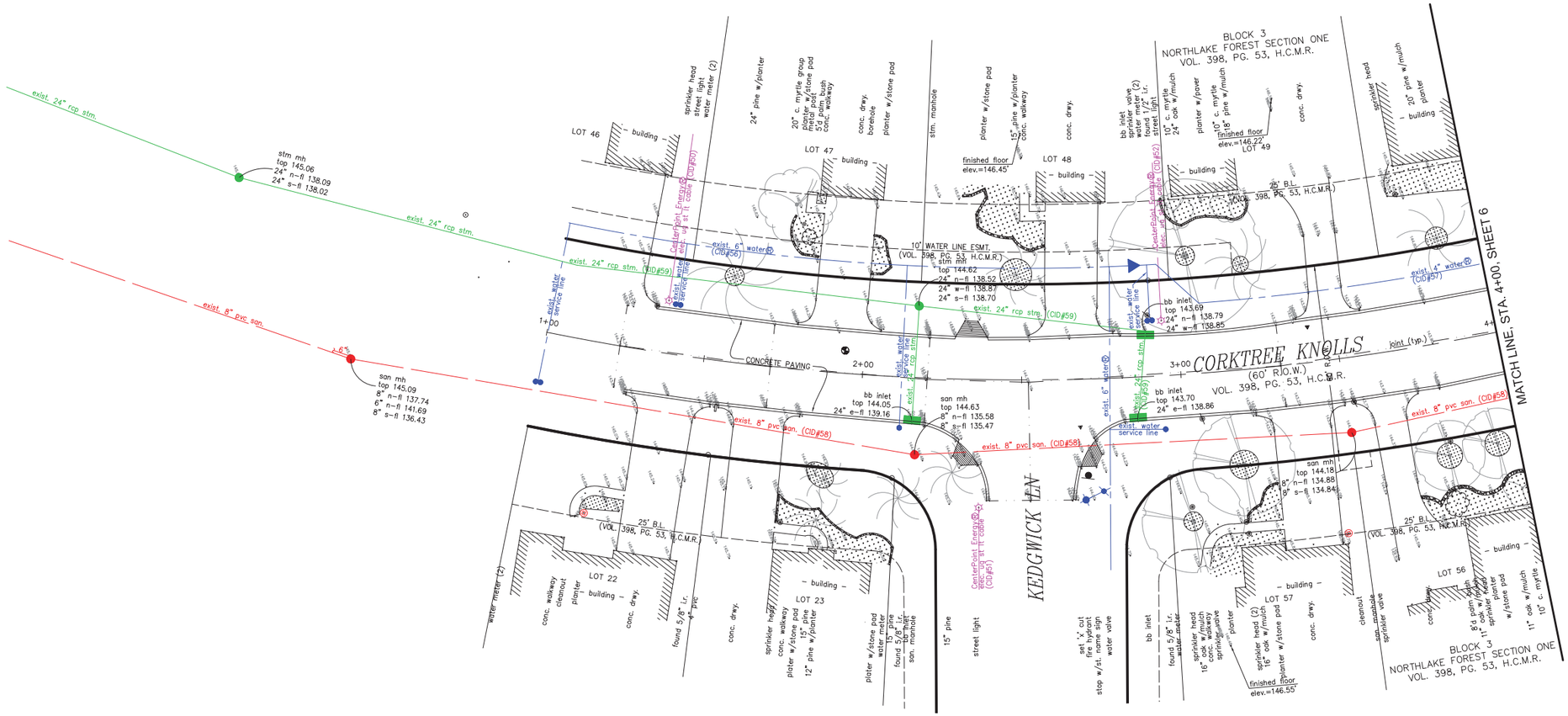
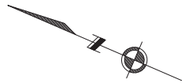
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS		
DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	CHAPEL HOLLOW LANE	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'		SHEET NO: 4 / 12
DATE: 12/14/2020	APPROVED BY:	

$DATE$
$FILEA$





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ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

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ASPHALT SYMBOL	PLANTER
B OR BB INLET	POWER POLE
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05/13/2021

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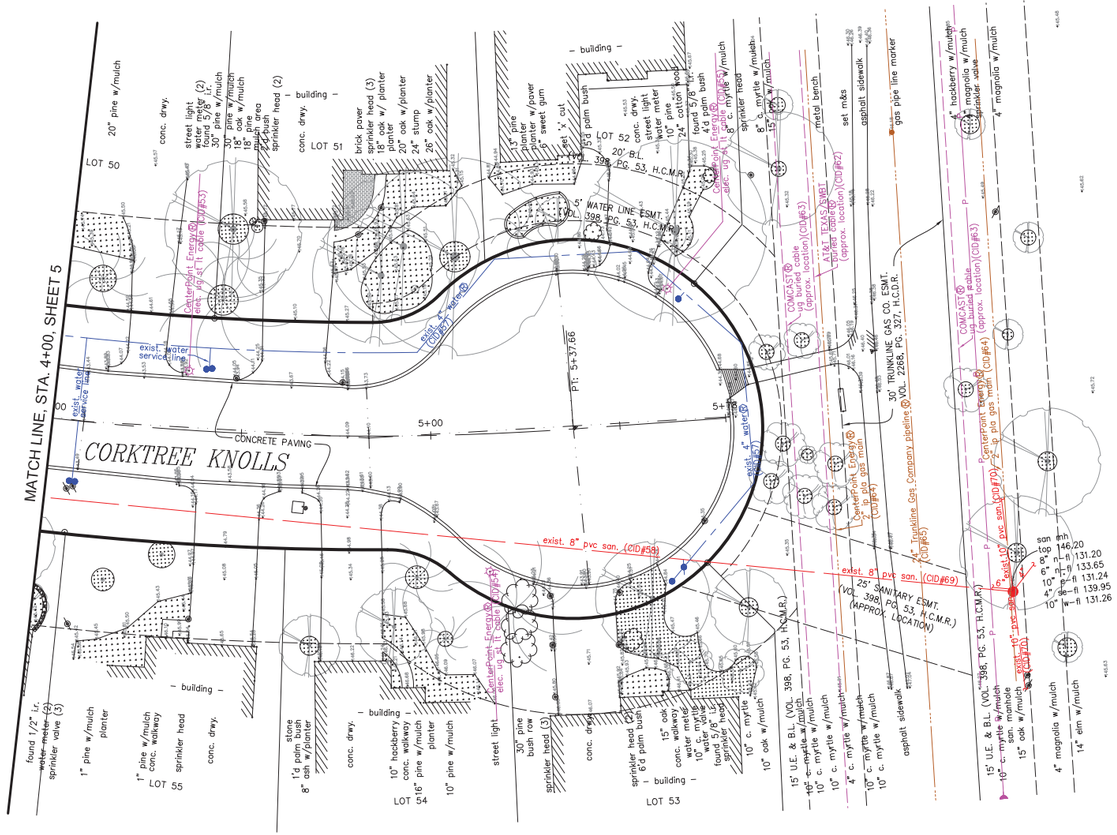
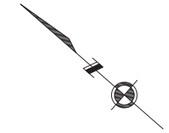
PROJECT TITLE:	NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS
DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY
CK'D BY: SW	CORKTREE KNOLLS
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO 4+00
DATE: 05/13/2021	APPROVED BY:
HCED STANDARD	SHEET NO: 5 / 12

$DATE$
$FILEA$





20 0 10 20 40

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ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

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SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 4+00 TO END	SHEET NO: 6/ 12
DATE: 12/14/2020	APPROVED BY:	

$DATE$
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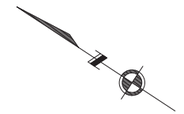

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ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

HORIZONTAL DATUM:

ALL HORIZONTAL COORDINATES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83. THE COORDINATES & DISTANCES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A SCALE FACTOR OF 0.999870017.

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LEGEND:

- ASPHALT SYMBOL
- B OR BB INLET
- BUSH
- C INLET
- CLEANOUT
- COLUMN
- DOWN GUY
- E INLET
- ELEC MANHOLE
- FIRE HYDRANT
- GAS METER
- GAS VALVE
- GATE
- GRATE INLET
- GRATE INLET
- IRRIGATION CONTROL VALVE
- MAIL BOX
- MANHOLE
- BOREHOLE
- PLANTER
- POWER POLE
- POWER POLE W/LT.
- REFERENCE INFORMATION (FROM RECORD DRAWING)
- SBC MANHOLE
- SIGN
- SIGNAL POLE
- SPRINKLER VALVE
- SPRINKLER HEAD
- STREET LIGHT/FLOOD LIGHT
- STREET LIGHT/PARKING LIGHT
- TREE
- TREE STUMP
- TREE-CREPE MYRTLE
- TREE-PINE
- UTILITY MARK
- WATER METER
- WATER VALVE
- WATERLINE REDUCER
- BRUSH ROW
- DITCH/SWALE CENTER LINE
- EASEMENT OR BUILDING LINE
- FENCE
- GAS LINE
- GUARD RAIL
- HEDGE ROW OR TREE LINE
- HIGH BANK
- OVERHEAD POWER LINE
- SANITARY SEWER LINE
- SANITARY FORCE MAIN
- STORM LINE
- TELEPHONE LINE
- UG STREET LIGHT CABLE
- WATER LINE

ABBREVIATIONS:

E./ESMT.	EASEMENT	I.R.	IRON ROD
B.L.	BUILDING LINE	I.P.	IRON PIPE
STM.	STORM	CONC.	CONCRETE
SAN.	SANITARY	LT	LIGHT
SWR.	SEWER	UG	UNDER GROUND
N.F.I.F.	NOT FOUND IN FIELD		

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC MAP CORRECTLY REPRESENTS THE FACTS FOUND AS A RESULT OF AN ACTUAL SURVEY CONDUCTED UNDER MY SUPERVISION FROM 08/24/2020 TO 09/10/2020. THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION 2 SURVEY

05/13/2021

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL · LAND SURVEYOR

NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

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Consulting Engineers & Surveyors
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Houston, TX 77042
Tel: (713) 975-8769
Fax: (713) 975-0920
www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	LIGHT FALLS COURT	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END	SHEET NO: 7 / 12
DATE: 05/13/2021	APPROVED BY:	

$DATE$
$FILE$

BENCHMARK:

FLOODPLAIN REFERENCE MARK NUMBER 110960 IS AN HCFCD ALUMINUM ROD STAMPED 110960 LOCATED ON EAST SIDE 90 DEGREE BEND IN DITCH APPROXIMATELY 0.2 MILES FROM THE INTERSECTION OF LADINO RUN STREET WEST OF WAYNEWOOD DRIVE IN KEYMAP 327Y IN THE CYPREESS CREEK WATERSHED

ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

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LEGEND:

////	ASPHALT SYMBOL	▨	PLANTER
🟩	B OR BB INLET	●	POWER POLE
✿	BUSH	●	POWER POLE W/LT.
🟩	C INLET	Ⓡ	REFERENCE INFORMATION (FROM RECORD DRAWING)
◎	CLEANOUT		
☒	COLUMN	●	SBC MANHOLE
⊂	DOWN GUY	●	SIGN
🟩	E INLET	⬡	SIGNAL POLE
●	ELEC MANHOLE	∅	SPRINKER VALVE
●	FIRE HYDRANT	◎	SPRINKLER HEAD
○	GAS METER	☼	STREET LIGHT/FLOOD LIGHT
∅	GAS VALVE	☼	STREET LIGHT/PARKING LIGHT
⊣⊢	GATE	○	TREE
▦	GRATE INLET	⊖	TREE STUMP
⊕	GRATE INLET	✿	TREE–CREPE MYRTLE
∅	IRRIGATION CONTROL VALVE	✳	TREE–PINE
▯	MAIL BOX	◇○◇	UTILITY MARK
●	MANHOLE	●	WATER METER
◕	BOREHOLE	●	WATER VALVE
		◀	WATERLINE REDUCER

✿✿✿✿✿✿	BRUSH ROW
— — — —	DITCH/SWALE CENTER LINE
— — — —	EASEMENT OR BUILDING LINE
——//——	FENCE
—— --- ——	GAS LINE
o—o—o—o	GUARD RAIL
︶︶︶︶	HEDGE ROW OR TREE LINE
——^——^——	HIGH BANK
——P——P——	OVERHEAD POWER LINE
——— ———	SANITARY SEWER LINE
———]———	SANITARY FORCE MAIN
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NOTE:

1. BY GRAPHIC REPRESENTATION ONLY, THE LIMITS OF THIS PROJECT APPEAR TO BE LOCATED WITHIN ZONE X (SHADED) OF THE FEMA FIRM PANEL MAP NO. 48201C0410M. DATED REVISED OCT. 16, 2013.
2. SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF CITY OF HOUSTON BUILDING LINE ORDINANCE AS RECORDED UNDER HARRIS COUNTY CLERKS FILE NO. N253886 O.P.R.R.P.H.C.
3. THE TOPOGRAPHIC SURVEY INFORMATION SHOWN HEREON SUBSTANTIALLY CONFORMS TO THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION II SURVEY.
4. THE FIELD WORK WAS COMPLETED ON DEC. 11, 2020.

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RenChyWeng 12/14/2020

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

REN CHYUN STEVEN WENG
6491

NO.	REVISIONS	DATE	APP

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PROJECT TITLE:
NORTHLAKE FOREST SUBDIVISION
DRAINAGE IMPROVEMENTS

DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	MEDLOWE COURT	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END	SHEET NO: 8/ 12
DATE: 12/14/2020	APPROVED BY:	

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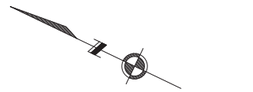

SCALE: 1" = 20'-0" FEET FOR 22"X34" SHEET
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BENCHMARK:

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ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

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LEGEND:

ASPHALT SYMBOL	PLANTER
B OR BB INLET	POWER POLE
BUSH	POWER POLE W/L.T.
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DOWN GUY	SIGNAL POLE
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ELEC MANHOLE	SPRINKLER HEAD
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GAS METER	STREET LIGHT/PARKING LIGHT
GAS VALVE	TREE
GATE	TREE STUMP
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STATE OF TEXAS, NO. 6491

STATE OF TEXAS
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PROFESSIONAL
LAND SURVEYOR

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HARRIS COUNTY ENGINEERING DEPARTMENT

HARRIS COUNTY TEXAS 1836

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PROJECT TITLE:
NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	BACH SPRINGS COURT	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END	SHEET NO: 9 / 12
DATE: 05/13/2021	APPROVED BY:	

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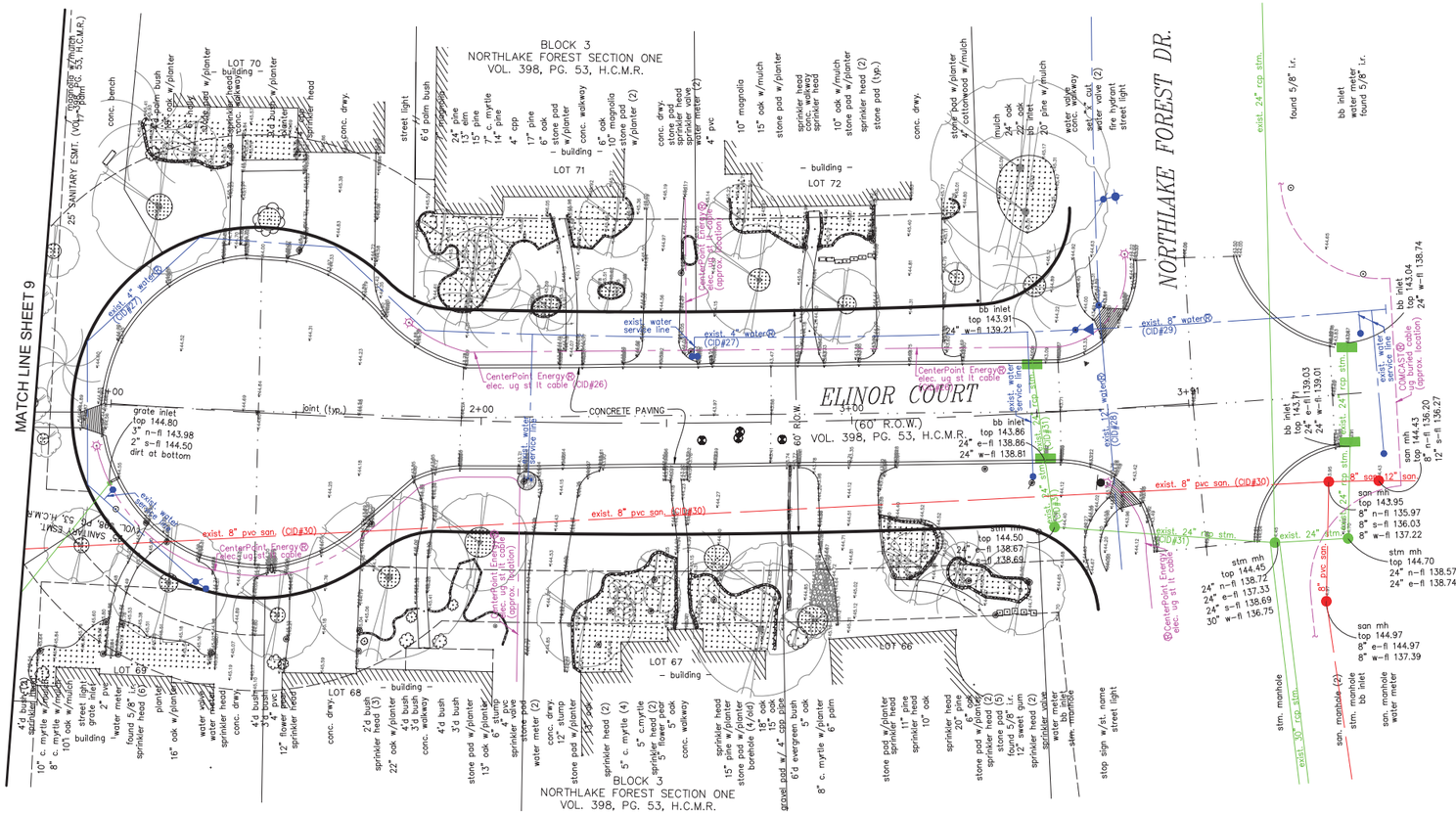

MATCH LINE SHEET 9

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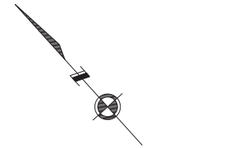

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12/14/2020

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STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL · LAND SURVEYOR

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SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END	SHEET NO: 10 / 12
DATE: 12/14/2020	APPROVED BY:	

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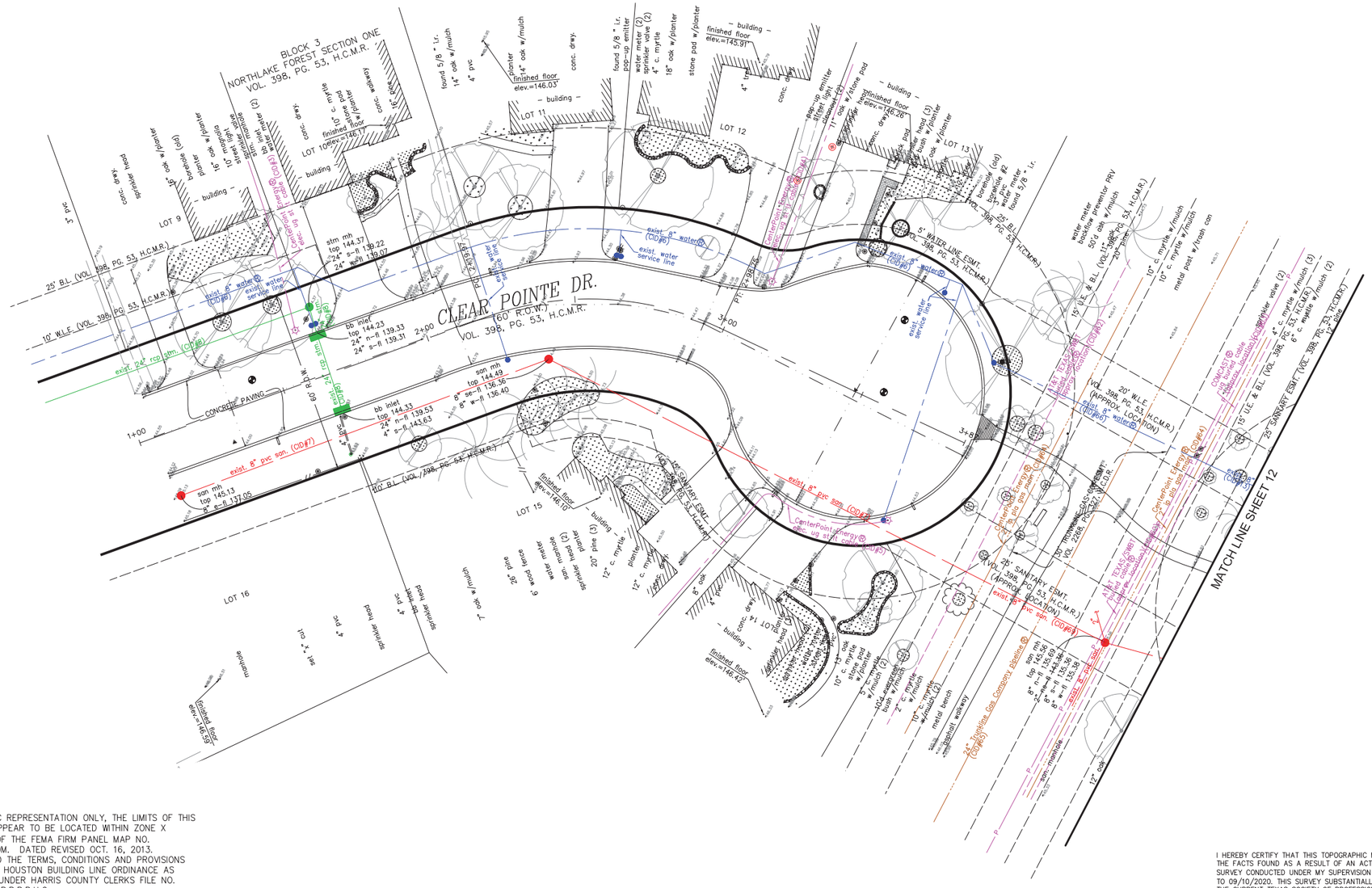

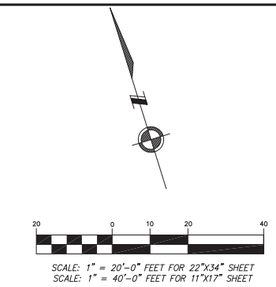

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4. THE FIELD WORK WAS COMPLETED ON DEC. 11, 2020.

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC MAP CORRECTLY REPRESENTS THE FACTS FOUND AS A RESULT OF AN ACTUAL SURVEY CONDUCTED UNDER MY SUPERVISION FROM 08/24/2020 TO 09/10/2020. THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 6, CONDITION 2 SURVEY

05/13/2021

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL LAND SURVEYOR

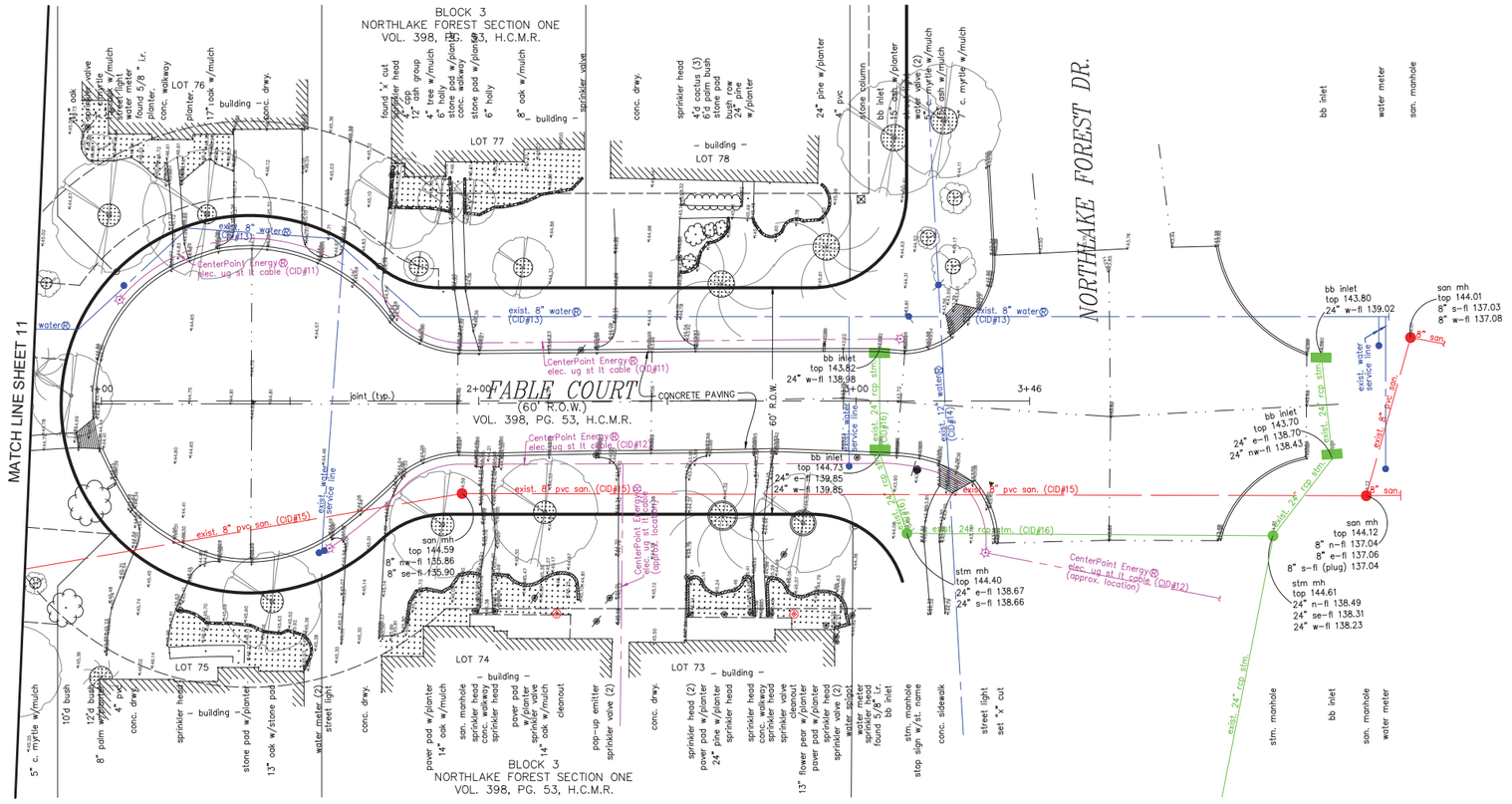
NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800
Houston, TX 77042
Tel: (713) 975-8769
Fax: (713) 975-0920
www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE:	NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS
DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY
CK'D BY: SW	CLEAR POINTE DRIVE
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END
DATE: 05/13/2021	APPROVED BY:
HCED STANDARD	SHEET NO: 11 / 12

$DATE$
$FILEA$



NOTE:

1. BY GRAPHIC REPRESENTATION ONLY, THE LIMITS OF THIS PROJECT APPEAR TO BE LOCATED WITHIN ZONE X (SHADED) OF THE FEMA FIRM PANEL MAP NO. 48201C0410M. DATED REVISED OCT. 16, 2013.
2. SUBJECT TO THE TERMS, CONDITIONS AND PROVISIONS OF CITY OF HOUSTON BUILDING LINE ORDINANCE AS RECORDED UNDER HARRIS COUNTY CLERKS FILE NO. N253886 O.P.R.R.P.H.C.
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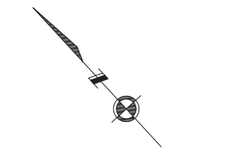
4. THE FIELD WORK WAS COMPLETED ON DEC. 11, 2020.



SCALE: 1" = 20'-0" FEET FOR 22"X34" SHEET
SCALE: 1" = 40'-0" FEET FOR 11"X17" SHEET

BENCHMARK:

FLOODPLAIN REFERENCE MARK NUMBER 110960 IS AN HCFCD ALUMINUM ROD STAMPED 110960 LOCATED ON EAST SIDE 90 DEGREE BEND IN DITCH APPROXIMATELY 0.2 MILES FROM THE INTERSECTION OF LADINO RUN STREET WEST OF WAYNEWOOD DRIVE IN KEYMAP 327Y IN THE CYPREESS CREEK WATERSHED

ELEV. 146.48 FEET NAVD 1988, 2001 ADJUSTMENT

HORIZONTAL DATUM:

ALL HORIZONTAL COORDINATES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83. THE COORDINATES & DISTANCES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY MULTIPLYING BY A SCALE FACTOR OF 0.999870017.

EXISTING UTILITY NOTE:

EXISTING UNDERGROUND UTILITY INFORMATION (TYPE, SIZE & OWNERSHIP) ARE SHOWN APPROXIMATELY BASED ON THE AVAILABLE RECORD DRAWINGS AND FIELD VERIFICATION (WHERE FEASIBLE) WITHOUT PROBING AND EXCAVATION. NO WARRANTY IS MADE AS TO THE ACCURACY OR COMPLETENESS OF UTILITY LOCATION SHOWN ON THE DRAWING. CAUTION SHOULD BE EXERCISED WHEN EXCAVATING OR BORE AND JACKING IN THE VICINITY OF UNDERGROUND UTILITIES. OWNERS OF THE UTILITIES SHOULD BE NOTIFIED PRIOR TO SUCH ACTIVITIES. CALL UTILITY COORDINATING COMMITTEE AT 713-223-4567, AT LEAST 48 HOURS PRIOR TO EXCAVATING IN THE STREET RIGHT-OF-WAY.

LEGEND:

ASPHALT SYMBOL	PLANTER
B OR BB INLET	POWER POLE
BUSH	POWER POLE W/LT.
C INLET	REFERENCE INFORMATION (FROM RECORD DRAWING)
CLEANOUT	SBC MANHOLE
COLUMN	SIGN
DOWN GUY	SIGNAL POLE
E INLET	SPRINKLER VALVE
ELEC MANHOLE	SPRINKLER HEAD
FIRE HYDRANT	STREET LIGHT/FLOOD LIGHT
GAS METER	STREET LIGHT/PARKING LIGHT
GAS VALVE	TREE
GATE	TREE STUMP
GRATE INLET	TREE-CREPE MYRTLE
GRATE INLET	TREE-PINE
IRRIGATION CONTROL VALVE	UTILITY MARK
MAIL BOX	WATER METER
MANHOLE	WATER VALVE
BOREHOLE	WATERLINE REDUCER
BRUSH ROW	
DITCH/SWALE CENTER LINE	
EASEMENT OR BUILDING LINE	
FENCE	
GAS LINE	
GUARD RAIL	
HEDGE ROW OR TREE LINE	
HIGH BANK	
OVERHEAD POWER LINE	
SANITARY SEWER LINE	
SANITARY FORCE MAIN	
STORM LINE	
TELEPHONE LINE	
UG STREET LIGHT CABLE	
WATER LINE	

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12/14/2020

REN CHYUN STEVEN WENG
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 6491

STATE OF TEXAS · REGISTERED · REN CHYUN STEVEN WENG · 6491 · PROFESSIONAL LAND SURVEYOR

ABBREVIATIONS:

E./ESMT.	EASEMENT	I.R.	IRON ROD
B.L.	BUILDING LINE	I.P.	IRON PIPE
STM.	STORM	CONC.	CONCRETE
SAN.	SANITARY	LT	LIGHT
SWR.	SEWER	UG	UNDER GROUND
N.F.I.F.	NOT FOUND IN FIELD		

NO.	REVISIONS	DATE	APP

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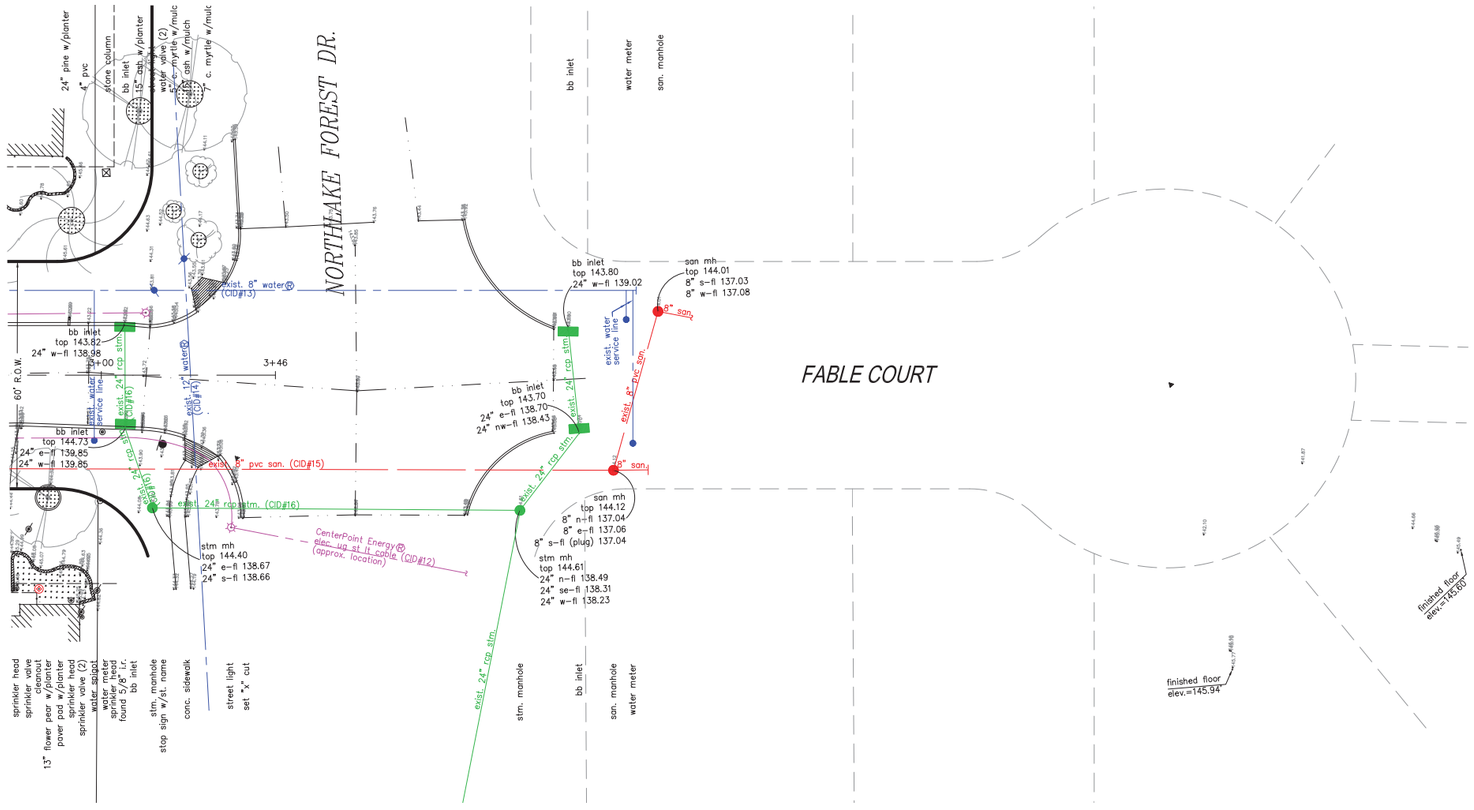
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE:
NORTHLAKE FOREST SUBDIVISION
DRAINAGE IMPROVEMENTS

DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	FABLE COURT	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'	STA. 1+00 TO END	SHEET NO: 12 / 12
DATE: 12/14/2020	APPROVED BY:	

$DATE$
$FILE$



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STATE OF TEXAS, NO. 6491

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NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

HARRIS COUNTY TEXAS 1836

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PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS		
DRAWN BY: JX	SHEET DESCRIPTION: TOPOGRAPHIC SURVEY	HCED STANDARD
CK'D BY: SW	FABLE COURT	
SCALE: FULL SIZE: 1"=20' HALF SIZE: 1"=40'		SHEET NO: 12A/ 12
DATE: 05/13/2021	APPROVED BY:	

$DATE$
$FILEA$

EXHIBIT 6

DRAINAGE AREA MAP AND HYDRAULIC DATA

LEGEND:

1X — SYSTEM 1 DRAINAGE AREA DESIGNATION INLET LETTER

2X — SYSTEM 2 DRAINAGE AREA DESIGNATION INLET LETTER

ZONE X: AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD

NORTHLAKE FOREST

EXHIBIT 6

DRAINAGE AREA MAP &
HYDRAULIC COMPUTATIONS

r.g.miller engineers

16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600

TEXAS FIRM REGISTRATION NO. F-487

DATE: 9/16/2021

Table 1: Rational Method Calculations

System 1													
							Rainfall Intensity (in/hr)			Peak Discharge (cfs)			
Area ID	Area (ac.)	Area (sq. mi.)	C	C x A	TC (min)	TC (hr)	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year	
1A	2.54	0.0040	0.44	1.12	26.78	0.45	3.43	4.88	7.14	3.84	5.45	7.98	
1B	2.60	0.0041	0.44	1.14	27.99	0.47	3.35	4.76	6.99	3.83	5.45	7.99	
1C	1.63	0.0025	0.44	0.72	28.67	0.48	3.31	4.70	6.90	2.37	3.37	4.95	
1D	3.32	0.0052	0.44	1.46	27.35	0.46	3.39	4.82	7.07	4.96	7.05	10.32	
1E	0.94	0.0015	0.44	0.41	28.90	0.48	3.29	4.68	6.87	1.36	1.94	2.84	
1F	1.89	0.0030	0.44	0.83	29.55	0.49	3.25	4.63	6.80	2.70	3.85	5.65	
1G	1.21	0.0019	0.44	0.53	26.40	0.44	3.46	4.92	7.19	1.84	2.62	3.83	
1I	2.49	0.0039	0.44	1.10	26.74	0.45	3.44	4.88	7.15	3.76	5.35	7.83	
1J	4.46	0.0070	0.44	1.96	30.37	0.51	3.20	4.56	6.70	6.28	8.94	13.15	
1K	2.22	0.0035	0.44	0.98	32.33	0.54	3.09	4.40	6.49	3.02	4.30	6.34	
1L	2.82	0.0044	0.44	1.24	32.71	0.55	3.07	4.37	6.45	3.81	5.43	8.00	
1M	2.58	0.0040	0.44	1.14	28.09	0.47	3.34	4.75	6.97	3.80	5.40	7.92	
1N	1.26	0.0020	0.44	0.55	29.60	0.49	3.25	4.62	6.79	1.80	2.56	3.76	
1O1	2.60	0.0041	0.55	1.43	30.47	0.51	3.20	4.55	6.69	4.57	6.51	9.57	
1O2	6.15	0.0096	0.55	3.38	32.56	0.54	3.08	4.39	6.47	10.41	14.83	21.87	
1P	1.90	0.0030	0.55	1.05	34.86	0.58	2.96	4.22	6.24	3.09	4.41	6.52	
System 2													
		Area					Rainfall Intensity (in/hr)			Peak Discharge (cfs)			
Area ID	Area (ac.)	(sq. mi.)	C	C x A	TC (min)	TC (hr)	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year	
2B	2.53	0.0040	0.44	1.11	26.78	0.45	3.43	4.88	7.14	3.82	5.43	7.95	
2C	3.76	0.0059	0.44	1.65	27.63	0.46	3.37	4.80	7.03	5.58	7.94	11.63	
2D	3.02	0.0047	0.44	1.33	27.15	0.45	3.41	4.84	7.09	4.53	6.43	9.43	
2E	1.76	0.0028	0.44	0.77	26.05	0.43	3.49	4.95	7.24	2.70	3.83	5.61	
2F	0.52	0.0008	0.44	0.23	23.91	0.40	3.65	5.18	7.56	0.83	1.18	1.73	
2G	2.57	0.0040	0.44	1.13	27.10	0.45	3.41	4.85	7.10	3.86	5.48	8.03	
2H	2.38	0.0037	0.44	1.05	26.65	0.44	3.44	4.89	7.16	3.60	5.12	7.50	
2I	3.53	0.0055	0.44	1.55	30.90	0.52	3.17	4.51	6.64	4.92	7.01	10.32	
2J	1.84	0.0029	0.44	0.81	30.95	0.52	3.17	4.51	6.64	2.56	3.65	5.37	
2K	5.12	0.0080	0.44	2.25	31.07	0.52	3.16	4.50	6.62	7.12	10.14	14.92	

NORTHLAKE FOREST

EXHIBIT 6
DRAINAGE AREA MAP &
HYDRAULIC COMPUTATIONS

r.g.miller engineers

16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600

TEXAS FIRM REGISTRATION NO. F-487

DATE: 9/16/2021

TABLE 1

COST ESTIMATE

CONSTRUCTION COST ESTIMATE

Project:	**Northlake Forest Subdivision Drainage Improvements**
Limit From:	**Northlake Forest Subdivision**
Limit To:	**Northlake Forest Subdivision**
Proj Length:	**1,200'**
Precinct:	**Three**
UPIN:	**19103MF14F01**
Job No:	
Prepared By:	**R. G. Miller Engineers, Inc.**
Date:	**10/07/21**

Summary of Estimate		
Stage:		**1st Submittal**
Total Amount for Roadway:		**$494,807.00**
Total Amount for XXXX:		**$0.00**
Total Amount for XXXX:		**$0.00**
Total Amount for XXXX:		**$0.00**
Grant Total Amount:		**$494,807.00**
Contingencies:	**0%**	**$0.00**
Grand Total Project:		**$494,807.00**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
A	**SITE PREPARATION AND EARTHWORK**					
1	Drawing	Project Sign	EA	2.00	$1,000.00	$2,000.00
2	104	Removing Old Concrete (Pavement W/Curb)	SY	1,236.00	$8.00	$9,888.00
3	495	Removing Old Structures - Headwalls including Wingwalls	LS	1.00	$3,000.00	$3,000.00
4	465	Remove and Dispose of Existing Concrete or Metal Pipe (All Sizes)	LF	349.00	$15.00	$5,235.00
5	495	Removing Old Structures – Inlets (All Depths)	EA	8.00	$500.00	$4,000.00
6	495	Removing Old Structures – Manholes (All Depths)	EA	2.00	$500.00	$1,000.00
7	HCFCD 2241	Care and Control of Water	LS	1.00	$20,000.00	$20,000.00
					Subtotal of Item A	**$45,123.00**
B	**PAVING**					
8	433	Cement Stabilized Sand Bedding and Backfill (8" Depth)	SY	1,485.00	$25.00	$37,125.00
9	360	Concrete Pavement (8")	SY	1,236.00	$60.00	$74,160.00
10	530	Reinforced Concrete Curb (4"x12" Lay Back Curb)	LF	818.00	$5.00	$4,090.00
					Subtotal of Item B	**$115,375.00**
C	**STORM SEWER**					
11	421	Structural Concrete (Wingwall)	CY	4.00	$1,200.00	$4,800.00
12	429	Trench Safety System (5' to 10')	LF	815.00	$1.00	$815.00
13	429	Trench Safety System (10' to 15')	LF	107.00	$2.00	$214.00
14	460	Reinforced Concrete Pipe, C76, Class III, Rubber Gasket (24")	LF	806.00	$100.00	$80,600.00
15	460	Reinforced Concrete Pipe, C76, Class III, Rubber Gasket (42")	LF	9.00	$195.00	$1,755.00
16	471	Precast Concrete Standard Manhole (5 ft ≤ Depth ≤ 10 ft)	EA	10.00	$3,500.00	$35,000.00
17	471	Precast Manhole on Concrete Box (5 ft ≤ Depth ≤ 10 ft)	EA	2.00	$2,000.00	$4,000.00
18	471	8'x8' Junction Box (5 ft ≤ Depth ≤ 10 ft)	EA	1.00	$14,500.00	$14,500.00
19	472	Type BB Inlet	EA	6.00	$3,000.00	$18,000.00
20	472	Type C-1 Inlet	EA	8.00	$4,000.00	$32,000.00
21	480	Precast RCB (6' x 4')	LF	107.00	$440.00	$47,080.00
22	480	5'x4' Restrictor for 6'x4' RCB	EA	1.00	$350.00	$350.00
					Subtotal of Item C	**$239,114.00**
E	**TRAFFIC CONTROL PLAN**					
23	671	Traffic Control - Barricades, Barriers, Barrels, Cones, and Signing	MO	5.00	$4,000.00	$20,000.00
24	671	Temporary Residential Driveways - Furnish-Install & Remove	EA	11.00	$800.00	$8,800.00
					Subtotal of Item E	**$28,800.00**

CONSTRUCTION COST ESTIMATE

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UPIN:	**19103MF14F01**
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Grant Total Amount:		**$494,807.00**
Contingencies:	**0%**	**$0.00**
Grand Total Project:		**$494,807.00**

ITEM NO.	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
F	**STORM WATER POLLUTION PREVENTION PLAN**					
25	162	Sodding for Erosion Control (Various Widths)	SY	369.00	$5.00	$1,845.00
26	719	Inlet Protection Barrier (Stage 1, With Fiber Rolls; 60% of unit cost for furnish and installation, and 40% of unit cost for removal)	EA	14.00	$70.00	$980.00
27	741	Inlet Protection Barrier (For Stage II Inlets, Gravel Bags; 60% of unit cost for furnish and installation, and 40% of unit cost for removal)	EA	20.00	$70.00	$1,400.00
28	751	SWPPP Inspection and Maintenance (Min. Bid - $3,000.)	MO	5.00	$3,000.00	$15,000.00
29	713	Reinforced Filter Fabric Barrier	LF	60.00	$2.00	$120.00
30	724	Stabilized Construction Access	SY	89.00	$25.00	$2,225.00
31	730	Concrete Truck Washout Structures (60% of unit cost for furnish and installation, and 40% of unit cost for removal)	LS	1.00	$1,000.00	$1,000.00
32	750	Rock Filter Dams	LF	25.00	$80.00	$2,000.00
33	Project Manual	TPDES General Permit No. TXR150000; Notice of Intent (NOI) is not needed ($325)	EA	1.00	$325.00	$325.00
					Subtotal of Item F	**$24,895.00**
D	**EXTRA WORK ITEMS**					
34	COH 02512	Furnish and Install Service Connection - "Long Side", Complete in Place	EA	6.00	$2,000.00	$12,000.00
35	COH 02512	Furnish and Install Service Connection - "Short Side", Complete in Place	EA	6.00	$1,750.00	$10,500.00
36	COH 02534	Sanitary Sewer Service Stub or Reconnection With or W/O Stack, Complete in Place (all sizes, dpeths)	EA	6.00	$1,500.00	$9,000.00
37	433	Cement Stabilized Sand Bedding and Backfill Material	SY	100.00	$50.00	$5,000.00
38	559	Construction Safety Fence	LF	100.00	$5.00	$500.00
39	672	Off-Duty Uniformed Police Officer - As Directed by Engineer (Min. Bid $25/HR)	HR	100.00	$25.00	$2,500.00
40	Attachment M	Additional Steel Plates (Outside of Contractor's Inventory)	EA	4.00	$500.00	$2,000.00
					Subtotal of Item D	**$41,500.00**

TABLE 2

UTILITY CONFLICT TABLE

Utility Contact/Conflict Table

Project Name: Northlake Forest Subdivision Drainage Improvements
Project Limits: Northlake Forest Subdivision
UPIN No. 19103MF14F01
Consultant Name/Project Mgr: R. G. Miller Engineers / Mark Rotz, PE

No.	Beginning Station	Ending Station	Alignment / Street Name	Utility Type	Owner	Is facility located in an easement? Yes/No	Conflict Yes/No	Probed Yes/No	SUE (QL D, QL B, or No) Yes/No	Contact Name	Address	Phone No.	Email	Describe Conflict (if applicable)	Est. Cost	Reloc. Start Date	Reloc. Com. Date
1	**Clear Pointe Drive**																
2	**0+00**	**2+87**															
3	0+60	0+60	Clear Pointe Drive	Underground Electrical	CenterPoint Energy Electrical	No	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
4	2+08	2+08	Clear Pointe Drive	Underground Electrical	CenterPoint Energy Electrical	No	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed storm sewer and pavement replacement			
5	2+35	2+75	Clear Pointe Drive	Underground Electrical	CenterPoint Energy Electrical	No	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
6	1+00	2+87	Clear Pointe Drive	Water Service Line	Northwest Harris County MUD 10	Yes (Partial)	Yes	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	In potential conflict with storm sewer at STA 1+23			
7	0+07	2+87	Clear Pointe Drive	8" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
9	**Fable Court**																
10	**0+00**	**2+46**															
11	0+05	2+14	Fable Court	Underground Electrical	CenterPoint Energy Electrical	No	Yes	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed storm sewer and pavement replacement			
12	0+55	2+46	Fable Court	Underground Electrical	CenterPoint Energy Electrical	No	Yes	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed storm sewer and pavement replacement			
13	0+00	2+46	Fable Court	8" Water	Northwest Harris County MUD 10	Yes (Partial)	Yes	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	Service line conflict with proposed storm sewer and pavement replacemnt			
14	2+25	2+25	Fable Court	12" Water	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
15	0+00	2+46	Fable Court	8" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
17	**Bach Springs Court**																
18	**0+00**	**2+60**															
19	0+00	2+45	Bach Springs Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	Yes	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed pavement replacement and storm sewer			
20	2+18	3+53	Bach Springs Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
21	0+00	2+60	Bach Springs Court	4" Water	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
22	0+00	2+60	Bach Springs Court	8" Sanitary	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
24	**Elinor Court**																
25	**0+00**	**2+91**															
26	0+00	2+77	Elinor Court	Underground Electrical	CenterPoint Energy Electrical	No	Yes	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed storm sewer			
27	0+00	2+68	Elinor Court	4" Water	Northwest Harris County MUD 10	No	Yes	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	Service line conflict with proposed storm sewer and pavement replacemnt			
28	2+68	2+68	Elinor Court	12" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
29	2+68	2+91	Elinor Court	8" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
30	0+00	2+91	Elinor Court	8" Sanitary	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
32	**Light Falls Court**																
33	**0+00**	**3+15**															
34	1+11	1+11	Light Falls Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
35	2+49	2+49	Light Falls Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
36	2+72	3+03	Light Falls Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
37	0+00	3+15	Light Falls Court	4" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
38	0+00	3+15	Light Falls Court	8" Sanitary	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			

Utility Contact/Conflict Table

Project Name: Northlake Forest Subdivision Drainage Improvements
Project Limits: Northlake Forest Subdivision
UPIN No. 19103MF14F01

40	**Medlowe Court**																
41	**0+00**	**3+55**															
42	0+04	1+56	Medlowe Court	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	Yes	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed storm sewer and pavement replacement			
43	3+09	3+41	Medlowe Court	Underground Electrical	CenterPoint Energy Electrical	No	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
44	0+00	3+55	Medlowe Court	4" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
45	3+34	3+34	Medlowe Court	12" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
46	1+58	1+58	Medlowe Court	Water Service Line	Northwest Harris County MUD 10	No	Yes	No	Yes	Jeffrey W. Vogler	778 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0043	jvogler@vs-eng.com	In potential conflict with storm sewer.			
47	3+01	3+01	Medlowe Court	Water Service Line	Northwest Harris County MUD 10	No	Yes	No	Yes	Jeffrey W. Vogler	779 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0044	jvogler@vs-eng.com	In potential conflict with storm sewer.			
48	0+00	2+28	Medlowe Court	8" Sanitary	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
48	**Corktree Knolls**																
49	**0+00**	**4+78**															
50	0+36	0+36	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
51	1+36	1+36	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	No	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
52	1+95	1+95	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
53	3+35	3+35	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
54	4+14	4+14	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
55	4+65	4+65	Corktree Knolls	Underground Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
56	0+00	1+87	Corktree Knolls	6" Water	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
57	1+87	4+78	Corktree Knolls	4" Water	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
58	3+07	3+07	Corktree Knolls	Water Service Line	Northwest Harris County MUD 10	No	Yes	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	In potential conflict with storm sewer.			
59	0+00	2+28	Corktree Knolls	8" Sanitary	Northwest Harris County MUD 10	No	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
60	**Pipeline Corridor**																
61			Pipeline Corridor	Overhead Electrical	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	N/A			
62			Pipeline Corridor	Telephone	AT&T	Yes (Partial)	No	Yes	Yes	Kathy Tinney	6500 West Loop SouthZone 1.3Bellaire, TX 77401	713-485-8128	Kathy.Tinney@att.com	N/A			
63			Pipeline Corridor	Underground Cable	Comcast	Yes (Partial)	No	Yes	Yes	Joshua Case	8590 W. Tidwell, Houston, TX 77040	713-637-5966	joshua_case@comcast.com	N/A			
64			Pipeline Corridor	2" Gas	CenterPoint Energy Gas	Yes (Partial)	No	No	Yes	Mike Brower	1111 Louisiana St, Houston, TX 77002	713-665-5665	michael.brower@centerpointenergy.com	N/A			
65			Pipeline Corridor	24" Gas	Trunkline Gas Company (Energy Transfer)	Yes (Partial)	No	No	Yes	Scott Manning	1300 Main St., Houston, TX 77002	713-989-4324	Scott.Manning@energyTransfer.com	N/A			
66			Pipeline Corridor	8" Water	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
67			Pipeline Corridor	2" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
68			Pipeline Corridor	4" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
69			Pipeline Corridor	8" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
70			Pipeline Corridor	10" Sanitary	Northwest Harris County MUD 10	Yes (Partial)	No	No	Yes	Jeffrey W. Vogler	777 North Eldridge Parkway, Suite 500, Houston TX 77079	713-782-0042	jvogler@vs-eng.com	N/A			
73	**Arlington Place Outfall**																
74			Arlington Place Outfall	Telephone	AT&T	Yes (Partial)	No	Yes	Yes	Kathy Tinney	6500 West Loop SouthZone 1.3Bellaire, TX 77401	713-485-8128	Kathy.Tinney@att.com	Conflict with proposed Outfall			
75			Arlington Place Outfall	Underground Electric	CenterPoint Energy Electrical	Yes (Partial)	No	No	Yes	Cynthia Martinez	1111 Louisiana 7th floor Houston, Texas 77002	713-207-6555	cindy.martinez@centerpointenergy.com	Conflict with proposed Outfall			
76			Arlington Place Outfall	2" Gas	CenterPoint Energy Gas	Yes (Partial)	No	No	Yes	Mike Brower	1111 Louisiana St, Houston, TX 77002	713-665-5665	michael.brower@centerpointenergy.com	N/A			

APPENDIX A

GEOTECHNICAL EXPLORATION STUDY

GEOTECHNICAL EXPLORATION STUDY
NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS
PRECINCT THREE (3) - UPIN: 19103MF14F01
HARRIS COUNTY, TEXAS

GET PROJECT NO. 20-391E

TO

R.G. MILLER ENGINEERS, INC.
HOUSTON, TEXAS

BY

GEOTECH ENGINEERING AND TESTING

SERVICING

TEXAS, LOUISIANA, NEW MEXICO, OKLAHOMA

www.geotecheng.com

NOVEMBER 2020

TEXAS BOARD OF PROFESSIONAL ENGINEERS
REGISTRATION NUMBER F-001183

GEOTECH ENGINEERING and TESTING

Geotechnical, Environmental, Construction Materials, and Forensic Engineering

ACCREDITED
CERTIFICATE #0075-01
#0075-02

R.G. Miller Engineers, Inc.
16340 Park Ten Place, Suite 350
Houston, Texas 77084

Project No. 20-391E
Report No: 1
Project Type: 9H
November 5, 2020

Attention: Mr. Mark T. Rotz, P.E.
Assistant Project Manager

GEOTECHNICAL EXPLORATION STUDY
NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS
PRECINCT THREE (3) - UPIN: 19103MF14F01
HARRIS COUNTY, TEXAS

Gentlemen:

Submitted here is Geotech Engineering and Testing (GET) geotechnical study for the Northlake Forest Subdivision Drainage Improvements, Precinct Three (3), UPIN-19103MF14F01, Harris County, Texas. The planned facilities were discussed in detail with Mr. Mark Rotz, P.E., in order to plan our study that would provide the necessary design and construction data. This study was conducted in general accordance with GET Proposal No. P20-154, Revision I, dated June 24, 2020. Authorization to proceed with this study was received through a subconsultant agreement between R.G. Miller Engineers, Inc. and GET. This study was authorized by Mr. Jack Miller, President, with R.G. Miller Engineers, Inc. on August 10, 2020.

This report presents the results of our field exploration and laboratory testing together with design recommendations for Northlake Forest Subdivision Drainage Improvements, Precinct Three (3), UPIN-19103MF14F01, Harris County, Texas.

We appreciate the opportunity to be of service. Should you have any questions or need additional assistance, please call.

Very truly yours,

GEOTECH ENGINEERING AND TESTING
TBPE Registration Number F-001183

Jack Wu, P.E.
Project Manager

STATE OF TEXAS
YUQING WU
104862
LICENSED
PROFESSIONAL ENGINEER

Jack
Yuqing Wu
11/5/20

JW/DAE

Copies Submitted: (1) Hard Copy – R.G. Miller Engineers, Inc. – Mr. Mark T. Rotz, P.E.
(1) PDF Copy Email – Mr. Mark T. Rotz, P.E.

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APPENDICES

1.0 EXECUTIVE SUMMARY

On August 10, 2020 Geotech Engineering and Testing was authorized through a subconsultant agreement between GET and R.G. Miller Engineers, Inc by Mr. Jack Miller, President of R.G. Miller Engineers, Inc, to perform a geotechnical investigation for Harris County Engineering Department's (HCED) proposed Northlake Forest Subdivision Drainage Improvement project, Precinct 3, UPIN-19103MF14F01, Harris County, Texas. A site vicinity map is presented in Plate A-1 in Appendix A. The proposed improvements include extending the storm sewer system and adding inlets at the end of cul-de-sac streets prone to flooding (Clear Point Drive, Bach Springs Court, Light Falls Court, and Corktree Knolls, Fable Lane, Elinor Court, and Medlowe Court), and upsizing two of the internal pond outlets. We understand that open-cut or auguring method will be used for the storm sewer construction.

The soil stratigraphy and groundwater conditions along the project alignment were explored by conducting four (4) soil test borings (Borings B-1 through B-4). Results of our field investigation and engineering analyses are summarized below:

1. In general, based on our field exploration and laboratory test data, the soils along the project alignment appear to be uniform. The soils stratigraphy along the project alignment is summarized as follows:

Stratum No.	Range of Depth, ft.	Soil Description*
–	0 – 0.8	CONCRETE PAVEMENT (7" and 10" in thickness)
I	0 – 2	FILL: SANDY LEAN CLAY (CL), stiff to very stiff, dark brown, reddish brown, gray, brown to light brown, with root fibers, sands
II	2 – 20	SANDY LEAN CLAY (CL), soft to very stiff, brown to light brown, gray, brownish yellow, with root fibers to 12', sands

2. Our short-term field exploration indicates that no groundwater was encountered during and at 0.5-hour after drilling in the borings.

3. We understand that open cut excavation or augering construction techniques will be used for the construction of underground utilities (storm sewers) installations. The bedding and backfill for the proposed waterlines should be constructed in accordance with the Harris County Specifications, Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material. The augering method will be used for the storm sewer, water lines and sanitary sewer lines installations and the proposed utility lines will be constructed in accordance with the Harris County Specifications, Item 431– Jacking, Boring or Tunneling Pipe.

4. In order to prevent intolerable movement and overstressing of the pipe, suitable thrust restraint should be provided. Use of restrained joints or thrust blocks is the typical methods of providing reaction for the thrust restraint.

5. The bedding and backfill for the auger pits should be conducted in accordance with the Harris County Specifications, Item No. 120 – Excavation for Channels and Other Drainage Facilities, Item No. 400 – Structural Excavation and Backfill, Item No. 430 – Construction of Underground Utilities, and Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material.

2.0 INTRODUCTION

On August 10, 2020 Geotech Engineering and Testing was authorized through a subconsultant agreement between GET and R.G. Miller Engineers, Inc by Mr. Jack Miller, President of R.G. Miller Engineers, Inc, to perform a geotechnical investigation for Harris County Engineering Department's (HCED) proposed Northlake Forest Subdivision Drainage Improvement project, Precinct 3, UPIN-19103MF14F01, Harris County, Texas. A site vicinity map is presented in Plate A-1 in Appendix A. This study was conducted in general accordance with GET Proposal No. P20-154, Revision I, dated June 24, 2020.

The proposed Northlake Forest Subdivision drainage improvements include extending the storm sewer system and adding inlets at the end of cul-de-sac streets prone to flooding (Clear Point Drive, Bach Springs Court, Light Falls Court, and Corktree Knolls, Fable Lane, Elinor Court, and Medlowe Court), and upsizing two of the internal pond outlets. Specific details of the proposed facilities are as follows:

Facility Improvements	Description
Storm Sewer Lines	We understand that the inverts of the proposed storm sewer lines will be approximately 5- to 6-ft deep. The basic construction techniques for the storm sewer system will be open cut or augering.
Outfalls	We understand that the inverts of proposed two internal pond outlets will be approximately 10-ft deep.

This report contains a description of our field and laboratory testing programs together with engineering analysis and recommendations for the design and construction of the proposed Northlake Forest Subdivision Drainage Improvements, Harris County, Texas. Our recommendations are in general accordance with the "HCED Guidelines for Consultants Performing Geotechnical Investigations" dated January 01, 2011 (Ref. 1) and "Regulations of Harris County Texas for the Approval and Acceptance of Infrastructure" dated July 09, 2019 (Ref. 2). The scope of our work would not be in accordance with Harris County Flood Control District (HCFCD) since we did not disturb any HCFCD facility. Furthermore, slope stability and erosion study are out of scope of our work.

3.0 PURPOSE & SCOPE OF WORK

The purpose of our study was to evaluate the subsoils and groundwater conditions and use the information obtained to develop recommendations for design and construction of the proposed Northlake Forest Subdivision Drainage Improvements.

The proposed Northlake Forest Subdivision Drainage Improvements include extending the storm sewer system and adding inlets at the end of cul-de-sac streets prone to flooding (Clear Point Drive, Bach Springs Court, Light Falls Court, and Corktree Knolls Fable Lane, Elinor Court, and Medlowe Court), and upsizing two of the internal pond outlets. Specific details of the proposed facilities are as follows:

Facility Improvements	Description
Storm Sewer Lines	We understand that the inverts of the proposed storm sewer lines will be approximately 5- to 6-ft deep. The basic construction techniques for the storm sewer system will be open cut or augering.

Outfalls	We understand that the inverts of proposed two internal pond outlets will be approximately 10-ft deep.

Our scope of work consists of field exploration, laboratory testing, engineering analysis, and recommendations for design and construction of the proposed underground utilities and outfalls. Our scope of work is summarized as follows:

- Field Exploration was conducted by four (4) soil borings to the completion depths of 15-ft and 20-ft, which consist of one (1) boring at each outfall, one boring close to a tie in point for the storm sewer, and one boring at a cul-de-sac. It should be noted that the number of borings and their locations were recommended by HCED. Soil samples were obtained continuously at boring locations from the ground surface to the completion depths of the borings. The cohesive soils were sampled in general accordance with the ASTM D 1587, using a Shelby Tube sampler. Cohesionless soils were generally sampled with a split-spoon sampler driven in general accordance with the Standard Penetration Test (SPT), ASTM D 1586.

- Laboratory Testing included of natural moisture content tests (ASTM D 4643), percent finer than the No. 200 sieve tests (ASTM D 1140), and Atterberg limit determinations (ASTM D 4318, Method B), hand penetrometer tests, unconfined compressive strength tests (ASTM D 2166) etc.

- Engineering analysis and recommendations consisted of design and construction for Underground Utilities (Open-Trench Method, trenchless method, dewatering control, loads imposed on buried pipes, backfilling, excavation, OSHA soil classifications, and lateral earth pressures) and Outfall structures (Bedding and Backfilling).

4.0 SITE EXPLORATION

4.1 Site Conditions

The project alignments are generally flat and exhibits a topographic variation of less than three-ft. In general, the vicinity of the project alignments consists of residential facilities.

4.2 Site Geology

A review of Geologic Map of Texas (Ref. 3) indicates that the project site is geologically located on The Lissie Formation. The geologic character of each soil type (Ref. 4) is described below:

The Lissie Formation is unconformably contained between the Goliad Sand and the overlying Beaumont Clay. The Lissie Formation crops out in a band parallel to the coast and is about 30 miles wide from the Sabine River to the Rio Grande. The sediments of the Lissie Formation in the outcrop are partly continental deposits laid down on flood plains and partly as delta sands, silts, and mud at the mouth of rivers. The Lissie Formation hosts flatter, gently undulating topography, and has much lower-dipping beds than the Goliad Sand.

Lissie Formation sediments consist of reddish, orange, and gray fine- to coarse-grained, crossbedded sands. Over most of Brooks and Hidalgo counties to the south, the Lissie Formation is either eroded or covered by sand dunes. Thin beds of the Lissie Formation crop out over a small area in southern Hidalgo and northern Willacy counties. The sands in the Lissie Formation are fine-grained and the formation contains relatively less conglomerates than the underlying Goliad Sand. Caliche beds often mark the base of the Lissie Formation.

5.0 FIELD WORK

5.1 Pavement Coring

The existing pavement was only cored at Borings B-1 and B-2 prior to drilling and sampling. The results of pavement coring show that the existing pavements generally consist of concrete pavement. The pavement thicknesses at Borings B-1 and B-2 are about 10-inch and 7-inch, respectively. The pavement core locations were patched with Quickcrete.

5.2 Drilling and Sampling

The soil conditions were explored by conducting four (4) borings (B-1 through B-4) to the completion depths of 15-ft and 20-ft located approximately as shown on Plate A-2. The schedule of borings is as follows:

Facility	Borings [1]	Depth, ft
Storm Sewer	B-1 and B-2	15
Outfalls	B-3 and B-4	20

Note: 1. See Plan of Borings, Plate A-2.

Soil samples were obtained continuously at each boring location from the ground surface to the completion depths of 15-ft and 20-ft. The cohesive soils were sampled in general accordance with ASTM D 1587.

Some cohesive soils were generally sampled with a split-spoon sampler driven in general accordance with the Standard Penetration Test (SPT), ASTM D 1586. This test is conducted by recording the number of blows required for a 140-pound weight falling 30 inches to drive the sampler 12 inches into the soil. Driving resistance for the SPT, expressed as blows per foot of sampler resistance (N), is tabulated on the boring logs.

Soil samples were examined and classified in the field. This data, together with a classification of the soils encountered and strata limits, are presented on the soil stratigraphy profile, Plate A-3 and the logs of borings are presented on Plates A-4 through A-7 in Appendix A. A key to log terms and symbols is shown on Plate A-8 in Appendix A.

Depth to groundwater will be important for design and construction of the proposed underground utility lines. For this reason, borings were drilled dry and the depth at which groundwater was first encountered was recorded. Water level observations made during and 0.5-hr after drilling in the borehole are indicated at the bottom portion of the individual logs. The boreholes were grouted with non-shrink grout using tremie method after the completion of the field work.

Pictures of the project site were taken during our field explorations. These pictures are presented on cover page and Appendix B.

6.0 LABORATORY TESTING

6.1 General

Soil classifications and shear strengths were further evaluated by laboratory tests on representative samples of the major strata. The laboratory tests were performed in general accordance with ASTM Standards. Specifically, ASTM D 2487 is used for classification of soils for engineering purposes. The laboratory test results are presented in Appendix C.

6.2 Classification Tests

As an aid to visual soil classifications, physical properties of the soils were evaluated by classification tests. The tests were conducted in general accordance with ASTM Standards. These tests consisted of natural moisture content tests (ASTM D 4643), percent finer than the No. 200 sieve tests (ASTM D 1140), and Atterberg limit determinations (ASTM D 4318, Method B). Similarity of these properties is indicative of uniform strength and compressibility characteristics for soils of essentially the same geological origin. Results of these tests are tabulated on the boring logs at respective sample depths.

6.3 Strength Tests

Undrained shear strengths of the cohesive soils, measured in the field, were verified by calibrated hand penetrometer tests, unconfined compressive strength tests (ASTM D 2166) and torvane tests. Natural water content and dry unit weight were determined for each unconfined compressive strength test. These test results are also presented on the boring logs.

6.4 Soil Sample Storage

Soil samples tested or not tested in the laboratory will be stored for a period of three-month subsequent to submittal of the final report. The samples will be discarded after this period, unless we are instructed otherwise.

7.0 SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

7.1 Soil Stratigraphy

Field and laboratory test data indicate the soil stratigraphy along the project alignment appears to be variable. Details of subsoil conditions at each boring location along the project alignment are presented on the respective boring logs. In general, the soils can be grouped into two (2) major strata with depth limits and characteristics as follows:

Stratum No.	Range of Depth, ft.	Soil Description*
–	0 – 0.8	CONCRETE PAVEMENT (7” and 10” in thickness)
I	0 – 2.0	FILL: SANDY LEAN CLAY (CL), stiff to very stiff, dark brown, reddish brown, gray, brown to light brown, with root fibers, sands
II	2 – 20	SANDY LEAN CLAY (CL), soft to very stiff, brown to light brown, gray, brownish yellow, with root fibers to 12’, sands

*Classification in accordance with the Unified Soil Classification System (ASTM D 2487)

7.2 Soil Properties

Soil strength and index properties and how they relate to foundation design is summarized below:

Stratum No.	Soil Type	SPT (N)	PI (s)	Soil Expansivity	Soil shear Strength, tsf
I	Fill: Sandy Lean Clay (CL)	–	8 – 19	Non-Expansive	0.56 – 1.50
II	Sandy Lean Clay (CL)	16 – 24	8 – 21	Non- to Moderately Expansive	0.15 – 1.50

Legend: PI = Plasticity Index
SPT = Standard Penetration Test

7.3 Water-Level Measurements

The soil borings were dry augered to evaluate the presence of perched or free-water conditions. The level where free water was encountered in the open boreholes during the time of our field exploration is shown on the boring logs. Our groundwater measurements are as follows:

Boring No.	Groundwater Depth, ft. at the Time of Drilling	Groundwater Depth, ft. at 0.5 Hour Later
B-1 through B-4	Dry	Dry

Fluctuations in groundwater generally occur as a function of seasonal moisture variation, temperature, groundwater withdrawal and future construction activities that may alter the surface drainage and subdrainage characteristics of this project alignment.

An accurate evaluation of the hydrostatic water table in the relatively impermeable clay and low permeable silts/sands requires long term observation of monitoring wells and/or piezometers. It is not possible to accurately predict the pressure and/or level of groundwater that might occur based upon short-term site exploration. The installation of piezometers/monitoring wells was beyond the scope of our study. We recommend that the groundwater level be verified just before construction if any excavations such as construction of underground utilities, etc. are planned.

We recommend that GET be immediately notified if a noticeable change in groundwater occurs from that mentioned in our report. We would be pleased to evaluate the effect of any groundwater changes on our design and construction sections of this report.

8.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

8.1 Underground Utilities

8.1.1 General

We understand that underground utilities installation along the alignments will include extending the storm sewer system and adding inlets at the end of cul-de-sac streets prone to flooding (Clear Point Drive, Bach Springs Court, Light Falls Court, and Corktree Knolls Fable Lane, Elinor Court, and Medlowe Court), and upsizing two of the internal pond outlets.

Furnished information indicated that the existing storm sewer system consists of reinforced concrete pipes with diameters ranging from 24- to 48-inch. This storm sewer system will be extended to improve drainage of Northlake Forest Subdivision. The invert depth of the extended storm sewer systems will be approximately 5- to 6-ft deep below the existing grades.

Furthermore, Open-trench or Augering method will be used for the underground utility installations. We understand that the proposed underground utilities will be constructed in accordance with the Harris County Specifications (Ref. 5).

8.1.2 Open-Trench Method

The bedding and backfill for the proposed storm sewer lines should be constructed in accordance with the Harris County Specifications, Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material. Trenches for the proposed storm sewer lines must have a width below the top of the pipe of not less than the outside diameter of the pipe plus 18-inches and shall be wide enough to permit making up the joints. Sufficient space should be provided between shoring cross braces to permit equipment operations and handling of forms, pipe embedment and backfill, and other materials.

The results of our field exploration and laboratory testing indicate that unsatisfactory soils for excavation, such as soft clay soils, exist at various depths in the borings along the project alignments. A summary of the unsatisfactory soil locations and depths are as follows:

Boring(s)	Depth Range, ft.
B-3	12 to 16

If these conditions are encountered during the time of construction, suitable groundwater control measures should be implemented. Furthermore, the contractor may have to over excavate an additional 1-ft and remove unstable or unsuitable materials with approval by geotechnical engineer, then place an equal depth of cement stabilization sand.

Due to potential variability of the on-site soils, unstable trench conditions may still exist in the areas where we did not conduct our borings. If these conditions are encountered during the time of construction, a stable trench should be provided to allow proper bedding and installation.

Sand backfill used in the cement-stabilized sand and sand backfill sections should be free of clay lumps, organic materials, or other deleterious substances, and should have a PI less than 4 for the cement-stabilized sand and less than 7 for the sand backfill section, and not more than 15% passing the No. 200 sieve. Cement stabilized sand should conform to the Harris County Specifications, Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material.

Our recommendation on trench safety at the project site does not address the effects of excavations on existing buildings/facilities at the project site. This study was outside the scope of our work.

8.1.3 Trenchless Method (Augering) pen-Trench Method

We understand that augering method may be used for the underground utility installations along the proposed alignment. Furthermore, the augering method will be used for the storm sewer, water lines and sanitary sewer lines installations and the proposed utility lines will be constructed in accordance with the Harris County Specifications, Item 431– Jacking, Boring or Tunneling Pipe.

Diameter of auger hole should not exceed pipe bell diameter plus 2-inches. The receiving pit distance should conform to the aforementioned Harris County Specifications, Item 431– Jacking, Boring or Tunneling Pipe. A minimum spacing of 6-inch should be provided between the pipe and walls of bore pit. The maximum allowable width of pit shall be 5-ft unless approved by Engineers. Width of pit at surface shall not be less than the pit width at the bottom.

8.1.4 Loads Imposed on Buried Pipes

8.1.4.1 General

The loads on an underground pipe depend principally upon the weight of overburden soils, roadway and loads due to surcharges. For design of concrete pressure pipe, linear load due to overburden can be determined based on the design tables and charts presented in the "AWWA Manual of Water Supply Practices Concrete Pressure Pipe (AWWA M9)" developed by the American Concrete Pipe Association. Overburden pressure for the buried pipes at the project alignments are estimated by using the soil density (γ) and the height of the soil over the pipe (H).

8.1.4.2 Loads Due to Overburden Pressure

Overburden or prism load for buried pipes is given by the following equation:

$$P = \gamma H$$

Where: P = Load due to weight of soils at depth, psf
γ = Total Unit weight of soil, 125 pcf
H = Height of the soil over the pipe, ft

Loadings per linear foot of pipe:

$$W_e = C_d\, \gamma (B_d)^2 \text{ (Marston Equation)}$$

$$C_d = \frac{1 - e^{-2ku'\left(\frac{H}{B_d}\right)}}{2ku'}$$

Where: W_e = Load, pounds per linear foot (lb/ft)
B_d = Trench width (ft)
C_d = Load Coefficient
k = Friction angle between backfill and soil
u' = Coefficient of friction between fill material and sides of trench
ku' = for sand = 0.165
for clay = 0.130
for saturated clay = 0.110

8.1.4.3 Piping System Thrust Restraint

Fittings on underground pipes are subject to thrust forces inherited from the fluid pressure in the pipe and are directly proportional to the fluid pressure. Unbalance thrust forces will be developed in pressure pipelines due to changes in direction, cross-sectional areas, or when the pipe is terminated. These forces may cause joints to disengage if not adequately restrained. There will be a slight loss of head due to turbulence friction in bends of the pipes. This loss will cause a pressure change across the bend, but it is usually small enough to be neglected.

The thrust force may require more reaction than is available just from the pipe bearing against the backfill. In order to prevent intolerable movement and overstressing of the pipe, suitable buttressing should be provided. In general, thrust blocks, restrained joints and tie rods are common methods of providing reaction for the thrust restraint design. The thrust restraint design provisions described in this section are based on the American Water Works Association Manual M9 (1996)-Concrete Pressure Pipe.

The force diagram shown on Plate D-3 illustrates the thrust force generated by flow at a bend in the pipe. The equations for computing this thrust force are also given on this plate. The values of thrust force for a surge pressure of 50 psi were computed for a bend angle of 90 degrees. Results are presented on Plate D-3.

Once the size of the thrust is determined, a thrust block size can be calculated based on the bearing capacity of the soil. The area of block required is equal to the thrust force (lb) divided by the safe bearing value of the soil (psf). In cohesive soils, the safe bearing value is equal to 2/3 of the average shear strength of the soil adjacent to the block which includes a factor of safety of 3. We believe that a factor of safety of 3 is appropriate in order to limit deflections required to mobilize the passive resistance within tolerable values.

For granular soil encountered at this site, a safe bearing value for thrust blocks can be taken as 90% of the effective overburden pressure at the mid height of the thrust block which includes a factor of safety of 3. The effective overburden pressure can be calculated based on the effective unit weight of the soil above the mid-height of the thrust block.

Geotechnical design parameters for designing the necessary buttressing are as follows:

γ : = Wet unit weight of soil − above water level : 125 pcf
Submerged unit weight of soil − below water level : 60 pcf
c : = Cohesion = 1000 psf (for clay)
ϕ : = Angle of internal friction = 30 degrees (for sand)

8.1.5 Groundwater Control

8.1.5.1 General

We understand that the invert depths for the underground utilities will be approximately 5- to 6-ft deep below the existing grades. Our field exploration along the project alignment indicates that groundwater was not encountered in Borings B-1 through B-4 during and 0.5 hour after drilling. Hence, groundwater dewatering may not be required. However, fluctuations in groundwater can occur as a function of seasonal moisture variation. Groundwater control recommendations are presented in the following report sections.

8.1.5.2 Dewatering Technique

In the event that groundwater is encountered during construction, it is our opinion that groundwater should be lowered to a depth of at least three-ft below the deepest excavation grade in order to provide dry working conditions and firm bedding. Any minor water inflow in cohesive soil layers can probably be removed using a sump-pump or a trench sump-pump immediately. Wellpoint system can be used in the area where sands are present.

Piezometers may be installed near the excavation area to evaluate groundwater levels in the area prior to construction. The piezometers should be left in place during construction to monitor groundwater levels and effectiveness of the dewatering system.

Design of a wellpoint system should consider the amount of groundwater to be lowered and the permeability of the affected soils. The selection and proper implementation of an effective groundwater control system is the responsibility of the contractor. The design of groundwater and surface water should be in accordance with the Harris County Specifications, Item No. 436 – Well Pointing.

8.1.6 Backfilling

Sand backfill used in the cement-stabilized sand and sand backfill sections should be free of clay lumps, organic materials, or other deleterious substances, and should have a PI less than 4 for cement-stabilized sand and less than 7 for the sand backfill section, and not more than 15% passing the No. 200 sieve. Cement stabilized sand should conform to the Harris County Specifications, Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material.

Random fill for zones above pipe bedding should be placed in loose lifts not exceeding eight-inches and compacted to 100% of the natural soil density. This value will be on the order of 95% of standard density (ASTM D 698) at a moisture content between optimum and +3% of optimum. These values should be verified by testing during construction.

8.1.7 OSHA Soil Classifications

The subsoils can be classified in accordance with Occupational Safety and Health Administration (OSHA) Standards, dated October 31, 1989 of the Federal Register. OSHA classification system categorizes the soil and rock in four types based on shear strength and stability. The description of four (4) types in classification system is summarized in the Appendix D.

Based on our geotechnical exploration and laboratory test results, details of soil classifications at each boring are summarized in the Trench Safety Report, presented in Appendix D.

8.1.8 Excavations

An excavation or trench which is five-ft or deeper must be protected by sheeting/bracing shoring or sloped. Based on soil strength data, temporary (less than 24 hours) open-trenched, non-surcharged, and unsupported excavations should be made on slopes of flatter than 1.5 (h):1 (v). Vertical cuts can be constructed, provided shoring and bracing are used for the excavation wall stability. Benched excavation can also be used with average slopes of about 1(h):1(v) and steps should not be higher than five-ft. In all cases, excavations should conform to OSHA guidelines. Flatter slopes may have to be used if large amounts of sand need to be excavated for deep utility installations. Specifications should require that no water be allowed to pond in the excavations. The surface slopes should be protected from deterioration and weathering if they are to be left open for more than 24 hours.

Excavations should be performed with equipment capable of providing a relatively clean bearing area. Excavation equipment should not disturb the soil beneath the design excavation bottom and should not leave large amounts of loose soil in the excavation.

The bearing surface should be protected against disturbance and deterioration by completing the backfilling operations as quickly as possible. The excavation bottom should be properly sloped to allow any water infiltrating into the excavation to pond at a convenient location along the edge of the excavation. This water should be pumped out as soon as possible. Water should not be allowed to stand on the bearing area.

8.1.9 Lateral Earth Pressures

In the event that open excavations are not used, the proposed storm sewer can be installed using trench sheeting. The sheeting can be constructed in the form of cantilever sheeting or with bracing. Lateral earth pressures for each method used are summarized in Appendix D. The trenching and shoring operations should follow OSHA Standards. We recommend that a geotechnical engineer monitor all phases of trench excavation and bracing to assure trench safety.

8.2 Outfall Structures

8.2.1 General

Furnished information indicated that that two existing internal pond outlets consists of reinforced concrete pipes with diameters ranging from 36- to 48-inch. We understand these two internal pond outlets will be upsized to improve drainage of Northlake Forest Subdivision. The inverts of proposed internal pond outlets will be approximately 10-ft deep. In general, sandy lean clay (CL) soils are present at the proposed internal pond outlet locations. Excavation and groundwater control for construction of this structure should be in accordance with our recommendations provided in construction consideration section of this report.

8.2.2 Bedding and Backfilling

The reinforced concrete pipes should be placed on a well prepared, properly compacted working surface. The drainage outfall pipes can be supported on the natural soils provided subgrade is protected from construction disturbances and surface water is not allowed to pond within the excavation. In the event that potentially wet and unstable cohesionless soils are encountered during construction, these soils need to be stabilized by lowering the groundwater, excavate and replaced with cement stabilized sands. The excavation, trenching, foundation, embedment, and backfilling for the proposed box culvert shall be in accordance with the Harris County Specifications, Item No. 120 – Excavation for Channels and Other Drainage Facilities, Item No. 400 – Structural Excavation and Backfill, Item No. 430 – Construction of Underground Utilities, and Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material.

Sand used in the cement-stabilized sand backfill sections should be free of clay lumps, organic materials, or other deleterious substances, and should have a PI less than 4 for the cement-stabilized sand, and not more than 15% passing the No. 200 sieve. Cement stabilized sand should conform to the Harris County Specifications, Item No. 433 – Cement Stabilized Sand, Bedding and Backfilling material.

9.0 CONSTRUCTION CONSIDERATIONS

9.1 Surface Water Drainage

In order to minimize ponding of surface water, site drainage should be established early in project construction so that this condition will be controlled.

9.2 Site Preparation

Portions of the project alignment has the potential for construction problems related to the near surface layer of high permeable sandy lean clay fill soils. These permeable surficial soils are underlain by low permeable sandy lean clay soils. Thus, due to poor site drainage, wet season or site geohydrology, water may pond on the clays and creating a "perched water table condition." The surficial high permeable sandy lean clay fill soils become extremely soft when wet, and must be stabilized, aerated, or replaced. Site preparation should be conducted in accordance with Harris County Specifications, Items 102 and 104. In general, subgrade preparation should be as follows:

1. The requirement for removal of any existing paving, and subsoil materials will depend on final grades and other alignment information. In general, remove all vegetation, tree roots, organic topsoils, existing foundations, paved areas and any undesirable materials from the construction area. Tree trunks under the pavement should be removed to a root size of less than 0.5-inches. We recommend that the stripping depth be evaluated at the time of construction by a soil technician.

2. The subgrade areas should then be proofrolled with a loaded dump truck or similar pneumatic-tired equipment with loads ranging from 25- to 50-tons. The proofrolling serves to compact surficial soils and to detect any soft or loose zones. Any soils deflecting excessively under moving loads should be undercut to firm soils and recompacted. Any subgrade stabilization should be conducted after site proofrolling is completed and approved by the geotechnical engineer. The proofrolling operations should be observed by an experienced geotechnician.

3. The subgrade soils should be stabilized, using lime based on the Harris County Specification, Item No. 220. Use 4% lime by dry weight to stabilize the subgrade soils. This results in application rates of 24 pounds of lime, per square yard per eight-inch of compacted thickness. Harris County Specification Item 223 can be used as a procedural guide for placing, mixing and compacting the lime stabilizer and the soils.

4. The fill soils should consist of lean clays with a liquid limit not exceeding 45 and PI between 12 to 20 (Harris County Specification, Item 130). The earthwork contractor should not blend cohesive soils and granular soils to achieve the required plasticity index. These soils should be placed in loose lifts not exceeding eight-inches and compacted to at least 95% of maximum standard Proctor density (ASTM D 698) at moisture content between optimum and +3%.

5. In cut areas, the soils should be excavated to grade and the surficial soil proofrolled and scarified to a minimum depth of six-inches and recompacted to the previously mentioned density and moisture content.

6. Positive site drainage should be developed at the beginning of the project to limit construction difficulties with wet surface soils.

9.3 Suitability of On-Site Soils for Use as Fill

9.3.1 General

Fill requirements should be in accordance with the Harris County Specification, Item 130 "Borrow" and Item 132 "Embankment". The on-site soils can be used as fill materials as described in the following report sections.

9.3.2 Select Backfill

This is the type of fill that can be used for the structures or utilities. These soils should consist of lean clays with plasticity indices between 7 and 20 and amount of passing No. 200 sieve greater than 50 percent.

9.3.3 Random Backfill

This type of fill does not meet the Atterberg limit requirements for select structural fill. This fill should consist of lean clays or fat clays. They can be used for the utilities after treatment.

9.3.4 General Fill

This type of fill consists of silts or organic clay. These soils are moisture sensitive and are difficult to compact in a wet condition (they may pump). Furthermore, these soils can erode easily. Their use is not recommended as backfill materials. They can be used for site grading and in unimproved areas.

9.3.5 On-Site Fill Soil Classification

The on-site soils can be used as fill materials as described below:

Stratum No.(1)	Soil Type	Use as Fill: Select Backfill	Use as Fill: Random Backfill	Use as Fill: General Fill	Notes
I	Fill: Sandy Lean Clay (CL)	–	✓	✓	2, 3
II	Sandy Lean Clay (CL)	–	✓	✓	2, 3

Notes:
1. See soil stratigraphy and design conditions sections of this report for strata description.
2. All fill soils should be free of organics, roots, etc.
3. These soils, once lime modified (4% by dry weight), can be used as select structural fill.

9.4 Earthwork

Difficult access and workability problems can occur in the surficial sandy lean clay fill soils due to poor site drainage, wet season, or site geohydrology. Should this condition develop, drying of the soils for support of the structures may be improved by the addition of 4% lime by dry weight. The application rate corresponding to this additive amount would be approximately 24 pounds per square yard for each eight-inch of compacted thickness.

Harris County Standard Specifications, Item 220 – Lime Stabilized Subgrade and Item 224 – Quicklime (Stabilization) shall be used as procedural guides for placing, mixing, and compacting lime stabilizer and the soils.

Our recommendations on subgrade stabilization are preliminary. The actual depth and type of stabilization should be determined in the field at the time of construction just after site stripping and proofrolling. The required amount of lime for stabilization should be determined by ASTM C 977 Method. Furthermore, the type and amount of the stabilizer may vary depending on the final grade elevation and the soil type encountered.

9.5 Construction Surveillance

Construction surveillance and quality control tests should be planned to verify materials and placement in accordance with the specifications. The recommendations presented in this report were based on a discrete number of soil test borings. Soil type and properties may vary across the site. As a part of quality control, if this condition is noted during the construction, we can then evaluate and revise the design and construction to minimize construction delays. We recommend the following quality control procedures be followed by a qualified engineer or technician during the construction of the facility:

- Monitor all phases of trench safety (if trench is used).
- Observe the site stripping and proofrolling.
- Verify the type, depth and amount of stabilizer.
- Verify the compaction of subgrade soils and backfill soils.
- Evaluate the quality of fill and monitor the fill compaction for all lifts.
- Monitor and test the excavations for strength, cleanness, depth, size, etc.
- Observe all excavation operations.
- Monitor concrete placement, conduct slump tests and make concrete cylinders.

It is the responsibility of the client to notify GET when each phase of the construction is taking place so that proper quality control and procedures are implemented.

10.0 RECOMMENDED ADDITIONAL STUDIES

This report has been on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. We recommend that GET be retained to review the plans and specifications to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted as intended.

11.0 STANDARD OF CARE

The recommendations described herein were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical engineering profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty or guarantee, expressed or implied, is made other than the work was performed in a proper and workmanlike manner.

12.0 REPORT DISTRIBUTION

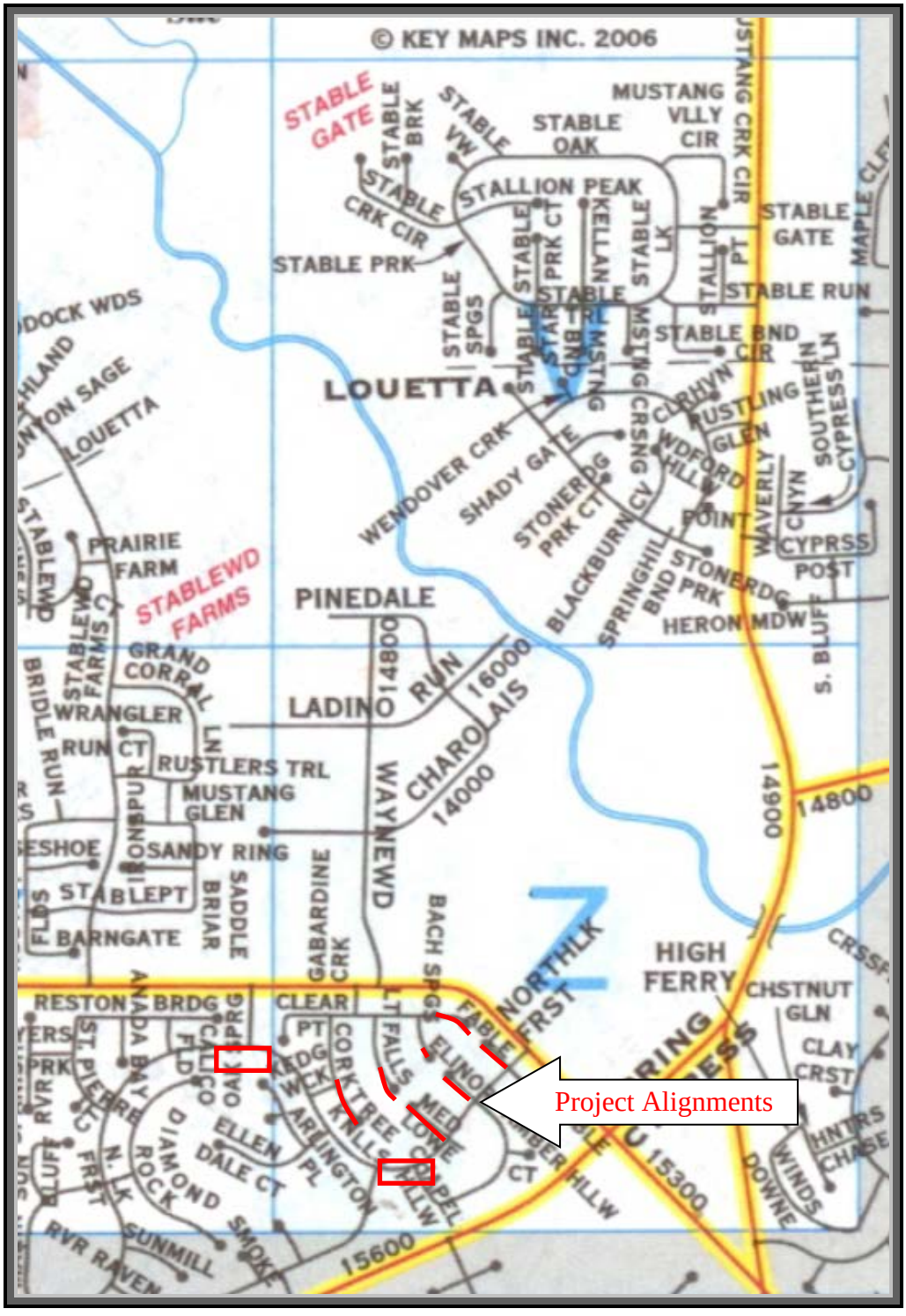
This report was prepared for the sole and exclusive use by our client (R.G. Miller Engineers, Inc.) and owner (Harris County) as well as associated construction contractors, based on specific and limited objectives. All reports, boring logs, field data, laboratory test results, maps and other documents prepared by GET as instruments of service shall remain the property of GET. GET assumes no responsibility or obligation for the unauthorized use of this report by other parties and for purposes beyond the stated project objectives and work limitations.

13.0 REFERENCES

1. "HCED Guidelines for Consultants Performing Geotechnical Investigations" dated January 01, 2011.
2. "Regulations of Harris County Texas for the Approval and Acceptance of Infrastructure.", dated July 09, 2019.
3. Bureau of Economic Geology, 1992, Geologic Map of Texas: University of Texas at Austin, Virgil E. Barnes, project supervisor, Hartmann, B. M., and D. F. Scranton, cartography, scale 1:500,000.
4. Robert E. Mace, Sarah C. Davidson, Edward S. Angle, and William F. Mullican, III, 2006. Aquifers of the Gulf Coast of Texas, Texas Water Development Board, Report No. 365, pp. 304.
5. "Specifications for the Construction and Maintenance of Roads and Bridges within Harris County", Public Infrastructure Department Engineering Division, Harris County, September 2017.

APPENDIX A

- **Site Vicinity Map**
- **Plan of Borings**
- **Soil Stratigraphy Profile**
- **Logs of Boring**
- **Key to Log Terms and Symbols**

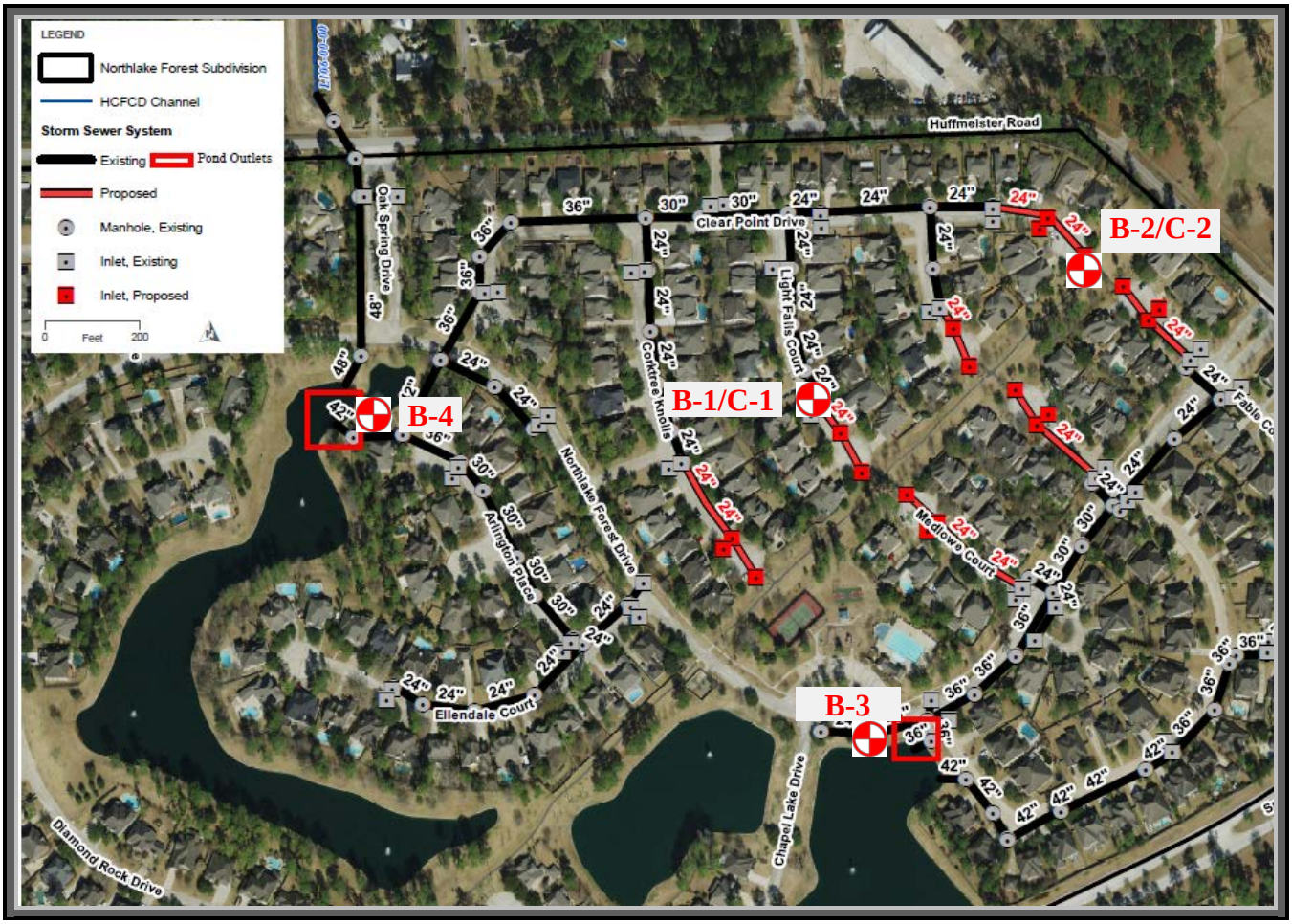


SITE VICINITY MAP

NORTH

PROJECT: Geotechnical Exploration Study for Northlake Forest Subdivision Drainage Improvements UPIN 19103MF14F01
Precinct 3, Harris County, Texas

SCALE: No to Scale	DATE: OCTOBER 2020	PROJECT NO.: 20-391E

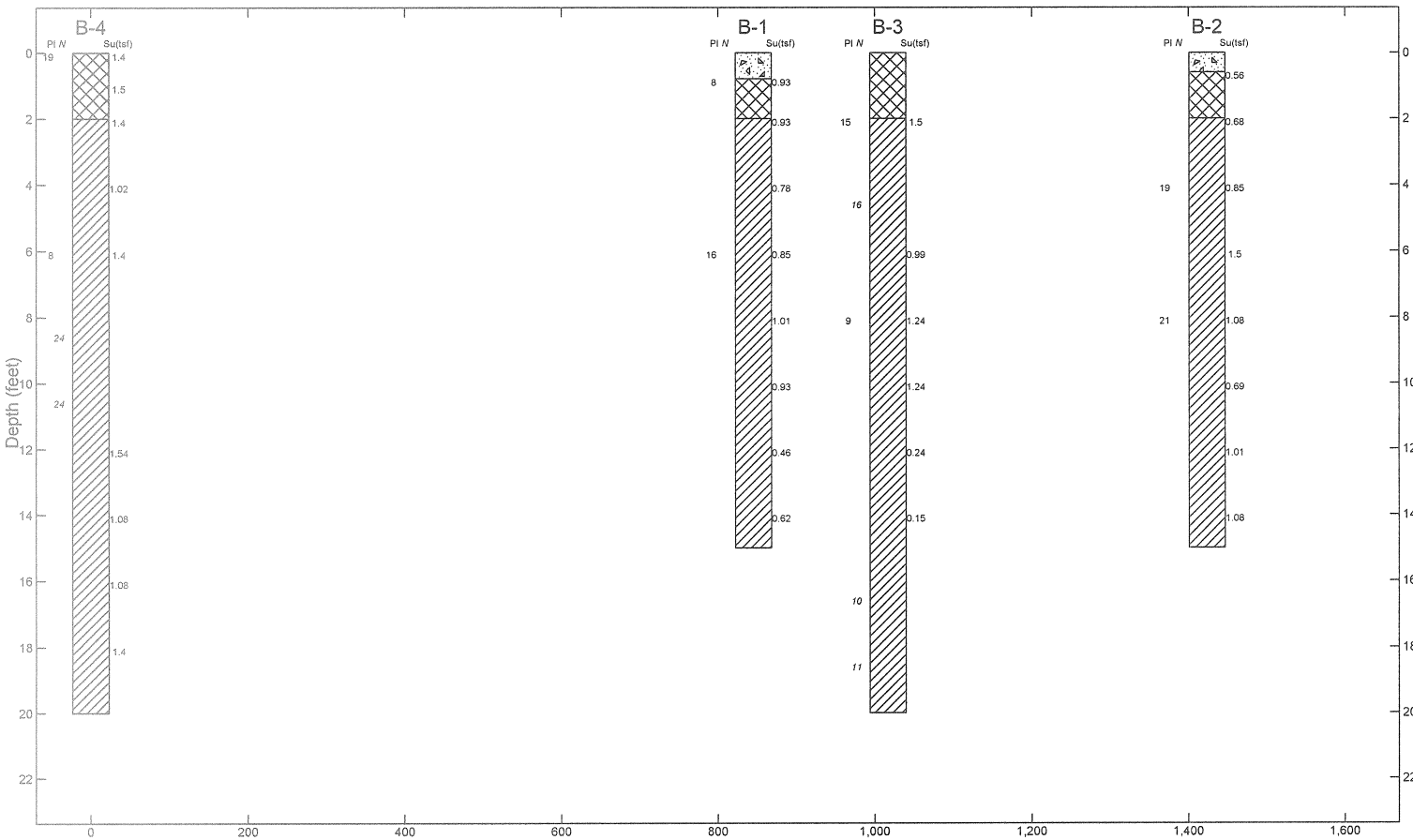


PLAN OF BORINGS FOR PROPSED STORM SEWER SYSTEM

NORTH

PROJECT: Geotechnical Exploration Study for Northlake Forest Subdivision Drainage Improvements UPIN 19103MF14F01
Precinct 3, Harris County, Texas

SCALE: NOT TO SCALE	DATE: OCTOBER 2020	PROJECT NO.: 20-391E

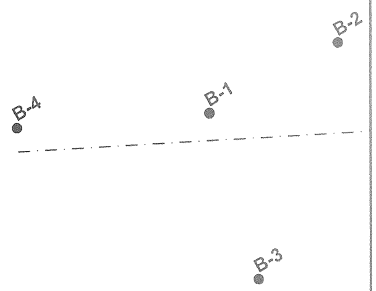


Lithology Graphics

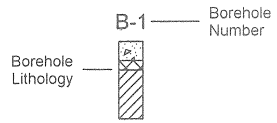
Concrete

Fill

Lean Clay (CL)



Explanation



Water Level Reading at time of drilling.

Water Level Reading after drilling.

Geotech Engineering and Testing
17407 US Highway 59
Houston, Texas 77396

Northlake Forest Subdivision Dainage Improvements
UPIN NO. : 19103MF14F01

Harris County, Texas

JOB NUMBER	PLATE NUMBER
20-391E	Plate A-3

SCOTT 20-391E - REVISION.GPJ FANWNL01.GDT 11/1/20

LOG OF BORING B-1

PROJECT: Northlake Forest Subdivision Drainage Improvements, Harris County, Texas UPIN NO. : 19103MF14F01

PROJECT NO.: 20-391E

LOCATION: N 13921074.557; E 3025084.68

COMPLETION DEPTH: 15 FT

SURFACE ELEVATION: 144.2 FT

DATE: 08/27/20

SAMPLER: Shelby Tube/Split Spoon

DRY AUGER: 0 TO 15 FT

WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0			CONCRETE (10" in thickness)							
				FILL: SANDY LEAN CLAY (CL), stiff, dark brown, reddish brown, with root fibers, sands		56		15	22	14	8
								13			
140	5			SANDY LEAN CLAY (CL), stiff, brown, light brown, with root fibers to 12', sands			118	13			
				- gray 4' to 6'		64	120	12	32	16	16
				- brownish yellow 6' to 15'							
								16			
135	10			- very stiff 8' to 10', light gray 8' to 15'				17			
								16			
				- firm 12' to 14'							
130	15							16			

UNDRAINED SHEAR STRENGTH, TSF

○ HAND PENETROMETER

● UNCONFINED COMPRESSION

■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION

△ TORVANE

0.5 1.0 1.5 2.0 2.5

DEPTH TO WATER IN BORING:

▽ FREE WATER 1ST ENCOUNTERED AT FT. DURING DRILLING; AFTER 15.0 MIN. AT FT.

▼ WATER DEPTH AT FT., HOLE OPEN TO 15.0 FT. ON

Drilled By: GET(T) Logged By: Blake

Geotech Engineering & Testing

PLATE A-4

LOG OF BORING B-2

PROJECT: Northlake Forest Subdivision Drainage Improvements, Harris County, Texas UPIN NO. : 19103MF14F01

PROJECT NO.: 20-391E

LOCATION: N 1392138.161; E 3025646.12

COMPLETION DEPTH: 15 FT

SURFACE ELEVATION: 144.8 FT

DATE: 08/27/20

SAMPLER: Shelby Tube/Split Spoon

DRY AUGER: 0 TO 15 FT

WET ROTARY: TO FT

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	CONCRETE (7" in thickness)				16			
		FILL: SANDY LEAN CLAY (CL), stiff, light brown, light gray, sands			110	17			
		SANDY LEAN CLAY (CL), stiff, brown, gray, with root fibers to 8', sands							
140	5	- reddish brown 4' to 6'		62		15	35	16	19
		- very stiff 6' to 10', light brown 6' to 10', brownish yellow 6' to 15'				13			
				62	119	14	38	17	21
135	10	- light gray 10' to 15'				16			
		- very stiff 12' to 15'				14			
130	15					14			

UNDRAINED SHEAR STRENGTH, TSF

○ HAND PENETROMETER

● UNCONFINED COMPRESSION

■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION

△ TORVANE

0.5 1.0 1.5 2.0 2.5

DEPTH TO WATER IN BORING:

▽ FREE WATER 1ST ENCOUNTERED AT FT. DURING DRILLING; AFTER 15.0 MIN. AT FT.

▼ WATER DEPTH AT FT., HOLE OPEN TO 15.0 FT. ON

Drilled By: GET(T) Logged By: Blake

Geotech Engineering & Testing

PLATE A-5

LOG OF BORING B-3

PROJECT: Northlake Forest Subdivision Drainage Improvements, Harris County, Texas UPIN NO. : 19103MF14F01

PROJECT NO.: 20-391E

LOCATION: N 13920349.33; E 3025298.773

COMPLETION DEPTH: 20 FT

SURFACE ELEVATION: 144.7 FT

DATE: 08/27/20

SAMPLER: Shelby Tube/Split Spoon

DRY AUGER: 0 TO 20 FT

WET ROTARY: TO FT

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

ELEVATION, FT	DEPTH, FT	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0	FILL: SANDY LEAN CLAY (CL), brown, light brown, with root fibers, sands				7			
		FILL: SANDY LEAN CLAY (CL), very stiff, brown, light brown, with root fibers to 10', sands		63		8	31	16	15
140	5		16			8			
					109	13			
				61		14	24	15	9
135	10					12			
		- brownish yellow 10' to 20'							
		- soft 12' to 16'			107	20			
						19			
130	15								
		- stiff 16' to 20'	10			19			
			11			20			
125	20								

DEPTH TO WATER IN BORING:
▽ FREE WATER 1ST ENCOUNTERED AT FT. DURING DRILLING; AFTER 15.0 MIN. AT FT.
▼ WATER DEPTH AT FT., HOLE OPEN TO 20.0 FT. ON

Drilled By: GET(T) Logged By: Blake

Geotech Engineering & Testing

PLATE A-6

LOG OF BORING B-4

PROJECT: Northlake Forest Subdivision Drainage Improvements, Harris County, Texas UPIN NO. : 19103MF14F01

PROJECT NO.: 20-391E

LOCATION: N 13921011.356; E 3024241.558

COMPLETION DEPTH: 20 FT

SURFACE ELEVATION: 146.1 FT

DATE: 08/27/20

SAMPLER: Shelby Tube/Split Spoon

DRY AUGER: 0 TO 20 FT

WET ROTARY: TO FT

UNDRAINED SHEAR STRENGTH, TSF
○ HAND PENETROMETER
● UNCONFINED COMPRESSION
■ UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION
△ TORVANE
0.5 1.0 1.5 2.0 2.5

ELEVATION, FT	DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	STANDARD PENETRATION TEST, BLOWS PER FOOT	PERCENT PASSING NO. 200 SIEVE	DRY UNIT WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX, %
	0					66		15	36	17	19
145				FILL: SANDY LEAN CLAY (CL), very stiff, dark brown, brown, with root fibers, sands				14			
				FILL: SANDY LEAN CLAY (CL), very stiff, brown, light brown, with root fibers to 12', sands			108	15			
	5										
140						58		13	22	14	8
					24			11			
	10										
135					24			12			
				- light gray 12' to 20', brownish yellow 12' to 20'			115	16			
	15							16			
130								15			
								14			
	20										

DEPTH TO WATER IN BORING:

▽ FREE WATER 1ST ENCOUNTERED AT FT. DURING DRILLING; AFTER 15.0 MIN. AT FT.

▼ WATER DEPTH AT FT., HOLE OPEN TO 20.0 FT. ON

Drilled By: GET(T) Logged By: Blake

Geotech Engineering & Testing

PLATE A-7

KEY TO LOG TERMS AND SYMBOLS

UNIFIED SOIL CLASSIFICATIONS

Symbol		Material Descriptions
GW		WELL GRADED-GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GM		SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES
GC		CLAY GRAVELS, GRAVEL-SAND CLAY MIXTURES
SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP		POORLY GRADED SANDS, OR GRAVELLY SANDS, LITTLE OR NO FINES
SM		SILTY SANDS, SAND-SILT MIXTURES a
SC		CLAYEY SANDS, SAND-SILT MIXTURES b
ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS
OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
PT		PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT
		FILL SOILS

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	-	Having incline planes of weakness that are slick and glossy in appearance.
Fissured	-	Containing shrinkage cracks frequently filled with fine sand or silt: usually vertical.
Laminated	-	Composed of thin layers of varying colors and soil sample texture.
Interbedded	-	Composed of alternate layers of different soil types.
Calcareous	-	Containing appreciable quantities of calcium carbonate.
Well Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes.
Poorly Graded	-	Predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.
Pocket	-	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	-	Inclusion less than ⅛-inch thick extending through the sample.
Seam	-	Inclusion ⅛- to 3-inch thick extending through the sample.
Layer	-	Inclusion greater than 3-inch thick extending through the sample.
Interlayered	-	Soils sample composed of alternating layers of different soil types.
Intermixed	-	Soil samples composed of pockets of different soil type and layered or laminated structure is not evident.

COARSE GRAINED SOILS (major portion retained on No. 200 Sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Conditions rated according to standard penetration test (SPT)* as performed in the field.

Descriptive Terms	Blows Per Foot*
Very Loose	0 – 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	over 50

* 140 pound weight having a free fall of 30-inch

SOIL SAMPLERS

- SHELBY TUBE SAMPLER
- STANDARD PENETRATION TEST
- AUGER SAMPLING

FINE GRAINED SOILS (major portion passing No. 200 Sieve): Include (1) inorganic or organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength as indicated by hand penetrometer readings or by unconfined compression tests.

Descriptive Term	Undrained Shear Strength Ton/Sq. Ft.	Descriptive Term	Blows Per Foot*
Very Soft	Less than 0.13	Very Soft	< 2
Soft	0.13 to 0.25	Firm	2 – 8
Firm	0.25 to 0.50	Stiff	8 – 15
Stiff	0.50 to 1.00	Very Stiff	15 – 30
Very Stiff	1.00 to 2.00	Hard	> 30
Hard	2.00 or higher		

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above because of weakness or cracks in the soil. The consistency ratings of such soils are based on hand penetrometer readings.

* 140 pound weight having a free fall of 30-inch

TERMS CHARACTERIZING ROCK PROPERTIES

VERY SOFT OR PLASTIC	Can be remolded in hand; corresponds in consistency up to very stiff in soils.
SOFT	Can be scratched with fingernail.
MODERATELY HARD	Can be scratched easily with knife; cannot be scratched with fingernail. Difficult to scratch with knife.
VERY HARD	Cannot be scratched with knife.
POORLY CEMENTED OR FRIABLE	Easily crumbled.
CEMENTED	Bounded Together by chemically precipitated materials.
UNWEATHERED	Rock in its natural state before being exposed to atmospheric agents.
SLIGHTLY WEATHERED	Noted predominantly by color change with no disintegrated zones.
WEATHERED	Complete color change with zones of slightly decomposed rock.
EXTREMELY WEATHERED	Complete color change with consistency, texture, and general appearance or soil.

APPENDIX B

Project Site Pictures

PROJECT PICTURES

Project No. 20-391E

PROJECT PICTURES
Project No. 20-391E

PROJECT PICTURES

Project No. 20-391E

PROJECT PICTURES

Project No. 20-391E

APPENDIX C

Laboratory Test Results

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: Northlake Forest Subdivision Drainage Improvements, Harris County, Precinct 3, Texas

Geotechnical Consultant's Name: Geotech Engineering and Testing | Consultant's Project Number: 20-391E | UPIN Number: 19103MF14F01

BORING NO.	SAMPLE			WATER CONTENT(%)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PERCENT PASSING SIEVE 200 (%)	SHEAR STRENGTH (TSF)				SPT N-VALUES (Blows Per Foot)	TYPE OF MATERIAL
	NO.	DEPTH (FT) Top	DEPTH (FT) Bottom			LL (%)	PL (%)	PI (%)		UNCONFINED COMPRESSION TEST, tsf	UU TEST, tsf	POCKET PENETROMETER	TORVANE		
B-1	1	0.83	2	15		22	14	8	56			0.93	1.00	-	Fill Sandy Lean Clay (CL)
	2	2	4	13								0.93	1.00	-	Sandy Lean Clay (CL)
	3	4	6	13	118					0.78		0.62	0.75	-	Sandy Lean Clay (CL)
	4	6	8	12	120					0.85		0.78	0.88	-	Sandy Lean Clay (CL)
	5	8	10	16		32	16	16	64			1.01	1.12	-	Sandy Lean Clay (CL)
	6	10	12	17								0.93	1.00	-	Sandy Lean Clay (CL)
	7	12	14	16								0.46	0.62	-	Sandy Lean Clay (CL)
	8	14	15	16								0.62	0.75	-	Sandy Lean Clay (CL)

LEGEND: LL = LIQUID LIMIT PI = PLASTIC INDEX PI = PLASTIC INDEX UU = UNCONSOLIDATED UNDRAIN SPT = STANDARD PENETRATION TEST

PLATE C-1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: Northlake Forest Subdivision Drainage Improvements, Harris County, Precinct 3, Texas

Geotechnical Consultant's Name: Geotech Engineering and Testing | Consultant's Project Number: 20-391E | UPIN Number: 19103MF14F01

BORING NO.	SAMPLE NO.	DEPTH (FT) Top	DEPTH (FT) Bottom	WATER CONTENT(%)	DRY DENSITY (pcf)	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PL (%)	ATTERBERG LIMITS PI (%)	PERCENT PASSING SIEVE 200 (%)	SHEAR STRENGTH (TSF) UNCONFINED COMPRESSION TEST, tsf	SHEAR STRENGTH (TSF) UU TEST, tsf	SHEAR STRENGTH (TSF) POCKET PENETROMETER	SHEAR STRENGTH (TSF) TORVANE	SPT N-VALUES (Blows Per Foot)	TYPE OF MATERIAL
B-2	1	0.58	2	16								0.56	0.62	-	Fill Sandy Lean Clay (CL)
	2	2	4	17	110					0.68		0.56	0.62	-	Sandy Lean Clay (CL)
	3	4	6	15		35	16	19	62			0.85	0.88	-	Sandy Lean Clay (CL)
	4	6	8	13								1.50	1.50	-	Sandy Lean Clay (CL)
	5	8	10	14	119	38	17	21	62	1.08		0.85	0.88	-	Sandy Lean Clay (CL)
	6	10	12	16								0.69	0.75	-	Sandy Lean Clay (CL)
	7	12	14	14								1.01	1.12	-	Sandy Lean Clay (CL)
	8	14	15	14								1.08	1.12	-	Sandy Lean Clay (CL)

LEGEND: LL = LIQUID LIMIT PI = PLASTIC INDEX PI = PLASTIC INDEX UU = UNCONSOLIDATED UNDRAIN SPT = STANDARD PENETRATION TEST

PLATE C-2

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: Northlake Forest Subdivision Drainage Improvements, Harris County, Precinct 3, Texas

Geotechnical Consultant's Name: Geotech Engineering and Testing | Consultant's Project Number: 20-391E | UPIN Number: 19103MF14F01

BORING NO.	SAMPLE NO.	DEPTH (FT) Top	DEPTH (FT) Bottom	WATER CONTENT(%)	DRY DENSITY (pcf)	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PL (%)	ATTERBERG LIMITS PI (%)	PERCENT PASSING SIEVE 200 (%)	SHEAR STRENGTH (TSF) UNCONFINED COMPRESSION TEST, tsf	SHEAR STRENGTH (TSF) UU TEST, tsf	SHEAR STRENGTH (TSF) POCKET PENETROMETER	SHEAR STRENGTH (TSF) TORVANE	SPT N-VALUES (Blows Per Foot)	TYPE OF MATERIAL
B-3	1	0	2	7										-	Fill Sandy Lean Clay (CL)
	2	2	4	8		31	16	15	63			1.50	1.50	-	Sandy Lean Clay (CL)
	3	4	6	8										16	Sandy Lean Clay (CL)
	4	6	8	13	109					0.99		1.32	1.38	-	Sandy Lean Clay (CL)
	5	8	10	14		24	15	9	61			1.24	1.25	-	Sandy Lean Clay (CL)
	6	10	12	12								1.24	1.25	-	Sandy Lean Clay (CL)
	7	12	14	20	107					0.24		0.15	0.25	-	Sandy Lean Clay (CL)
	8	14	16	19								0.15	0.25	-	Sandy Lean Clay (CL)
	9	16	18	19										10	Sandy Lean Clay (CL)
	10	18	20	20										11	Sandy Lean Clay (CL)

LEGEND: LL = LIQUID LIMIT PI = PLASTIC INDEX PI = PLASTIC INDEX UU = UNCONSOLIDATED UNDRAIN SPT = STANDARD PENETRATION TEST

PLATE C-3

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NAME: Northlake Forest Subdivision Drainage Improvements, Harris County, Precinct 3, Texas

Geotechnical Consultant's Name: Geotech Engineering and Testing | Consultant's Project Number: 20-391E | UPIN Number: 19103MF14F01

BORING NO.	SAMPLE			WATER CONTENT(%)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PERCENT PASSING SIEVE 200 (%)	SHEAR STRENGTH (TSF)				SPT N-VALUES (Blows Per Foot)	TYPE OF MATERIAL
	NO.	DEPTH (FT) Top	DEPTH (FT) Bottom			LL (%)	PL (%)	PI (%)		UNCONFINED COMPRESSION TEST, tsf	UU TEST, tsf	POCKET PENETROMETER	TORVANE		
B-4	1	0	2	15		36	17	19	66			1.40	1.50	-	Fill Sandy Lean Clay (CL)
	2	2	4	14								1.40	1.50	-	Sandy Lean Clay (CL)
	3	4	6	15	108					1.02		0.93	1.00		Sandy Lean Clay (CL)
	4	6	8	13		22	14	8	58			1.40	1.50	-	Sandy Lean Clay (CL)
	5	8	10	11										24	Sandy Lean Clay (CL)
	6	10	12	12										24	Sandy Lean Clay (CL)
	7	12	14	16	115					1.54		1.08	1.12	-	Sandy Lean Clay (CL)
	8	14	16	16								1.08	1.12	-	Sandy Lean Clay (CL)
	9	16	18	15								1.08	1.12		Sandy Lean Clay (CL)
	10	18	20	14								1.40	1.50		Sandy Lean Clay (CL)

LEGEND: LL = LIQUID LIMIT PI = PLASTIC INDEX PI = PLASTIC INDEX UU = UNCONSOLIDATED UNDRAIN SPT = STANDARD PENETRATION TEST

PLATE C-4

APPENDIX D

OSHA Soil Classification and Trench Safety Recommendations

OSHA SOIL CLASSIFICATION AND TRENCH SAFETY RECOMMENDATIONS

General

Occupational Safety and Health Administration (OSHA) has required a trench protective system for trenches deeper than five-ft. Trenches that are deeper than five-ft, should be shored, sheeted, braced or laid back to a stable slope, or some other appropriate means of protection should be provided where workers might be exposed to moving ground or caving. OSHA developed a soil classification system to be used as a guideline in determining protective requirements for trench excavations.

OSHA classification system categorizes the soil and rock in four types based on shear strength and stability. These classifications are summarized in the following report sections.

Stable Rock

means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Type A Soil

means cohesive soils with an unconfined compressive strength of 1.5-ton per square foot (tsf) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam, silty clay loam, sandy clay loam, caliche and hardpan. No soil is Type A if:

- The soil is fissured; or
- The soil is subject to vibration from heavy traffic, pile driving or similar effects; or

The soil has been previously disturbed; or

- The soil is part of a slope, layered system where the layers dip into the excavation on a slope of 4(h):1(v) or greater; or
- The material is subject to other factors that would require it to be classified as a less stable material.

Type B Soil

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf; or
- Granular cohesionless soils including: angular gravel, silt, silt loam, sandy loam, and in some case, silty clay loam and sandy clay loam; or
- Previously disturbed soils except those which would otherwise be classified as Type C soil; or
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4(h): 1(v), but only if the material would otherwise be classified as Type B.

Type C Soil

- Cohesive soil with an unconfined compressive strength of 0.5 tsf or less; or
- Granular soils including gravel, sand, and loamy sand; or
- Submerged soil or soil from which water is freely seeping; or
- Submerged rock that is not stable; or
- Materials in a sloped, layered system where the layers dip into the excavation on a slope 4(h):1(v) or steeper.

Under the assumption that appropriate groundwater control measures are carried out, and the groundwater table, if present, is lowered and maintained at least 3 feet below the excavation depths, the stable cohesive soils (CL) & (CH), with unconfined compressive strength greater than 0.5 tsf, are classified as OSHA soil Type "B". The granular soils, which are less stable, are classified as OSHA soil Type "C".

Based on our geotechnical exploration and laboratory test results details of soil classifications at each boring are summarized below:

Boring No.	Depth Range [(1)], ft	Soil Type	OSHA Soil Classification
B-1	0.8 – 15	Sandy Lean Clay (CL)	B
B-2	0.6 – 15	Sandy Lean Clay (CL)	B
B-3	0 – 12	Sandy Lean Clay (CL)	B
	12 – 16	Sandy Lean Clay (CL)	C
	16 – 20	Sandy Lean Clay (CL)	B
B-4	0 – 20	Sandy Lean Clay (CL)	B

Note: 1. Refer to each boring log for soils stratigraphy

Stockpiling of excavated materials may not be allowed near the banks of excavated areas. Generally, a distance of one-half the excavation depth on both sides of the trench should be kept clear of any excavated material.

Storm sewers trenches should be provided with proper trench support system. The trenches should be provided with a temporary shoring system on excavations deeper than five-ft. We understand the storm sewers will be placed at depth less than 10-ft below the grade. The trenches can be made using shored, sheeted and braced, laid back stable slope or other means of appropriate protection system should be provided where workers are exposed to moving ground or caving. The slopes may be constructed in accordance with Table B-1 and shoring may be constructed in accordance with Table C-1.1, Table C-1.2 and Table C-1.3 of 29 CFR Part 1926 of OSHA.

In the event that a trench sheeting is used, the sheeting can be constructed in the form of cantilever sheeting or with bracing. Lateral earth pressures for each method used are summarized on Plate D-1. The trenching and shoring operations should follow OSHA Standards. It is recommended that a geotechnical engineer monitor all phases of trench excavation and bracing to assure trench safety.

Timber shoring as outlined in 29 CFR Part 1926 of OSHA recommendation may be used in the construction of trench supporting system.

For trench excavation, it is necessary to maintain the stability of the sides and base and not to disturb the soil below the excavation grade. In braced cuts, if the sheeting is terminated at the base of the cut, the bottom of the excavation can become unstable under certain conditions. The stability of the trench bottom is governed by the shear strength of the soils and the differential hydrostatic head. For cuts in cohesive soils (such as lean clay) stability of the bottom can be evaluated in accordance with the procedure outline on Plate D-2. However, where cohesionless soils are encountered, dewatering will be required to prevent bottom blowup if the groundwater is encountered during construction. Design soil parameters presented on Plate D-3 can be used for design.

Groundwater Conditions

We understand that the depths of the storm sewers will be less than 10-ft below existing grade. Our short-term field exploration along the project alignment indicated that the groundwater was encountered during and 0.5 hours after drilling. Hence, groundwater dewatering is required. Fluctuations in groundwater can occur as a function of seasonal moisture variation. Groundwater control recommendations are presented in the following report sections.

In the event that groundwater is encountered during construction, it is our opinion that groundwater should be lowered to a depth of at least three-ft below the deepest excavation grade in order to provide dry working conditions and firm bedding. Any minor water inflow in cohesive soil layers can probably be removed using a sump-pump or a trench sump-pump immediately. Wellpoint system can be used in the area where sands are present.

Piezometers may be installed near the excavation area to evaluate groundwater levels in the area prior to construction. The piezometers should be left in place during construction to monitor groundwater levels and effectiveness of the dewatering system.

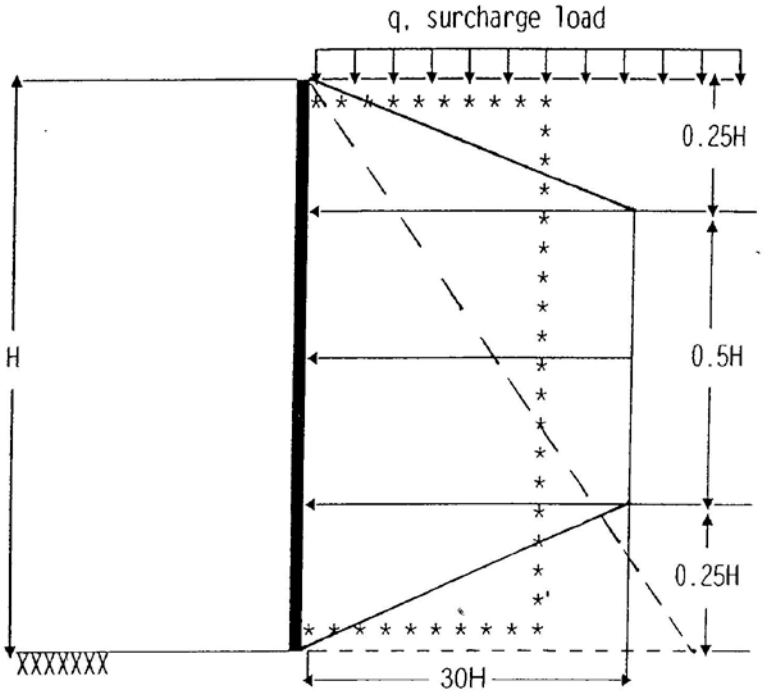
Design of a wellpoint system should consider the amount of groundwater to be lowered and the permeability of the affected soils. The selection and proper implementation of an effective groundwater control system is the responsibility of the contractor.

The results of our field exploration and laboratory testing indicate that unsatisfactory soils for excavation, such as soft sandy lean clay (CL) subsoils in the borings. A summary of the unsatisfactory soils locations and depths are as follows:

Boring(s)	Depth, ft.
B-3	12 to 16

If saturated soil conditions are encountered during the time of construction, suitable groundwater control measures should be implemented. Furthermore, the contractor may have to over excavate an additional 6-inch and remove unstable or unsuitable materials with approval by geotechnical engineer, then place an equal depth of cement stabilization sand or placed a 6-inch seal slab per Harris County Standard Drawing SSC – Strom Sewer Construction Details.

LATERAL EARTH PRESSURE DIAGRAM



Legend:

———————— Braced Excavation (stiff clays)
* * * * * * * * * * * * * Braced Excavation (sands)
- - - - - - - - - - - - - - - Cantilivered sheeting

Active Pressure:

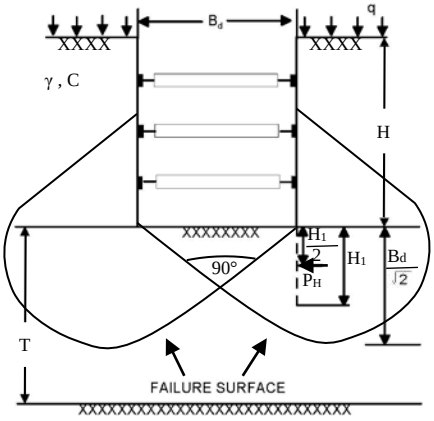
(a) Braced Excavation (stiff clays) = 0.5q + 30H + 62.4H
(b) Braced Excavation (sands) = 0.4q + 18H + 62.4H
(c) Cantilivered sheeting = 0.7q + 42H + 62.4H

where: q = surcharge load, psf
H = wall height, ft.

Notes:

1. The above Active Pressure Equations account for the groundwater at the surface.
2. The final lateral pressures should be reviewed prior to construction.
3. Trench excavation and construction should be observed by a geotechnical engineer.
4. The means and methods for a safe excavation is the responsibility of the contractor.

CUT IN COHESIVE SOIL,
DEPTH OF COHESIVE SOIL UNLIMITED (T > 0.7 B_d)
L= LENGTH OF CUT



If sheeting terminates at base of cut:

Safety Factor, $F_s = \dfrac{N_c c}{\gamma H + q}$

N_c = Bearing capacity factor, which depends on dimensions of the excavation: B_d, L and H (use N_c from graph below)

c = Undrained shear strength of clay in failure zone beneath and surrounding base of cut

γ = Wet unit weight of soil

q = Surcharge (assumed q = 250psf)

If safety factor is less than 1.5, sheeting or soldier piles must be carried below the base of cut to insure stability – (see note)

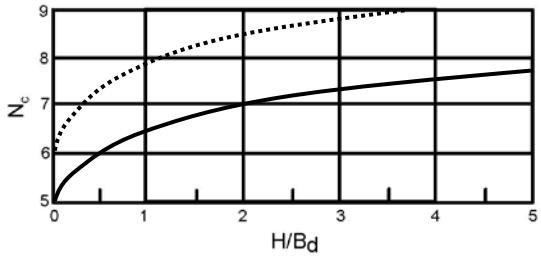
H_1 = Buried length = $\dfrac{B_d}{2} \geq 5$ feet

Note: If soldier piles are used, the center to center spacing should not exceed 3 times the width or diameter of soldier pile.

Force on buried length, P_H:

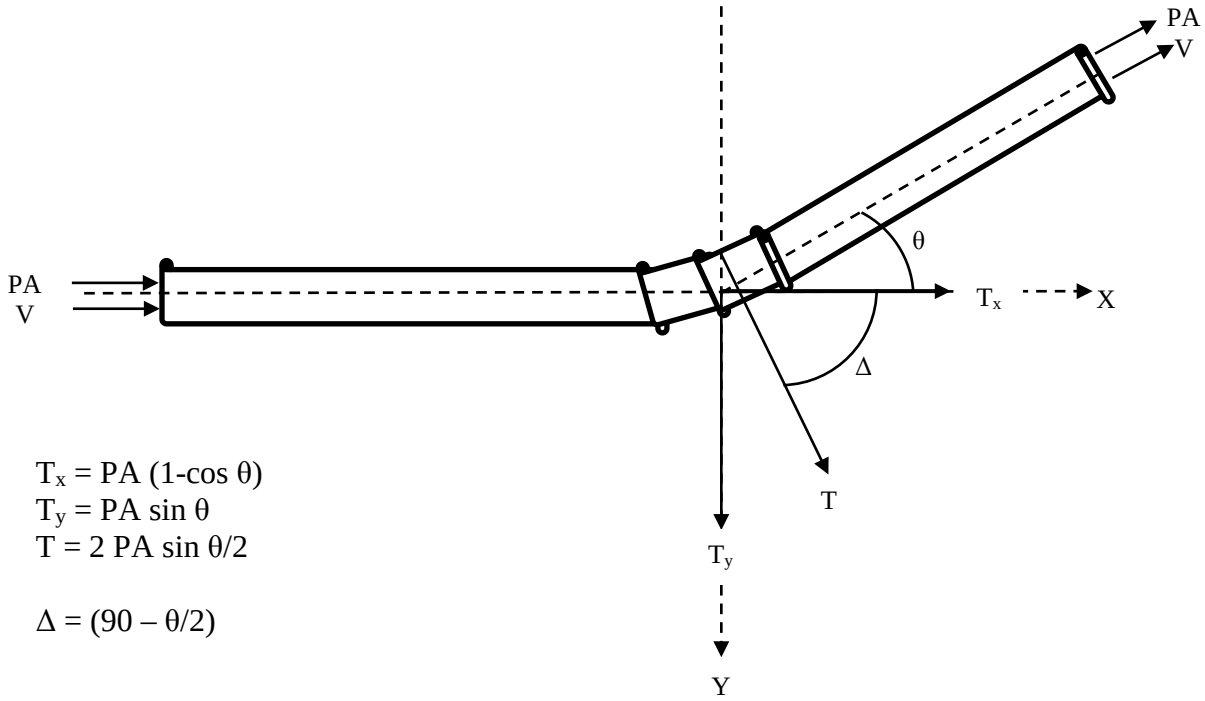
If $H_1 > \dfrac{2}{3}\dfrac{B_d}{\sqrt{2}}$, $P_H = 0.7\ (\gamma H B_d - 1.4CH - \pi c B_d)$ in lbs/linear foot

If $H_1 < \dfrac{2}{3}\dfrac{B_d}{\sqrt{2}}$, $P_H = 1.5 H_1\ (\gamma H - \dfrac{1.4CH}{B_d} - \pi c)$ in lbs/linear foot



STABILITY OF BOTTOM FOR BRACED CUT

THRUST FORCES ACTING ON BEND



$T_x = PA\ (1\text{-}\cos\ \theta)$
$T_y = PA \sin \theta$
$T = 2\ PA \sin \theta/2$

$\Delta = (90 - \theta/2)$

Where:

T = Resultant Thrust Force on the Bend
T_x = Component of Thrust Force in X-Direction
T_y = Component of Thrust Force in Y-Direction
P = Maximum Sustained Pressure
A = Pipe Cross Sectional Area
θ = Bend Deflection Angle
V = Fluid Velocity

Δ = Angle between T and X-axis
D = Inside Diameter of the Pipe

Sample Calculation:

Given P = 50 psi, D = 12-inch
$A = \pi d^2/4 = 113.1\ in^2$

For θ = 90°
T = 2 PA sin θ/2 = 2 * 50 * 113.1 * sin (90/2) = 7997.4 lb = 7.99 kips
Tx = PA (1 - cos θ) = 50 * 113.1 * (1 – cos 90°) = 5.66 kips
Ty = PA sin θ = 50 * 113.1 * sin 90° = 5.66 kips

SOIL DESIGN PARAMETERS

(BASED ON BORING B-1)

Soil Type	Depth Range, ft.	γ, pcf	c, psf
SANDY LEAN CLAY (CL)	0.8 – 4	115	1,860
SANDY LEAN CLAY (CL)	4 – 6	115	1,560
SANDY LEAN CLAY (CL)	6 – 8	115	1,700
SANDY LEAN CLAY (CL)	8 – 10	115	2,000
SANDY LEAN CLAY (CL)	10 – 12	115	1,860
SANDY LEAN CLAY (CL)	12 – 14	115	920
SANDY LEAN CLAY (CL)	14 – 15	115	1,240

(BASED ON BORING B-2)

Soil Type	Depth Range, ft.	γ, pcf	c, psf
SANDY LEAN CLAY (CL)	0.6 – 2	115	1,120
SANDY LEAN CLAY (CL)	2 – 4	115	1,360
SANDY LEAN CLAY (CL)	4 – 6	115	1,700
SANDY LEAN CLAY (CL)	6 – 10	115	2,000
SANDY LEAN CLAY (CL)	10 – 12	115	1,380
SANDY LEAN CLAY (CL)	12 – 15	115	2,000

(BASED ON BORING B-3)

Soil Type	Depth Range, ft.	γ, pcf	c, psf
SANDY LEAN CLAY (CL)	0 – 6	115	2,000
SANDY LEAN CLAY (CL)	6 – 8	115	1,980
SANDY LEAN CLAY (CL)	8 – 12	115	2,000
SANDY LEAN CLAY (CL)	12 – 14	115	480
SANDY LEAN CLAY (CL)	14 – 16	115	300
SANDY LEAN CLAY (CL)	16 – 20	115	1,500

(BASED ON BORING B-4)

Soil Type	Depth Range, ft.	γ, pcf	c, psf
SANDY LEAN CLAY (CL)	0 – 20	115	2,000

APPENDIX B

DRAINAGE ANALYSIS

Memo

Date:	Monday, May 17, 2021
Project:	Northlake Forest Subdivision Drainage Improvement Project
To:	Mr. Mark Rotz, PE – R.G. Miller Engineers, Inc.
From:	Jeremy Blevins, PE, CFM
Subject:	Drainage Analysis

This memorandum provides the results of a drainage analysis associated with the proposed storm sewer improvements within the Northlake Forest subdivision in Harris County Precinct 3. The Northlake Forest subdivision is roughly bound by Spring Cypress Road on the south, Huffmeister Road on the north, and Telge Road on the east. Exhibit 1 provides a vicinity map of the project area. The subdivision experienced significant structural flooding during the Tax Day flood of 2016 and Hurricane Harvey in 2018. The following paragraphs provide background information on the project area, discuss the proposed storm sewer improvements and present the results of the hydraulic analysis associated with the project.

Project Background

The Northlake Forest Subdivision conveys stormwater runoff through a storm sewer system and curb and gutter streets. The storm sewer system drains to a system of detention ponds within the neighborhood. The central pond drains north to Harris County Flood Control District (HCFCD) Unit L106-00-00. The outfall for Unit L106-00-00 has a flap gate to minimize backflow into the neighborhood from Little Cypress Creek (HCFCD Unit L100-00-00). The southeastern pond drains to a 60-inch trunk line that runs north along Spring Cypress Road thence to Telge Road and to Little Cypress Creek. Both the trunk line and Unit L106-00-00 ultimately drain into Little Cypress Creek. The general topography of the subdivision slopes towards the southeast. The subdivision is currently mapped within FEMA effective Special Flood Hazard Area Shaded Zone X, which indicates that the entire subdivision lies within the 0.2% annual chance (500-year) floodplain of Little Cypress Creek, as shown in Exhibit 2.

In 2019, HDR Engineering, Inc. (HDR) completed a preliminary drainage study for the Recovery & Resiliency Division of the Harris County Engineering Department (HCED-RRD). In that study, HDR recommended a series of storm sewer improvements to reduce the potential for nuisance street ponding and to reduce the risk of flooding associated with limited existing storm sewer capacity. Harris County Flood Control District has also undertaken the Little Cypress Creek Frontier Program which will reduce the risk of structural flooding within the Little Cypress Creek watershed and the Northlake Forest subdivision.

As a part of the current study phase of the Northlake Forest subdivision project, HDR has analyzed the existing storm sewer system and proposed improvements within Sections 1 and 3 of the Northlake Forest Subdivision. Exhibit 3 presents a map prepared by R.G. Miller Engineers of the existing storm sewer system.

Proposed Storm Sewer Improvements

Storm sewer improvements are proposed along Clear Point Drive, Corktree Knolls, and Medlowe Court. Additional inlet capacity is proposed by replacing existing Type B-B inlets with Type C-1 inlets along Light

Falls Court, Bach Springs Court, Fable Court, and Elinor Court. The storm sewer improvements involve extending the existing storm sewer toward the end of each respective cul-de-sac and to provide additional inlet capacity. The purpose of the storm sewer extension is to reduce nuisance ponding in those cul-de-sacs. The proposed storm sewers will be placed within the existing road rights of way.

Additionally, the storm sewer outfall of System 1 will be upsized to reduce the hydraulic grade line along the storm sewer system. Exhibit 4 prepared by R.G. Miller Engineers provides a layout of the proposed storm sewer improvements.

Hydraulic Analysis of Storm Sewer System

Pre-Project Conditions

Topographic field survey, record drawings, and 2018 LIDAR topographic data were used to build a pre-project conditions XP-SWMM model of Sections 1 and 3 of the Northlake Forest subdivision. Drainage areas obtained from record drawings (see Attachment A), and peak discharge rates were computed using the Rational Method and NOAA Atlas 14 e, b, d values to calculate rainfall intensity values. Table 1 below provides those calculations.

Table 1: Rational Method Calculations

System 1												
							Rainfall Intensity (in/hr)			Peak Discharge (cfs)		
Area ID	Area (ac.)	Area (sq. mi.)	C	C x A	TC (min)	TC (hr)	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year
1A	2.54	0.0040	0.44	1.12	26.78	0.45	3.43	4.88	7.14	3.84	5.45	7.98
1B	2.60	0.0041	0.44	1.14	27.99	0.47	3.35	4.76	6.99	3.83	5.45	7.99
1C	1.63	0.0025	0.44	0.72	28.67	0.48	3.31	4.70	6.90	2.37	3.37	4.95
1D	3.32	0.0052	0.44	1.46	27.35	0.46	3.39	4.82	7.07	4.96	7.05	10.32
1E	0.94	0.0015	0.44	0.41	28.90	0.48	3.29	4.68	6.87	1.36	1.94	2.84
1F	1.89	0.0030	0.44	0.83	29.55	0.49	3.25	4.63	6.80	2.70	3.85	5.65
1G	1.21	0.0019	0.44	0.53	26.40	0.44	3.46	4.92	7.19	1.84	2.62	3.83
1I	2.49	0.0039	0.44	1.10	26.74	0.45	3.44	4.88	7.15	3.76	5.35	7.83
1J	4.46	0.0070	0.44	1.96	30.37	0.51	3.20	4.56	6.70	6.28	8.94	13.15
1K	2.22	0.0035	0.44	0.98	32.33	0.54	3.09	4.40	6.49	3.02	4.30	6.34
1L	2.82	0.0044	0.44	1.24	32.71	0.55	3.07	4.37	6.45	3.81	5.43	8.00
1M	2.58	0.0040	0.44	1.14	28.09	0.47	3.34	4.75	6.97	3.80	5.40	7.92
1N	1.26	0.0020	0.44	0.55	29.60	0.49	3.25	4.62	6.79	1.80	2.56	3.76
1O1	2.60	0.0041	0.55	1.43	30.47	0.51	3.20	4.55	6.69	4.57	6.51	9.57
1O2	6.15	0.0096	0.55	3.38	32.56	0.54	3.08	4.39	6.47	10.41	14.83	21.87
1P	1.90	0.0030	0.55	1.05	34.86	0.58	2.96	4.22	6.24	3.09	4.41	6.52
System 2												
							Rainfall Intensity (in/hr)			Peak Discharge (cfs)		
Area ID	Area (ac.)	Area (sq. mi.)	C	C x A	TC (min)	TC (hr)	2-Year	10-Year	100-Year	2-Year	10-Year	100-Year
2B	2.53	0.0040	0.44	1.11	26.78	0.45	3.43	4.88	7.14	3.82	5.43	7.95
2C	3.76	0.0059	0.44	1.65	27.63	0.46	3.37	4.80	7.03	5.58	7.94	11.63
2D	3.02	0.0047	0.44	1.33	27.15	0.45	3.41	4.84	7.09	4.53	6.43	9.43
2E	1.76	0.0028	0.44	0.77	26.05	0.43	3.49	4.95	7.24	2.70	3.83	5.61
2F	0.52	0.0008	0.44	0.23	23.91	0.40	3.65	5.18	7.56	0.83	1.18	1.73
2G	2.57	0.0040	0.44	1.13	27.10	0.45	3.41	4.85	7.10	3.86	5.48	8.03
2H	2.38	0.0037	0.44	1.05	26.65	0.44	3.44	4.89	7.16	3.60	5.12	7.50
2I	3.53	0.0055	0.44	1.55	30.90	0.52	3.17	4.51	6.64	4.92	7.01	10.32
2J	1.84	0.0029	0.44	0.81	30.95	0.52	3.17	4.51	6.64	2.56	3.65	5.37
2K	5.12	0.0080	0.44	2.25	31.07	0.52	3.16	4.50	6.62	7.12	10.14	14.92

Runoff hydrographs of the 2-year (50% annual chance), 10-year (10% annual chance), and 100-year (1% annual chance) storm events were computed using HEC-HMS and NOAA Atlas 14 rainfall data. Those runoff hydrographs were applied at specific nodes within the XP-SWMM model to compute the hydraulic grade line and peak discharge of the storm sewer system for the 2-year, 10-year, and 100-year storm events. Table 2 provides a summary of the drainage areas and associated XP-SWMM nodes.

Table 2: XP-SWMM Node Summary

System 1		System 2	
Area ID	XP-SWMM Node	Area ID	XP-SWMM Node
1A	54	2B	51
1B	16	2C	40
1C	18	2D	50
1D	20	2E	42
1E	23	2F	45.1
1F	24	2G	48
1G	25	2H	37
1I	32	2I	49
1J	33	2J	45
1K	29	2K	
1L	27		
1M	14		
1N	3		
1O1	5		
1O2	7		
1P	9		

The 2018 LIDAR topographic data was linked to the nodes within the model to allow stormwater runoff to pond and/or flow across the terrain should the storm sewer system surcharge. The downstream boundary condition of the model is based on a fixed backwater condition of the detention basin static water surface elevations (140 feet) and does not take into account any overflows from Little Cypress Creek or the flood levels in Little Cypress Creek.

Exhibits 5, 6, and 7 provide the pre-project conditions ponding maps for the 2-year, 10-year, and 100-year storm events within the Northlake Forest subdivision, respectively. As shown, no street ponding is expected during a 2-year storm event. During a 10-year storm event, ponding of up to 0.75 foot (9 inches) is expected along Clear Point Drive, Bach Springs Court, and Corktree Knolls. During a 100-year storm event, widespread street ponding of depths up to 2 feet is expected, and there is a possibility of structural flooding near the eastern most end of Clear Point Drive. It is also expected that storm water will leave the subdivision during a 100-year storm event and enter the roadside ditch of Huffmeister Road near its intersection with the existing pipeline easement.

Proposed Conditions

In order to simulate the potential benefits of the proposed storm sewer system, the pre-project conditions model was modified to include the proposed storm sewer improvements. Storm sewer improvements are proposed along Clear Point Drive, Corktree Knolls, and Medlowe Court. Additional inlet capacity is proposed by replacing existing Type B-B inlets with Type C-1 inlets along Light Falls Court, Bach Springs Court, Fable Court, and Elinor Court. Where necessary, the runoff hydrographs were divided by percentage of proposed drainage area to simulate the effects of the proposed inlets and proposed storm sewer extensions. Additionally, the storm sewer outfall to the System 1 detention basin was modified to the proposed size of 6'x4' RCB with 5'x4' restrictor plate, as shown in Exhibit 4. Exhibits 8, 9, and 10 provide the proposed conditions ponding maps for the 2-year, 10-year, and 100-year storm events, respectively.

During a 10-year storm event, ponding depths are reduced to as much as 0.5 foot (6 inches) along Clear Point Drive, Bach Springs Court, and Corktree Knolls. The extents of ponding are reduced as shown on

Exhibit 9. During a 100-year storm event, ponding extents and depths are reduced throughout the system. Based on the results of the 100-year storm event, the risk of structural flooding is reduced along Clear Point Drive. In areas where ponding remains, the proposed ponding is reduced in depth ranging from 0 to 12 inches.

Detention Assessment

Based a comparison of peak discharge rates and runoff hydrographs, it was determined that no additional storm water detention is necessary. The proposed storm sewer improvements include in-line detention storage near the outfalls to the existing detention basins, and the results of the XP-SWMM model indicate that the proposed peak discharge rates are less than the existing peak discharge rates. Table 3 provides a comparison of the peak discharge rates for the existing and proposed conditions.

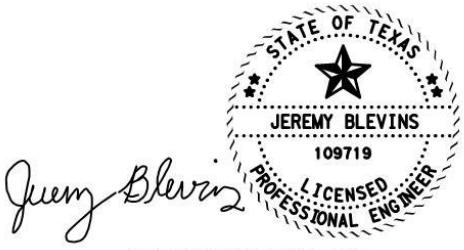
Table 3: Comparison of Peak Discharge Rates

	100-Year Storm Event			
	Existing		Proposed	
	XP-SWMM Link	Flow (cfs)	XP-SWMM Link	Flow (cfs)
System 1	Link 52	106	Link 52.1	106
System 2	Link 44	84	Link 44.1	81
	10-Year Storm Event			
	Existing		Proposed	
	XP-SWMM Link	Flow (cfs)	XP-SWMM Link	Flow (cfs)
System 1	Link 52	83	Link 52	83
System 2	Link 44	61	Link 44	61
	2-Year Storm Event			
	Existing		Proposed	
	XP-SWMM Link	Flow (cfs)	XP-SWMM Link	Flow (cfs)
System 1	Link 52	62	Link 52.1	61
System 2	Link 44	41	Link 44.1	41

Based on the results of this analysis, the proposed project will cause no adverse impacts to flood hazard conditions on the receiving waterways, including downstream properties within the City of Houston, for storm events up to and including the NOAA Atlas 14 1% annual chance (100-year) storm event.

Exhibits

1. Vicinity Map
2. Floodplain Map
3. Existing Storm Sewer Layout
4. Proposed Storm Sewer Layout
5. Existing Ponding Map – 2-Year
6. Existing Ponding Map – 10-Year
7. Existing Ponding Map – 100-Year
8. Proposed Ponding Map – 2-Year
9. Proposed Ponding Map – 10-Year
10. Proposed Ponding Map – 100-Year



HDR ENGINEERING, INC.
TEXAS REGISTERED FIRM F-754

Attachments

A. Northlake Forest Section 1 and Section 3 Record Drawings

LEGEND

Northlake Forest Subdivision

HCFCD Channel

0 Feet 200

Wayne Wood Drive

Huffmeister Road

Gabardine Creek

Clear Point Drive

Oak Spring Drive

Forest Drive

Light Falls Court

Bach Springs Court

Fable Court

Corktree Knolls

Kedgwick Lane

Elinor Court

Arlington Place

Medlowe Court

Amber Court

Ellendale Court

Chapel Lake Drive

Amber Hollow Lane

Spring Cypress Road

Diamond Rock Drive

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

VICINITY MAP

EXHIBIT 1

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 12/9/2020

LEGEND

- Northlake Forest Subdivision
- HCFCD Channel
- REGULATORY FLOODWAY
- ZONE AE
- SHADED ZONE X

0 Feet 200

00-00-9071

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Forest Drive
Corktree Knolls
Fable Court
Kedgwick Lane
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road
Diamond Rock Drive

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

FEMA FLOODPLAIN MAP

EXHIBIT 2

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 12/9/2020

CLEAR POINTE DR.
BACH SPRINGS CT.
FABLE CT.
LIGHT FALLS CT.
ELINOR CT.
NORTHLAKE FOREST DR.
KEDGWICK LN.
CORKTREE KNOLLS
MEDLOWE CT.
ARLINGTON PL.
MATCH LINE (SEE RIGHT)
MATCH LINE (SEE LEFT)

TYPE"C"MH. ℄135.17(48"E.) ℄135.30(48"NW.)
TYPE"C"MH. ℄135.17(48"NE.) ℄135.11(48"W.)
TYPE"C"MH. ℄135.11(48"E.) ℄136.00(36"NW.)
TYPE"C"MH. ℄136.43(36"E.) ℄135.18(48"W.)
48"RCP
36"RCP

TYPE"B-B"INLET ℄-4.25(24"E.)
TYPE"B-B"INLET ℄139.22(24"W.) ℄139.19(24"E.)
TYPE"C"MH. ℄137.55(24"N.) ℄137.74(24"S.) ℄138.52(24"W.)
TYPE"C"MH. ℄138.09(24"N.) ℄138.02(24"S.)
TYPE"B-B"INLET ℄140.00(24"W.) ℄139.92(24"E.)
TYPE"B-B"INLET ℄140.08(24"E.)
TYPE"C"MH. ℄139.14(24"S.) ℄139.13(24"N.)
TYPE"C"MH. ℄139.04(24"S.) ℄139.07(24"N.) ℄139.57(24"W.)
TYPE"C"MH. ℄139.10(24"SE.) ℄139.14(24"N.)
TYPE"C"MH. ℄139.10(24"NW.) ℄139.20(24"SW.)
TYPE"C"MH. ℄138.80(24"E.) ℄138.80(24"W.) ℄138.77(24"S.)
TYPE"B-B"INLET ℄139.76(24"NE.)
TYPE"B-B"INLET ℄139.76(24"SW.) ℄139.76(24"NE.)
TYPE"C"MH. ℄139.07(24"W.) ℄139.22(24"S.)
TYPE"B-B"INLET ℄139.31(24"S.) ℄139.33(24"N.)
TYPE"B-B"INLET ℄139.53(24"N.)
TYPE"C"MH. ℄139.13(24"N.) ℄139.20(24"S.)
TYPE"C"MH. ℄139.44(24"N.) ℄139.50(24"SW.)
TYPE"B-B"INLET ℄139.02(24"SW.)
TYPE"B-B"INLET ℄138.70(24"NE.) ℄138.43(24"W.)
TYPE"B-B"INLET ℄138.98(24"SW.)
TYPE"B-B"INLET ℄139.85(24"NE.) ℄139.85(24"SW.)
TYPE"C"MH. ℄138.67(24"NE.) ℄138.66(24"SE.)
TYPE"B-B"INLET ℄138.86(24"NE.) ℄138.81(24"SW.)
TYPE"B-B"INLET ℄139.21(24"SW.)
TYPE"C"MH. ℄138.23(24"NW.) ℄138.31(24"E.) ℄138.23(24"SW.)
TYPE"B-B"INLET ℄138.74(24"SW.)
TYPE"B-B"INLET ℄139.03(24"NE.) ℄139.10(24"SW.)
TYPE"C"MH. ℄138.74(24"NW.) ℄138.57(24"NE.)
TYPE"C"MH. ℄138.67(24"NE.) ℄138.69(24"SE.)
TYPE"C"MH. ℄138.72(24"NE.) ℄136.75(30"SW.) ℄138.69(24"NW.) ℄137.33(24"SE.)
TYPE"C"MH. ℄136.49(30"NE.) ℄136.47(30"SW.)
TYPE"C"MH. ℄136.28(30"NE.) ℄135.79(36"SW.) ℄137.81(24"NW.) ℄137.81(24"SE.)
TYPE"C"MH. ℄137.84(24"SW.) ℄137.83(24"SE.)
TYPE"B-B"INLET ℄139.34(24"SW.) ℄139.09(24"NE.)
TYPE"B-B"INLET ℄138.59(24"NE.)
TYPE"C"MH. ℄135.69(36"NE.) ℄135.71(36"SW.)
TYPE"C"MH. ℄137.85(24"NW.) ℄137.87(24"SW.)
TYPE"B-B"INLET ℄138.89(24"SW.) ℄137.89(24"NE.)
TYPE"B-B"INLET ℄137.89(24"NE.)
TYPE"B-B"INLET ℄139.16(24"E.)
TYPE"C"MH. ℄138.52(24"N.) ℄138.70(24"S.) ℄138.87(24"W.)
TYPE"B-B"INLET ℄140.12(24"NE.)
TYPE"B-B"INLET ℄139.51(24"SW.) ℄139.58(24"NE.)
TYPE"B-B"INLET ℄138.79(24"N.) ℄138.85(24"W.)
TYPE"B-B"INLET ℄138.86(24"E.)
TYPE"C"MH. ℄135.61(36"NE.) ℄135.42(36"SW.)
TYPE"B-B"INLET ℄140.07(24"S.)
TYPE"C"MH. ℄135.42(36"NE.) ℄135.43(36"S.) ℄138.98(24"N.) ℄138.88(24"W.)
TYPE"B-B"INLET ℄-4.25(24"SW.)
TYPE"B-B"INLET ℄-4.30(24"NE.) ℄-6.25(24"SW.)
TYPE"C"MH. ℄135.43(36"N.) ℄135.36(36"S.) ℄-6.23(24"NE.)
TYPE"C"MH. ℄135.39(36"N.) ℄135.29(36"SW.)
24"RCP
30"RCP
36"RCP

N

0 50 100
SCALE IN FEET

Note: Only storm sewers in vicinity of project improvements are shown for clarity. Refer to record drawings for additional existing storm sewer.

EXHIBIT 3
EXISTING STORM SEWER LAYOUT

r.g.miller engineers
16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600
TEXAS FIRM REGISTRATION NO. F-487

DATE: 11/23/2020

EXIST. STORM
TYPE"C"MH.
℄135.08(6'X4'E.)
℄135.08(6'X4'NW.)
6'X4'RCB
TYPE"C"MH.
℄135.17(48"SW.)
48"RCP
6'X4'RCB
ARLINGTON PL.
5'x4'
RESTRICTOR
TYPE"C"MH.
℄135.16(48"NE.)
℄135.16(6'X4'W.)
CLEAR POINTE DR.
EXIST. STORM
BACH SPRINGS CT.
TYPE"C"MH.
℄139.40(24"E.)
24"RCP
TYPE"B-B"INLET
℄139.63(24"SW.)
24"RCP
TYPE"C"MH.
℄139.62(24"NW.)
℄139.62(24"NE.)
℄139.62(24"SW.)
24"RCP
TYPE"C"MH.
℄139.55(24"W.)
℄139.55(24"SE.)
TYPE"B-B"INLET
℄139.65(24"NE.)
FABLE CT.
EXIST. STORM
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
EXIST. STORM
LIGHT FALLS CT.
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
ELINOR CT.
NORTHLAKE FOREST DR.
EXIST. STORM
REPLACE EXISTING "B-B"
INLET WITH C-1 INLET
TYPE"C"MH.
℄138.85(24"SE.)
24"RCP
TYPE"C"MH.
℄139.12(24"NW.)
℄139.12(24"SE.)
KEDGWICK LN.
CORKTREE KNOLLS
24"RCP
TYPE"B-B"INLET
℄139.25(24"S.)
24"RCP
TYPE"C"MH.
℄139.23(24"NW.)
℄139.23(24"SW.)
℄139.23(24"N.)
24"RCP
TYPE"B-B"INLET
℄139.27(24"NE.)
TYPE"C"MH.
℄139.42(24"SE.)
℄139.42(24"E.)
℄139.42(24"SW.)
24"RCP
24"RCP
MEDLOWE CT.
TYPE"B-B"INLET
℄139.44(24"W.)
24"RCP
TYPE"B-B"INLET
℄139.46(24"NE.)
24"RCP
TYPE"C"MH.
℄139.30(24"SE.)
℄139.30(24"NW.)
TYPE"C"MH.
℄139.00(24"NW.)
MATCH LINE
(SEE LEFT)
EXIST. STORM
NORTHLAKE
FOREST DR.
EXIST. STORM
MATCH LINE
(SEE RIGHT)

N

0 50 100
SCALE IN FEET

Note: Only storm sewers in vicinity of project improvements are shown for clarity. Refer to record drawings for additional existing storm sewer.

EXHIBIT 4
PROPOSED STORM SEWER LAYOUT

r.g.miller engineers
16340 Park Ten Place
Suite 350
Houston, Texas 77084
(713) 461-9600
TEXAS FIRM REGISTRATION NO. F-487

DATE: 3/11/2021

M:\04636.000 NORTHLAKE FOREST\CAD\EXHIBITS\EXH - COMBINED STORM SEWER ALT. 2.DWG | SAVED: Thursday, March 11, 2021 2:08:25 PM | PLOTTED: Thursday, March 11, 2021 2:10:19 PM

LEGEND

Northlake Forest Subdivision

HCFCD Channel

EXISTING - 2-YEAR

DEPTH (FT)

High : 3.40282e+38

Low : -3.40282e+38

0 Feet 200

NO PONDING CALCULATED

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Corktree Knolls
Kedgwick Lane
Fable Court
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

EXISTING PONDING MAP - 2 YEAR

EXHIBIT 5

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

LEGEND

Northlake Forest Subdivision

HCFCD Channel

EXISTING - 10-YEAR

DEPTH (FT)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1.000000001 - 1.25
- 1.250000001 - 1.5
- 1.500000001 - 1.75
- 1.750000001 - 2

0 Feet 200

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Corktree Knolls
Kedgwick Lane
Fable Court
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

EXISTING PONDING MAP - 10 YEAR

EXHIBIT 6

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

LEGEND

Northlake Forest Subdivision

HCFCD Channel

EXISTING - 100-YEAR

DEPTH (FT)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1.000000001 - 1.25
- 1.250000001 - 1.5
- 1.500000001 - 1.75
- 1.750000001 - 2

0 Feet 200

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Light Falls Court
Bach Springs Court
Corktree Knolls
Kedgwick Lane
Fable Court
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

EXISTING PONDING MAP - 100 YEAR

EXHIBIT 7

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

LEGEND

Northlake Forest Subdivision

HCFCD Channel

ALTERNATIVE 2 - 2-YEAR

DEPTH (FT)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1.000000001 - 1.25
- 1.250000001 - 1.5
- 1.500000001 - 1.75
- 1.750000001 - 2

0 Feet 200

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Corktree Knolls
Kedgwick Lane
Fable Court
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

PROPOSED PONDING MAP - 2-YEAR

EXHIBIT 8

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

LEGEND

Northlake Forest Subdivision

HCFCD Channel

ALTERNATIVE 2 - 10-YEAR

DEPTH (FT)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1.000000001 - 1.25
- 1.250000001 - 1.5
- 1.500000001 - 1.75
- 1.750000001 - 2

0 Feet 200

Wayne Wood Drive
Gabardine Creek
Huffmeister Road
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Corktree Knolls
Fable Court
Kedgwick Lane
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

PROPOSED PONDING MAP - 10-YEAR

EXHIBIT 9

PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

LEGEND

Northlake Forest Subdivision

HCFCD Channel

ALTERNATIVE 2 - 100-YEAR

DEPTH (FT)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1.000000001 - 1.25
- 1.250000001 - 1.5
- 1.500000001 - 1.75
- 1.750000001 - 2

0 Feet 200

Wayne Wood Drive
Huffmeister Road
Gabardine Creek
Oak Spring Drive
Clear Point Drive
Bach Springs Court
Light Falls Court
Corktree Knolls
Kedgwick Lane
Fable Court
Elinor Court
Arlington Place
Medlowe Court
Amber Court
Ellendale Court
Chapel Lake Drive
Amber Hollow Lane
Spring Cypress Road

NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS

PROPOSED PONDING MAP - 100-YEAR

EXHIBIT 10

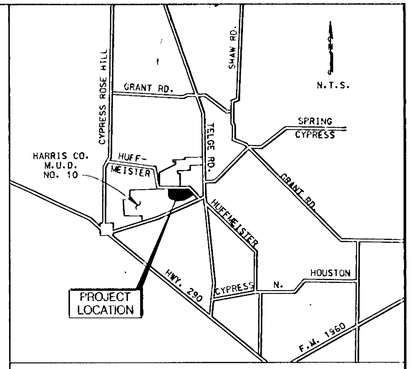
PATH: Q:\HOUSTON_PROJECTS\NORTHLAKEFOREST\GIS\MAPDOCS\PONDING.MXD - USER: JBLEVINS - DATE: 3/10/2021

NORTHLAKE FOREST - SECTION ONE

NORTHWEST HARRIS COUNTY
MUNICIPAL UTILITY DISTRICT NO. 10
WITHIN HARRIS COUNTY, TEXAS

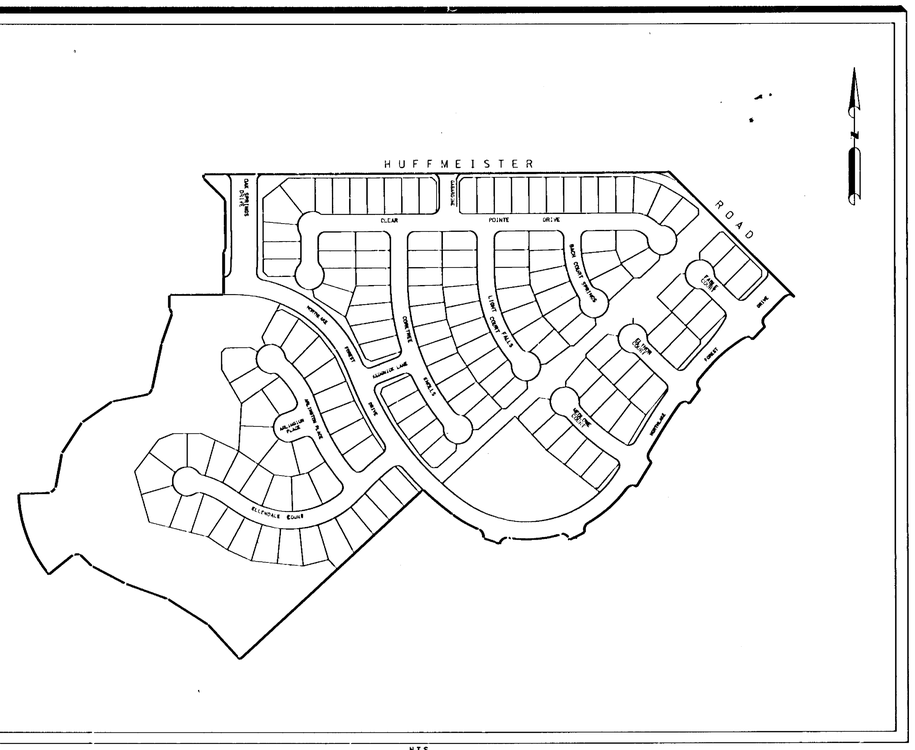
CONSTRUCTION PLANS
FOR

WATER DISTRIBUTION, SANITARY SEWER, PAVING AND DRAINAGE IMPROVEMENTS AND PUBLIC UTILITIES



VICINITY MAP

KEY MAP NO. 327-Y & 367-C



INDEX OF DRAWINGS

SHEET NO.	.dgn	DESCRIPTION	
1.	COVER	COVER SHEET	
2.	02NOTES	GENERAL NOTES & CONSTRUCTION SEQUENCE	
3.	DRNMAP	DRAINAGE AREA MAP	
4.	OA-PAD	PAVING AND DRAINAGE LAYOUT	
5.	OA-SAN	SANITARY SEWER LAYOUT	
6.	OA-WATER	WATERLINE LAYOUT	
7.	OED-1	STA.27+23.89 TO STA.33+00.00	NORTHLAKE FOREST DIRVE
8.	OED-2	STA.33+00.00 TO STA.37+00.00	"
9.	OED-3	STA.37+00.00 TO STA.42+00.00	"
10.	OED-4	STA.42+00.00 TO STA.47+00.00	"
11.	OED-5	STA.47+00.00 TO STA.52+00.00	"
12.	OED-6	STA.52+00.00 TO END	"
13.	OSD-1	STA.0+00.00 TO STA.5+06.19	OAK SPRING DRIVE
14.	AP-1	STA.1+00.00 TO STA.2+99.69	KEDGWICK LANE
15.	EDC-1	STA.1+00.00 TO STA.5+00.00	ELLENDALE COURT
16.	EDC-2	STA.5+00.00 TO STA.9+13.36	"
17.	KC-1	STA.1+00.00 TO STA.4+50.00	ARLINGTON PLACE
18.	KC-2	STA.4+50.00 TO END & BUBBLE	ARLINGTON PLACE
19.	CPD-1	STA.0+00.00 TO STA.4+00.00	CLEAR POINTE DRIVE
20.	CPD-2	STA.4+00.00 TO STA.8+00.00	"
21.	CPD-3	STA.8+00.00 TO STA.13+00.00	"
22.	CPD-4	STA.13+00.00 TO END	"
23.	GC-1	STA.1+00.00 TO END	GABARDINE CREEK
24.	BSC-1	STA.1+00.00 TO STA.5+08.76	BACH SPRINGS COURT
25.	LFC-1	STA.1+00.00 TO STA.4+00.00	LIGHT FALLS COURT
26.	LFC-2	STA.4+00.00 TO STA 7+43.32	"
27.	CTK-1	STA.1+00.00 TO STA.5+00.00	CORKTREE KNOLLS
28.	CTK-2	STA.5+00.00 TO STA.9+77.33	"
29.	MC-1	STA.1+00.00 TO STA.4+71.62	MEDLOWE COURT
30.	EC-1	STA.1+00.00 TO STA.4+08.14	ELINOR COURT
31.	FC-1	STA.1+00.00 TO STA.4+00.00	FABLE COURT
32.	PL-1	STA.1+00.00 TO STA. 4+60.00	UTILITY EASEMENT
33.	PL-2	STA.4+60.00 TO STA. 9+60.00	"
34.	PL-3	STA.9+60.00 TO STA. 12+25.74	"
35.	DRAIN1	STA.0+00.00 TO STA. 9+73.83	DRAINAGE DITCH
36.	OUTFALL1	STA.1+00.00 TO STA. 5+03.72	LAKE DRAIN LINE
37.	OUTFALL2	STA.0+00.00 TO STA. 4+80.18	SYSTEM 1 OUTFALL LINE
38.	DETPOND	DETENTION POND & SPILLWAY	
39.	-	SUBDIVISION STANDARD PAVEMENT DETAILS	
40.	-	HCFCD OUTFALL & INTERCEPTOR DETAILS	
41.	-	TRENCHING DETAILS	
42.	-	STORM WATER POLLUTION PREVENTION PLAN DETAILS	

APPROVED
CITY OF HOUSTON — CITY DWG. NO.:

CITY ENGINEER — DATE
RICHARD C. SCOTT, P.E.

DIRECTOR, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING — DATE
JIMMIE SCHINDEWOLF, P.E.

PRIOR TO THE CONSTRUCTION OF SUCH FACILITIES WITHIN THE DISTRICT, THE DISTRICT OR ITS ENGINEER WILL GIVE WRITTEN NOTICE BY REGISTERED OR CERTIFIED MAIL TO THE DIRECTOR OF PUBLIC WORKS AND ENGINEERING, STATING THE DATE SUCH CONSTRUCTION WILL BE COMMENCED. CONTRACTOR SHALL NOTIFTY THE CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING, ENGINEERING CONSTRUCTION AND REAL ESTATE GROUP (TELEPHONE No. 754-0700) 48 HOURS BEFORE STARTING WORK ON THIS PROJECT.

APPROVED;

TERRY A. ANDERSON, P.E. — DATE:
HARRIS COUNTY ENGINEER

SIGNATURE IS VOID IF CONSTRUCTION HAS NOT COMMENCED WITHIN ONE (1) YEAR OF SIGNATURE DATE.

I JERROLD L. GRAHAM, Jr. A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THESE PLANS WERE PREPARED UNDER MY SUPERVISION TO MEET OR EXCEED THE SPECIFICATIONS AND REQUIREMENTS OF HARRIS COUNTY, TEXAS.

J.L. GRAHAM, Jr. 66480 — 1/31/97

UTILITY NOTES:

HOUSTON LIGHTING AND POWER COMPANY (HL&P)

OVERHEAD LINES MAY EXIST ON THE PROPERTY. WE HAVE NOT ATTEMPTED TO MARK THOSE LINES SINCE THEY ARE CLEARLY VISIBLE. BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE, FORBIDS ALL ACTIVITIES IN WHICH PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES. CONTRACTORS AND OWNERS ARE LEGALLY RESPONSIBLE FOR SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED, CALL HL&P AT 713/207-7777

SOUTHWESTERN BELL TELEPHONE COMPANY (SWBT)

THE LOCATIONS OF SWBT UTILITIES 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 HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

ENTEX

LOCATION OF ENTEX MAIN LINES (TO INCLUDE UNIT GAS TRANSMISSION, AND/OR INDUSTRIAL GAS SUPPLY CORPORATION WHERE APPLICABLE) ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 713/223-4567 OR 1-800-245-4545 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK AND AGREE TO BE FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

REVISED 5/17/95

PRIVATE UTILITY LINES SHOWN

Thomas Fale 3.3.97
HOUSTON LIGHTING & POWER
CROSSING UNDERGROUND DUCT LINES, UNLESS NOTED
VALID AT TIME OF REVIEW ONLY

Mike Balin 3/17/97
SOUTHWESTERN BELL TELEPHONE CO.

Celeste G. Watmuff 3/18/97
ENTEX, INCORPORATED

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1 — FEBUARY, 1997

COH Log No. 97-0004

GENERAL CONSTRUCTION NOTES

1. ALIGNMENT, CENTERLINE CURVE DATA AND STATIONING TO BE VERIFIED FROM APPROVED SUBDIVISION PLAT OR APPROVED PLAT FOR OFFSITE EASEMENTS.

2. CONTRACTOR SHALL SEND WRITTEN NOTIFICATION TO HARRIS COUNTY ENGINEERING DEPARTMENT FORTY-EIGHT (48) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AND NOTIFY THEM TWENTY-FOUR (24) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713-755-8210).

3. CONTRACTOR SHALL NOTIFY THE FOLLOWING AGENCIES 48 HOURS PRIOR TO BEGINNING CONSTRUCTION:

   A) UTILITY LOCATION AND COORDINATING COMMITTEE AT 713-223-4567

   B) ENTEX AT 713-654-5166

   C) HOUSTON LIGHTING AND POWER COMPANY AT 713-659-6457

   D) TEXAS ONE CALL SYSTEM AT 800-245-4545

   E) HARRIS COUNTY FLOOD CONTROL DISTRICT AT 713-684-4050

4. CONTRACTOR SHALL OBTAIN ALL DEVELOPMENT, RIGHT-OF-WAY AND CONSTRUCTION PERMITS REQUIRED BY THE REGULATIONS OF HARRIS COUNTY, TEXAS AT HIS EXPENSE PRIOR TO COMMENCEMENT OF WORK. THE ENGINEER WILL ASSIST THE CONTRACTOR IN COMPLETING THE PERMIT APPLICATION.

5. CONTRACTOR SHALL GIVE NOTICE TO ALL AUTHORIZED INSPECTORS, SUPERINTENDENTS, OR PERSONS IN CHARGE OF PRIVATE AND PUBLIC UTILITIES OR RAILROADS AFFECTED BY HIS OPERATIONS PRIOR TO COMMENCEMENT OF WORK. REQUIRED PERMITS THAT CAN BE ISSUED TO CONTRACTOR WILL BE OBTAINED AT HIS EXPENSE.

6. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF EXISTING FACILITIES PRIOR TO CONSTRUCTION OF PROPOSED FACILITIES. NO SEPARATE PAY. ANY DAMAGE TO EXISTING FACILITIES INCURRED AS A RESULT OF CONSTRUCTION OPERATIONS WILL BE REPAIRED TO THE OWNING AUTHORITY'S STANDARDS BY THE CONTRACTOR AT HIS OWN EXPENSE.

7. CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF JOB, SHALL BE AS GOOD OR BETTER THAN THE CONDITION PRIOR TO STARTING WORK.

8. EXISTING PAVEMENTS, CURBS, SIDEWALKS, AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO CITY OF HOUSTON DESIGN AND CONSTRUCTION STANDARDS AS CURRENTLY AMENDED AT CONTRACTOR'S EXPENSE.

9. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING THE MUD AND/OR DIRT DEPOSITED ON EXISTING PAVEMENT DUE TO HIS CONSTRUCTION ACTIVITY ON A DAILY BASIS. (NO SEPARATE PAY)

10. PROPOSED PAVING AND BARRICADES AS SHOWN IN THE WATER, SEWER AND DRAINAGE PLANS ARE FOR INFORMATION ONLY AND ARE NOT INCLUDED IN THE WATER, SEWER AND DRAINAGE CONTRACT.

11. SEWER MATERIALS, CONSTRUCTION AND TESTING SHALL BE IN COMPLIANCE WITH THE CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATIONS (SEPTEMBER 1996) INCLUDING ALL REVISIONS AND AMENDMENTS THERETO. CONTRACTOR SHALL PROVIDE ALL NECESSARY TEST EQUIPMENT AT NO SEPARATE PAY.

12. CONTRACTOR SHALL REMOVE EXISTING PLUGS AND CONNECT TO EXISTING UTILITY LINES AS INDICATED ON PLANS. NO SEPARATE PAY.

13. MANHOLE RIM ELEVATIONS SHALL BE TWO (2) INCHES ABOVE A STRAIGHT LINE FROM TOP OF CURB TO FINISHED GRADE ELEVATION AT RIGHT-OF-WAY LINE.

14. NO MANHOLES SHALL BE LOCATED WITHIN PAVING LIMITS.

15. WHEN TRENCH CONDITIONS REQUIRE THE USE OF WELL POINTS, THIS SHALL BE REQUESTED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. MEASUREMENT AND PAYMENT OF THESE ITEMS SHALL BE IN ACCORDANCE WITH SPECIAL PROVISION NO. 1 TO SPECIFICATIONS FOR SEWER CONSTRUCTION.

16. ALL AREAS AFFECTED BY CONTRACTOR'S OPERATIONS, INCLUDING BUT NOT LIMITED TO ACCESS ROADS, AREAS OF MATERIAL AND EQUIPMENT STORAGE, AND ALL CONSTRUCTION AREAS, SHALL BE STRIPPED OF ALL VEGETATION PRIOR TO COMMENCEMENT OF WORK. STRIPPINGS SHALL BE DISPOSED OF OFFSITE BY THE CONTRACTOR. NO SEPARATE PAY.

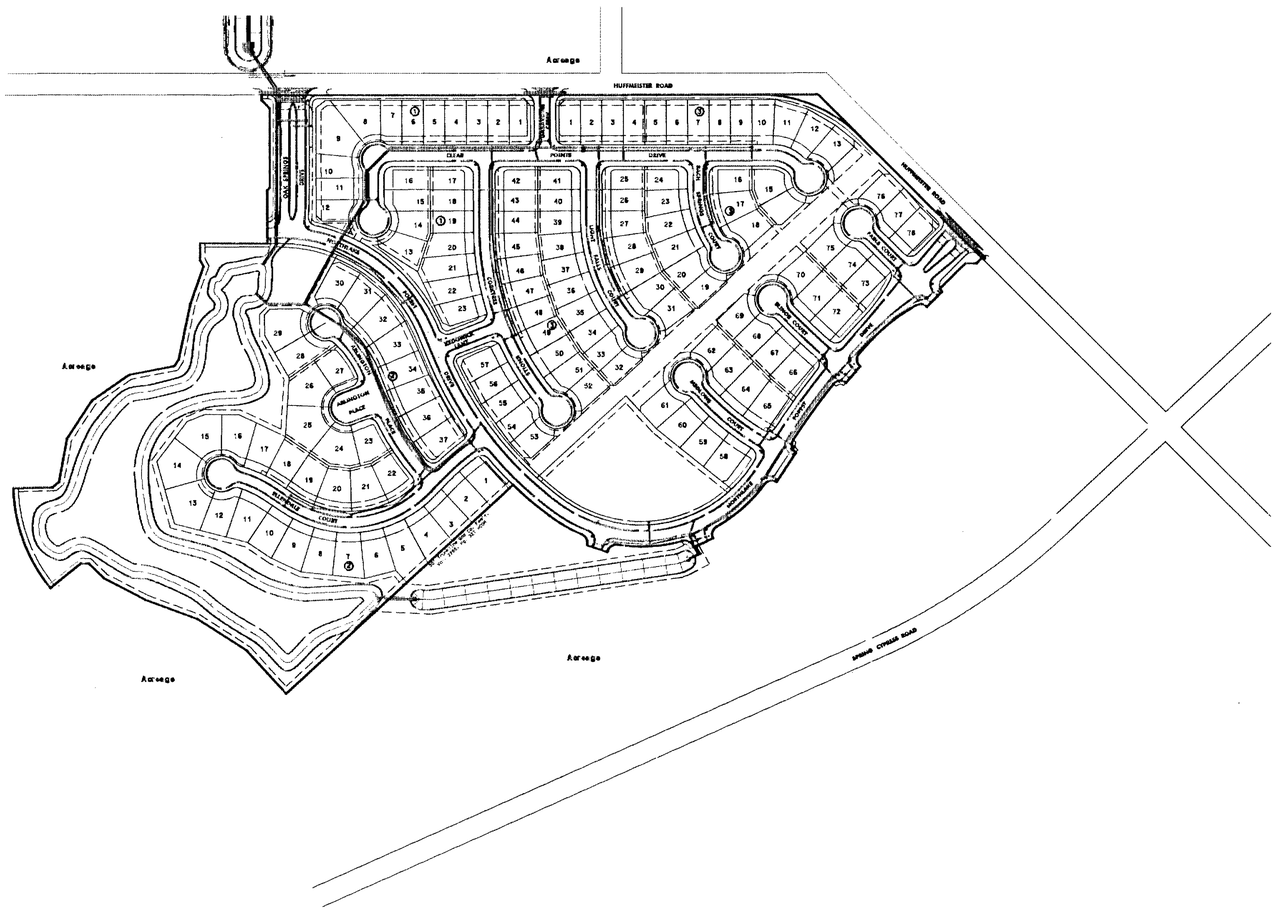
17. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE OWNING AUTHORITY.

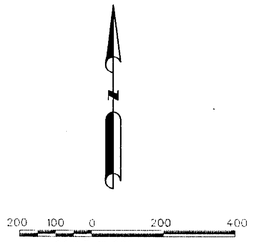
18. APPROVAL ONLY FOR UTILITIES WITHIN PUBLIC R.O.W.

19. FINAL ACCEPTANCE OF THE UTILITIES WILL NOT BE GIVEN TO THE CONTRACTOR UNTIL THEY ARE INSPECTED AND APPROVED BY THE TEXAS NATURAL RESOURCE CONSERVATION COMMISSION.

20. ALL TRENCH BACKFILL FOR UTILITIES SHALL BE COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY PER ASTM D-698. MOISTURE CONTENT SHALL BE WITHIN 2% OF OPTIMUM. ALL TRENCH BACKFILL SHALL BE CONSIDERED INCIDENTAL TO UTILITY CONSTRUCTION.

REVISED: 2/14/97





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE
GENERAL NOTES
&
CONSTRUCTION SEQUENCE

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

NOTES

STATE OF TEXAS
J.L. GRAHAM
66480
REGISTERED PROFESSIONAL ENGINEER
5-19-97
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10302-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 7/2/97 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 7/8/97 — CONSTRUCTION

OTHER DEPARTMENT

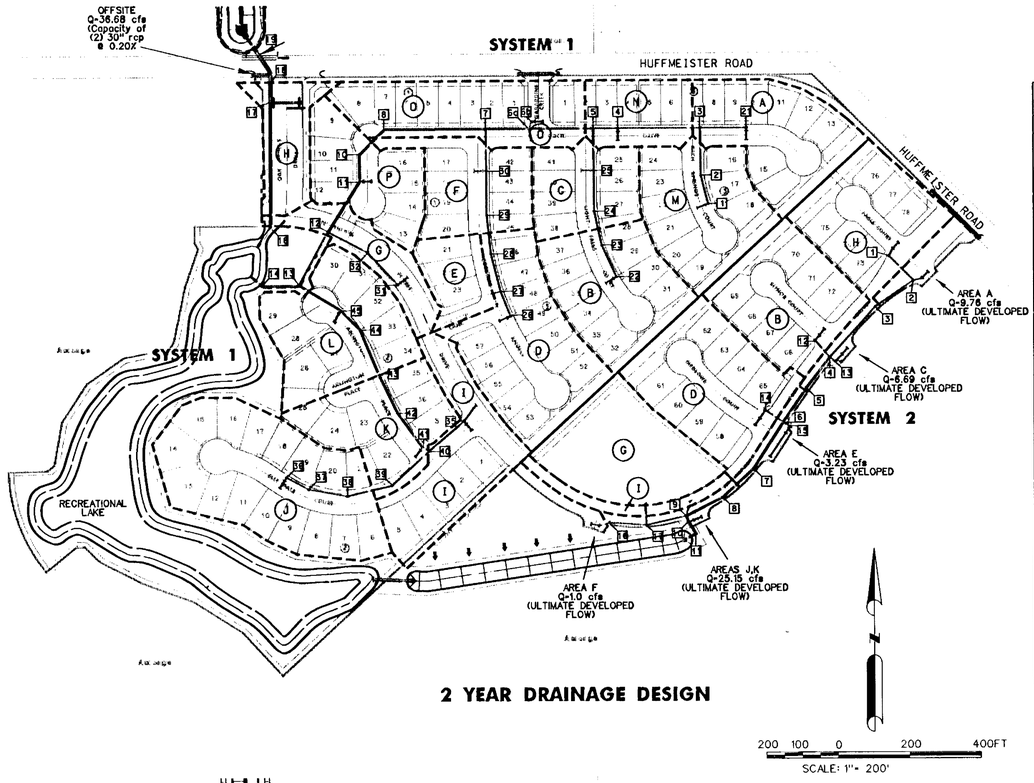
PLANNING AND DEVELOPMENT 7-22-97 — SPONSOR DEPARTMENT
CITY ENGINEER 7/22/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 7-22-97 DATE

SUBMITTED:
SCALE: 1"=200'
DATE:
SURVEY BY:
F B NO:

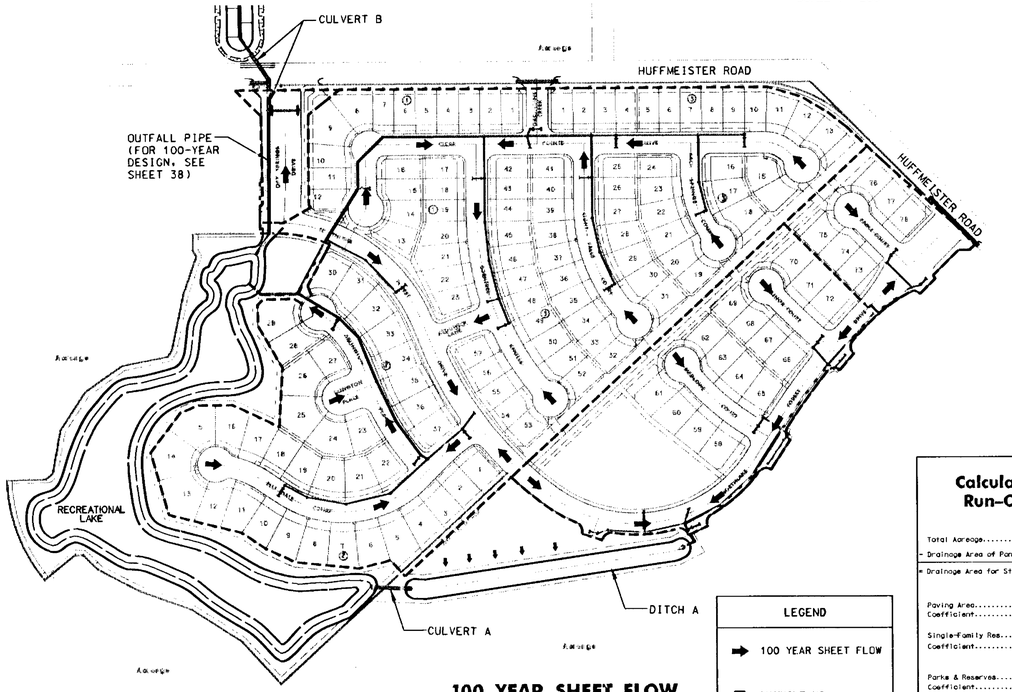
DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 2 OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600



2 YEAR DRAINAGE DESIGN



100 YEAR SHEET FLOW

LEGEND

- 100 YEAR SHEET FLOW
- [1] MANHOLE NO.
- (A) DRAINAGE AREA NO.

SYSTEM No. 1 — 2 -YEAR RAINFALL FREQUENCY

NO. AREA	MH FROM	MH TO	AREA (acres)	TL AREA (acres)	RUNOFF COEFF C	SUM OF CxA	TIME OF CONC. TC (min)	INTENSITY I in/hr	SUM OF FLOWS (cfs)	REACH LENGTH (ft)	DIAMETER (in)	SPAN (in)	AREA (ft**2)	SLOPE (%)	MANNING n	DESIGN CAPACITY (cfs)	DESIGN VELOCITY (ft/s)	FALL (ft)	MANHOLE DROP (ft)	FLOWLINE ELEVATION UP (ft)	FLOWLINE ELEVATION DOWN (ft)	TOP OF PIPE ELEVATION UP (ft)	TOP OF PIPE ELEVATION DOWN (ft)	ACTUAL VELOCITY (ft/s)	HYDRAULIC GRAD. (%)	CHANGE IN HEAD (ft)	ELEVATION OF HYDR. GRADIENT UP (ft)	ELEVATION OF HYDR. GRADIENT DOWN (ft)	TOP OF CURB UP (ft)	TOP OF CURB DOWN (ft)
A	21	3	2.54	2.54	0.44	1.12	26.78 0.78	3.28	3.68	130	24	–	3.142	0.174	0.013	9.41	3.00	0.23	–	140.25	140.02	142.25	142.02	2.79	0.20	0.26	142.05	142.02	144.95	145.65
B	22	23	2.60	2.60	0.44	1.14	26.63 0.58	3.29	3.76	98	24	–	3.142	0.174	0.013	9.41	3.00	0.17	–	140.44	140.27	142.44	142.27	2.81	0.20	0.20	142.30	142.27	145.14	145.70
	23	24	–	2.60	0.44	1.14	27.45 0.58	–	3.76	98	24	–	3.142	0.174	0.013	9.41	3.00	0.17	–	140.27	140.10	142.27	142.10	2.81	0.20	0.20	142.13	142.10	145.70	145.85
	24	25	–	2.60	0.44	1.14	27.86 0.59	–	3.76	114	24	–	3.142	0.174	0.013	9.41	3.00	0.20	–	140.10	139.90	142.10	141.90	2.81	0.20	0.23	141.93	141.90	145.85	145.57
C	25	5	1.03	4.23	0.44	1.86	28.61 0.62	3.17	5.91	117	24	–	3.142	0.174	0.013	9.41	3.00	0.20	–	139.90	139.70	141.90	141.70	3.14	0.24	0.28	141.78	141.70	145.57	145.76
D	26	27	3.32	3.32	0.44	1.46	27.35 0.60	3.25	4.75	71	24	–	3.142	0.174	0.013	9.41	3.00	0.12	–	139.72	139.60	141.72	141.60	2.98	0.22	0.16	141.68	141.65	144.42	144.60
E	27	28	0.94	4.26	0.44	1.87	27.75 0.57	3.23	6.05	108	24	–	3.142	0.174	0.013	9.41	3.00	0.19	–	139.60	139.41	141.60	141.41	3.16	0.25	0.27	141.65	141.57	144.60	145.30
	28	29	–	4.26	0.44	1.87	28.33 0.61	–	6.05	109	24	–	3.142	0.174	0.013	9.41	3.00	0.19	–	139.41	139.22	141.41	141.22	3.16	0.25	0.27	141.57	141.48	145.30	145.55
	29	30	–	4.26	0.44	1.87	28.89 0.61	–	6.05	123	24	–	3.142	0.174	0.013	9.41	3.00	0.21	–	139.22	139.01	141.22	141.01	3.16	0.25	0.30	141.48	141.40	145.55	145.26
F	30	7	1.89	6.15	0.44	2.71	29.55 0.58	3.12	8.45	117	24	–	3.142	0.174	0.013	9.41	3.00	0.20	–	139.01	138.81	141.01	140.81	3.36	0.31	0.37	141.40	141.24	145.26	145.65
G	31	32	1.21	1.21	0.44	0.53	25.34 6.03	3.38	1.80	146	24	–	3.142	0.174	0.013	9.41	3.00	0.25	–	140.51	140.26	142.51	142.26	2.29	0.18	0.26	142.27	142.26	145.21	146.00
	32	12	–	1.21	0.44	0.53	26.40 5.65	–	1.80	137	24	–	3.142	0.174	0.013	9.41	3.00	0.24	–	140.26	140.02	142.26	142.02	2.29	0.18	0.25	142.03	142.02	146.00	146.74
I	35	40	2.49	2.49	0.44	1.10	26.74 0.71	3.29	3.61	128	24	–	3.142	0.174	0.013	9.41	3.00	0.22	–	139.94	139.72	141.94	141.72	2.78	0.20	0.26	141.75	141.72	144.81	145.08
J	36	37	4.46	4.46	0.44	1.96	28.01 0.37	3.21	6.30	70	24	–	3.142	0.174	0.013	9.41	3.00	0.12	–	140.37	140.25	142.37	142.25	3.19	0.25	0.18	142.30	142.25	145.07	145.30
	37	38	–	4.46	0.44	1.96	28.38 0.24	–	6.30	111	24	–	3.142	0.174	0.013	9.41	3.00	0.19	–	140.25	140.06	142.25	142.06	3.19	0.25	0.28	142.15	142.06	145.30	145.70
	38	39	–	4.46	0.44	1.96	28.98 0.38	–	6.30	128	24	–	3.142	0.174	0.013	9.41	3.00	0.22	–	140.06	139.84	142.06	141.84	3.19	0.25	0.32	141.94	141.84	145.70	145.70
	39	40	–	4.46	0.44	1.96	29.93 0.74	–	6.30	142	24	–	3.142	0.174	0.013	9.41	3.00	0.25	–	139.84	139.59	141.84	141.59	3.19	0.25	0.36	141.70	141.59	145.70	145.09
	40	41	2.49	6.95	0.44	3.82	30.37 0.44	2.21	8.46	21	24	–	3.142	0.174	0.013	9.41	3.00	0.04	–	139.59	139.55	141.59	141.55	3.36	0.31	0.07	141.58	141.55	145.09	144.75
K	41	42	2.22	9.17	0.44	4.03	30.48 0.45	3.07	12.39	118	30	–	4.909	0.129	0.013	14.71	3.00	0.15	–	139.06	138.91	141.56	141.41	3.36	0.22	0.26	141.52	141.41	144.75	145.08
	42	43	–	9.17	0.44	4.03	31.06 0.61	–	12.39	123	30	–	4.909	0.129	0.013	14.71	3.00	0.17	–	138.75	138.58	141.25	141.08	3.36	0.22	0.29	141.20	141.08	145.24	145.07
	43	44	–	9.17	0.44	4.03	31.67 0.66	–	12.39	133	30	–	4.909	0.129	0.013	14.71	3.00	0.17	–	138.75	138.58	141.25	141.08	3.36	0.22	0.29	141.20	141.08	145.07	145.26
	44	45	–	9.17	0.44	4.03	32.33 0.38	–	12.39	77	30	–	4.909	0.129	0.013	14.71	3.00	0.10	–	138.58	138.48	141.08	140.98	3.36	0.22	0.17	141.05	140.98	145.07	145.26
L	45	13	2.82	11.99	0.44	5.28	32.71 0.69	2.95	15.58	136	36	–	7.069	0.101	0.013	21.18	3.00	0.14	–	137.58	137.84	140.98	140.84	3.26	0.16	0.21	140.91	140.84	145.26	145.30
M	1	2	2.58	2.58	0.44	1.14	26.82 0.48	3.29	3.73	82	24	–	3.142	0.174	0.013	9.41	3.00	0.14	–	140.48	140.34	142.48	142.34	2.80	0.20	0.16	142.36	142.34	145.18	145.40
	2	3	–	2.58	0.44	1.14	27.30 0.28	–	3.73	132	24	–	3.142	0.174	0.013	9.41	3.00	0.23	–	140.34	140.11	142.34	142.11	2.80	0.20	0.27	142.15	142.11	145.40	145.80
	3	4	2.54	5.12	0.44	2.25	28.09 1.21	3.21	7.23	229	24	–	3.142	0.174	0.013	9.41	3.00	0.40	–	140.02	139.62	142.02	141.62	3.28	0.28	0.63	141.89	141.66	145.80	145.36
N	4	5	1.26	6.38	0.44	2.81	29.24 0.34	3.14	8.81	69	24	–	3.142	0.174	0.013	9.41	3.00	0.12	–	139.62	139.50	141.62	141.50	3.38	0.33	0.23	141.66	141.56	145.36	145.76
	5	6a	4.23	10.61	0.44	4.67	29.60 0.37	3.12	14.56	180	30	–	4.909	0.129	0.013	14.71	3.00	0.23	–	139.00	138.77	141.50	141.27	3.42	0.26	0.46	141.56	141.33	145.76	145.00
O	6a	7	2.60	13.21	0.55	7.27	30.47 0.60	1.96	14.22	121	30	–	4.909	0.129	0.013	14.71	3.00	0.16	–	138.77	138.61	141.27	141.11	3.43	0.25	0.30	141.25	141.11	145.00	145.05
	7	8	6.15	19.36	0.55	10.65	31.07 1.10	1.83	19.46	283	36	–	7.069	0.101	0.013	21.18	3.00	0.29	–	137.81	137.52	140.81	140.52	3.40	0.19	0.53	140.78	140.54	145.65	146.59
	8	10	–	19.36	0.55	10.65	32.18 0.38	–	19.46	58	36	–	7.069	0.101	0.013	21.18	3.00	0.06	–	137.52	137.46	140.52	140.46	3.40	0.19	0.11	140.54	140.49	146.59	146.75
	10	11	–	19.36	0.55	10.65	32.56 0.35	–	19.46	77	36	–	7.069	0.101	0.013	21.18	3.00	0.08	–	137.40	137.32	140.40	140.32	3.40	0.19	0.14	140.44	140.37	146.65	146.41
P	11	12	1.90	21.26	0.55	11.69	10.00 0.83	1.46	17.08	167	36	–	7.069	0.101	0.013	21.18	3.00	0.17	–	137.32	137.15	140.32	140.15	3.32	0.17	0.28	140.37	140.26	146.41	146.74
	12	13	1.21	22.47	0.44	9.89	13.68 0.54	2.91	28.73	170	42	–	9.621	0.082	0.013	28.80	2.99	0.14	–	136.44	136.30	139.94	139.80	3.37	0.16	0.28	140.41	140.27	146.74	145.30
	13	14	11.99	34.46	0.44	15.16	24.52 0.34	2.87	43.45	105	42	–	9.621	0.187	0.013	43.49	4.52	0.20	–	136.30	136.10	139.80	139.60	5.10	0.37	0.39	140.27	140.08	145.30	–
	14	OUT	–	34.46	0.44	15.16	24.86 0.14	–	43.45	43	42	–	9.621	0.187	0.013	43.49	4.52	0.08	–	136.10	136.02	139.60	139.52	5.10	0.37	0.16	140.08	140.00	–	–

SYSTEM No. 2 — 2 -YEAR RAINFALL FREQUENCY

NO. AREA	MH FROM	MH TO	AREA (acres)	TL AREA (acres)	RUNOFF COEFF C	SUM OF CxA	TIME OF CONC. TC (min)	INTENSITY I in/hr	SUM OF FLOWS (cfs)	REACH LENGTH (ft)	DIAMETER RISE (in)	SPAN (in)	AREA (ft**2)	SLOPE (%)	MANNING n	DESIGN CAPACITY (cfs)	DESIGN VELOCITY (ft/s)	FALL (ft)	MANHOLE DROP (ft)	FLOWLINE ELEVATION UP (ft)	FLOWLINE ELEVATION DOWN (ft)	TOP OF PIPE ELEVATION UP (ft)	TOP OF PIPE ELEVATION DOWN (ft)	ACTUAL VELOCITY (ft/s)	HYDRAULIC GRAD. (%)	CHANGE IN HEAD (ft)	ELEVATION OF HYDR. GRADIENT UP (ft)	ELEVATION OF HYDR. GRADIENT DOWN (ft)	TOP OF CURB UP (ft)	TOP OF CURB DOWN (ft)
B	12	4	2.53	2.53	0.44	1.11	26.78 0.38	3.29	3.66	63	24	–	3.142	0.174	0.013	9.41	3.00	0.11	–	139.92	139.81	141.92	141.81	2.79	0.20	0.13	142.84	142.71	144.62	145.00
C	13	4	3.76	3.76	0.44	1.65	27.63 0.11	3.24	5.35	20	24	–	3.142	0.174	0.013	9.41	3.00	0.03	–	139.91	139.88	141.91	141.88	3.07	0.23	0.04	142.76	142.71	144.61	145.00
D	14	6	3.02	3.02	0.44	1.33	27.15 0.33	3.27	4.34	58	24	–	3.142	0.174	0.013	9.41	3.00	0.10	–	139.65	139.55	141.65	141.55	2.92	0.21	0.12	141.78	141.65	144.35	145.12
E	15	6	1.76	1.76	0.44	0.77	26.05 0.14	3.34	2.58	22	24	–	3.142	0.174	0.013	9.41	3.00	0.04	–	139.80	139.76	141.80	141.76	2.54	0.19	0.04	141.80	141.76	144.50	145.12
F	16	17	0.52	0.52	0.44	0.23	23.91 0.96	3.48	0.80	105	24	–	3.142	0.174	0.013	9.41	3.00	0.18	–	141.15	140.97	143.15	142.97	1.62	0.18	0.18	143.21	143.02	145.85	145.55
G	17	9	2.57	3.09	0.44	1.36	24.10 0.63	3.42	4.64	112	24	–	3.142	0.174	0.013	9.41	3.00	0.19	–	140.97	140.78	142.97	142.78	2.97	0.22	0.24	143.02	142.78	145.55	144.90
H	1	2	2.38	2.38	0.44	1.05	25.65 6.58	3.30	3.45	113	24	–	3.142	0.174	0.013	9.41	3.00	0.20	–	139.66	139.46	141.66	141.46	2.77	0.20	0.22	144.57	144.35	144.46	144.67
	2	3	5.58	7.96	0.44	3.50	27.53 0.51	3.25	11.40	129	24	–	3.142	0.256	0.013	11.42	3.64	0.33	–	139.46	139.13	141.46	141.13	4.19	0.51	0.66	144.35	143.69	144.67	145.69
	3	4	–	7.96	0.44	3.50	27.54 0.16	–	11.40	191	24	–	3.142	0.256	0.013	11.42	3.64	0.49	–	139.13	138.64	141.13	140.64	4.19	0.51	0.98	143.69	142.71	145.69	145.00
	4	5	6.29	14.25	0.44	6.27	28.60 0.39	3.18	19.92	109	30	–	4.909	0.237	0.013	19.94	4.06	0.26	–	138.14	137.88	140.64	140.38	4.67	0.47	0.51	142.71	142.20	145.00	145.40
	5	6	–	14.25	0.44	6.27	28.99 0.41	–	19.92	116	30	–	4.909	0.237	0.013	19.94	4.06	0.27	–	137.88	137.61	140.38	140.11	4.67	0.47	0.55	142.20	141.65	145.40	145.12
	6	7	4.78	19.03	0.44	8.37	29.40 0.60	3.13	26.21	154	36	–	7.069	0.155	0.013	26.23	3.71	0.24	–	137.11	136.87	140.11	139.87	4.30	0.31	0.48	141.65	141.18	145.12	145.00
	7	8	–	19.03	0.44	8.37	30.00 0.40	–	26.61	117	36	–	7.069	0.155	0.013	26.23	3.71	0.18	–	136.87	136.69	139.87	139.69	4.30	0.31	0.36	141.18	140.81	145.00	145.00
	8	9	–	19.03	0.44	8.37	30.48 0.48	–	26.21	115	36	–	7.069	0.155	0.013	26.23	3.71	0.18	–	136.69	136.51	139.69	139.51	4.30	0.31	0.36	140.81	140.46	145.00	144.90
I	9	10	3.53	22.56	0.44	9.93	30.90 0.06	3.05	30.25	15	36	–	7.069	0.206	0.013	30.24	4.28	0.03	–	136.51	136.48	139.51	139.48	4.93	0.41	0.06	140.46	140.40	144.90	144.45
J	10	11	1.84	24.20	0.44	10.74	30.95 0.12	3.05	32.69	38	36	–	7.069	0.241	0.013	32.71	4.63	0.09	–	136.48	136.39	139.48	139.39	5.28	0.48	0.18	140.40	140.21	144.45	144.49
K	11	OUT	5.12	29.52	0.44	12.99	31.07 0.08	3.04	39.47	30	36	–	7.069	0.351	0.013	39.48	5.58	0.11	–	136.39	136.28	139.39	139.28	6.36	0.70	0.21	140.21	140.00	144.49	–

2 - YEAR DESIGNS

Calculation of Average Run-Off Coefficient, C

Total Acreage.....60.0 Acres
– Drainage Area of Pond.....11.4 Acres
= Drainage Area for Storm Sewer.....48.8 Acres

Paving Area.....7.55 Acres / 48.8 Acres = 15.5%
Coefficient.....0.90

Single-Family Res.....31.4 Acres / 48.8 Acres = 64.3%
Coefficient.....0.40

Parks & Reserves.....9.8 Acres / 48.8 Acres = 20.2%
Coefficient.....0.20

Average Run-Off Coefficient.....0.44

Design of Ditch A

Solve For Depth
Given Input Data:
Right & Left Side Slope.....3.0(1 (H:V)
Manning's n.....0.040
Channel Slope.....0.0001 ft/ft
Discharge.....49.47 cfs
Computed Results:
Depth.....5.00 ft
Velocity.....0.66 fps
Flow Area.....74.91 sf
Flow Top Width.....29.98 ft
Wetted Perimeter.....31.60 ft
Critical Depth.....1.76 ft
Critical Slope.....0.0261 ft/ft
Froude Number.....0.07

Design of Culverts

Solve For Diameter	Culvert A	Culvert B
Given Input Data:		
Area	47Ac±	180 Ac
Manning's n	0.013	0.013
Slope	0.00253 ft/ft	0.0024 ft/ft
Time of Concentration	31.07 min	302.57 min
Average Run-Off Coefficient	0.44	0.44
2-Yr. Discharge	49.47 cfs	51.42 cfs
Computed Results:		
Size	42 inches	7 ft x 4 ft
Velocity	5.23 fps	8.49 fps
Flow Area	9.62 sf	28.00 sf
Critical Slope	0.0047 ft/ft	0.0040 ft/ft
Critical Depth	2.22 ft	3.30 ft
Froude Number	Full	0.75
Full Capacity	50.30 cfs	237.70 cfs
Qmax=.94D	54.11 cfs	

* Area of Drainage Easement and System No. 2

Design of Outfall Pipe (from pond to MH# 17)

Avg. Width of Pond.....133.5 ft
Avg. Depth of Pond.....5.5 ft
Cross-Sectional Area = W x D =.....133.5 ft
Run Length of Pond.....2200 ft
Assumed Flow of Outfall Pipe.....100 cfs
Velocity in Outfall Pipe = Q/A =.....0.136 fps
Travel Time of Pond = L/V.....269 min
Time of Concentration (System 2).....31 min
Total Time of Concentration.....300 min
Intensity (2-Year).....0.626
Area.....180.00 Ac.
Peak Flow = CIA.....49.6 cfs

2-Year Design
48" RCP @0.24%
Capacity = 70.32 cfs
V=5.6 fps

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE

DRAINAGE AREA MAP

BENCH MARK

REFERENCE BENCHMARK
RM 164 – CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

NOTES

STATE OF TEXAS
J.L. GRAHAM JR.
66480
REGISTERED PROFESSIONAL ENGINEER
6/18/97
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

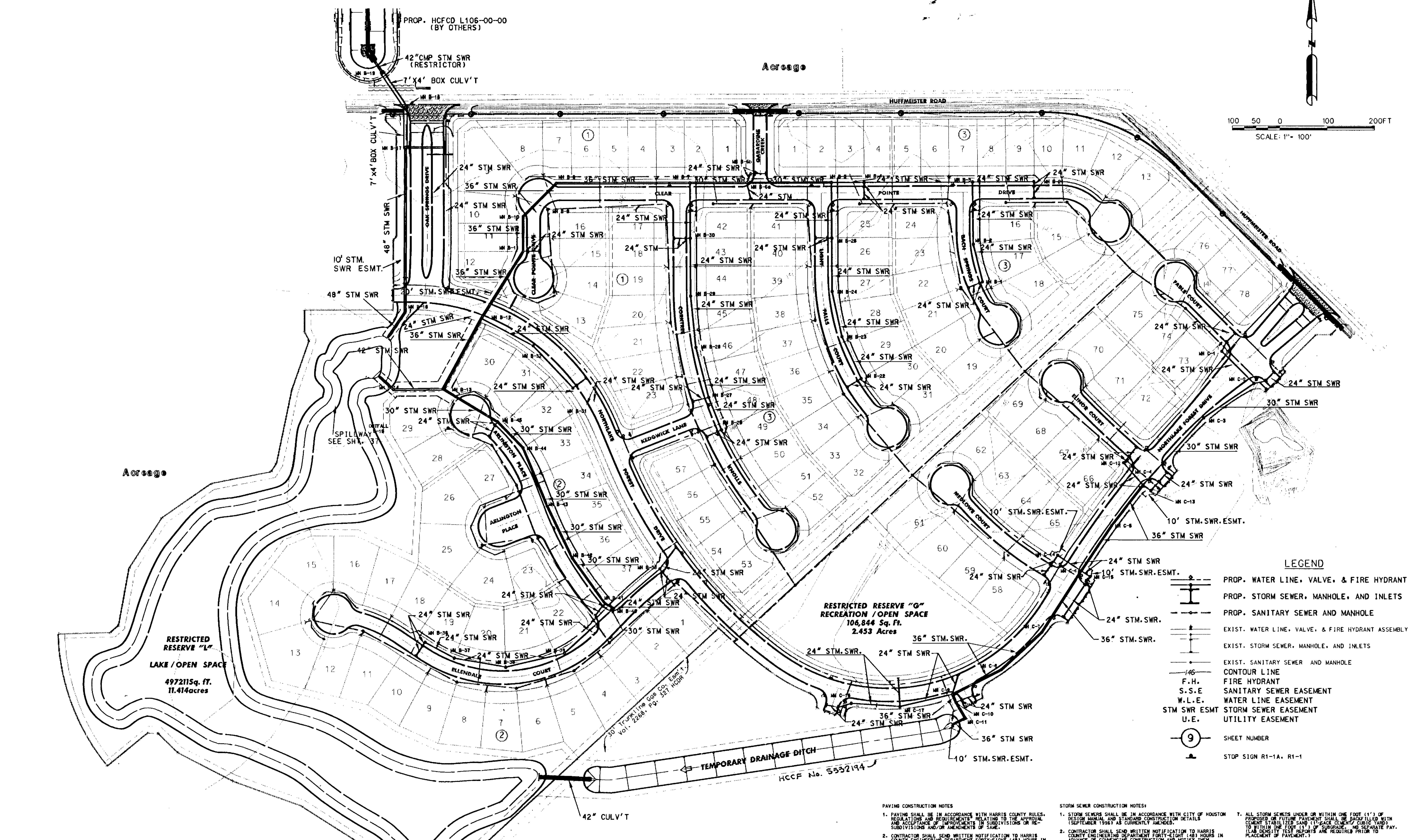
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — 7/22/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — 7-22-97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F B NO:

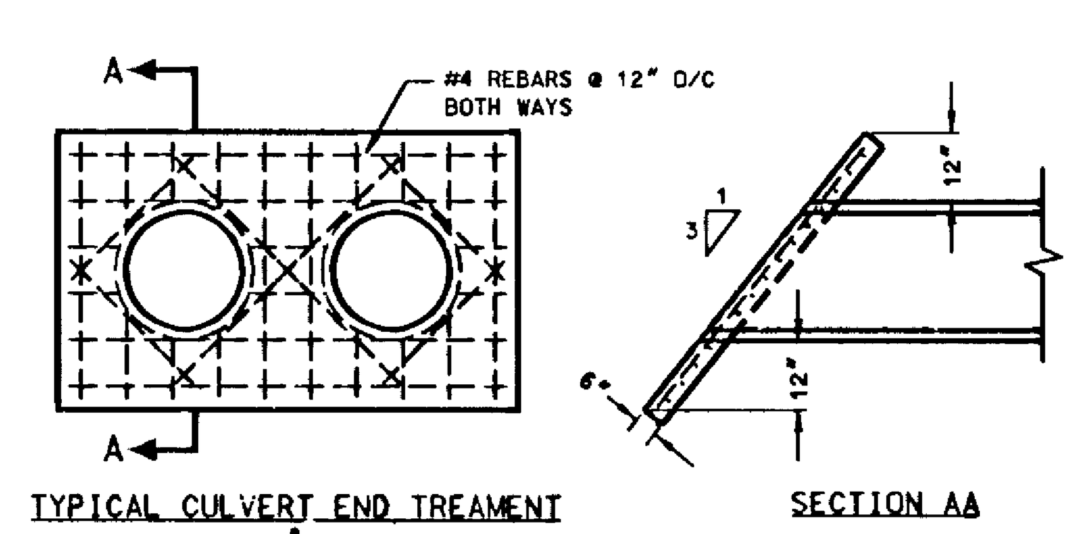
DESIGNED BY: JLG
DRAWN BY: RWL,Y,DD,SP
SHEET NO. 3 OF 42 SHEETS
CITY DWG NO:

P-600



LEGEND

	PROP. WATER LINE, VALVE, & FIRE HYDRANT
	PROP. STORM SEWER, MANHOLE, AND INLETS
	PROP. SANITARY SEWER AND MANHOLE
	EXIST. WATER LINE, VALVE, & FIRE HYDRANT ASSEMBLY
	EXIST. STORM SEWER, MANHOLE, AND INLETS
	EXIST. SANITARY SEWER AND MANHOLE
146	CONTOUR LINE
F.H.	FIRE HYDRANT
S.S.E	SANITARY SEWER EASEMENT
W.L.E.	WATER LINE EASEMENT
STM SWR ESMT	STORM SEWER EASEMENT
U.E.	UTILITY EASEMENT
9	SHEET NUMBER
	STOP SIGN R1-1A, R1-1



TYPICAL CULVERT END TREAMENT & PIPE PROTECTIVE CONCRETE

SECTION AA

NOTE:
1. ALL INLETS SHALL BE EQUIPPED WITH INLET PROTECTION BARRIERS THROUGHOUT THE CONSTRUCTION PHASE.
2. HUFFMEISTER ROAD SHALL BE PROTECTED BY A CONTINUOUS FILTER FABRIC FENCE THROUGHOUT THE CONSTRUCTION PHASE.
3. SEE STORM WATER POLLUTION PREVENTION PLAN DETAILS, SHT 41 OF 41.

LEGEND

FABRIC FENCE

PAVING CONSTRUCTION NOTES

1. PAVING SHALL BE IN ACCORDANCE WITH HARRIS COUNTY RULES, REGULATIONS AND REQUIREMENTS RELATING TO THE APPROVAL AND ACCEPTANCE OF IMPROVEMENTS IN SUBDIVISIONS OR RE-SUBDIVISIONS AND/OR AMENDMENTS OF SAME.
2. CONTRACTOR SHALL SEND WRITTEN NOTIFICATION TO HARRIS COUNTY ENGINEERING DEPARTMENT FORTY-EIGHT (48) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AND NOTIFY THEM TWENTY-FOUR (24) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713-755-6210).
3. DOUBLE REFLECTORIZED BLUE TRAFFIC MARKERS SHALL BE PLACED 6-INCHES OFFSET OF THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS BY PAVING CONTRACTOR. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED AT EACH STREET.
4. STREET NAME SIGNS (FOR ALL STREETS) SHALL BE LOCATED ATOP EACH STOP SIGN AT ALL INTERSECTIONS.
5. ALL TEMPORARY AND PERMANENT SIGNAGE MUST COMPLY WITH THE MOST CURRENT EDITION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AS CURRENTLY AMENDED.
6. CONTINUOUS LONGITUDINAL REINFORCING BARS SHALL BE USED IN CURBS.
7. REINFORCEMENT STEEL FOR PAVEMENT SHALL BE SUPPORTED WITH PLASTIC CHAIRS AT 24-INCH MAXIMUM SPACING.
8. THE 6" SUBGRADE IS TO BE SCARIFIED, LIME STABILIZED (AMOUNT TO BE DETERMINED BY TEST LAB) AND COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D-698. MOISTURE CONTENT SHALL BE WITHIN 2% OPTIMUM.
9. AREAS WITHIN THE R.O.W. TO BE FILLED SHALL BE SCARIFIED AND COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY PER ASTM D-698 TO A DEPTH OF 8-INCHES PRIOR TO FILL PLACEMENT. FILL MATERIAL SHALL CONSIST OF CLEAN EARTH, SAND, OR COMBINATION AND BE FREE OF TRASH, VEGETATION, AND LARGE STONE. FILL MATERIAL SHALL BE PLACED IN 8-INCH LIFTS AND COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY.
10. NECESSARY TESTING OF THE SUBGRADE AND CONCRETE PAVEMENT TO PROVE THAT THESE ITEMS MEET REQUIREMENTS SHALL BE DONE BY A COMMERCIAL TESTING LABORATORY APPROVED BY THE ENGINEER.

REVISED: 2/14/97

STORM SEWER CONSTRUCTION NOTES:

1. STORM SEWERS SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON DESIGN MANUAL AND STANDARD CONSTRUCTION DETAILS (SEPTEMBER 1996) AS CURRENTLY AMENDED.
2. CONTRACTOR SHALL SEND WRITTEN NOTIFICATION TO HARRIS COUNTY ENGINEERING DEPARTMENT FORTY-EIGHT (48) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AND NOTIFY THEM TWENTY-FOUR (24) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713-755-6210).
3. ALL STORM SEWERS SHALL BE REINFORCED CONCRETE PIPE (C-76, CLASS III) WITH RUBBER GASKET JOINTS (ASTM C-443), AND SHALL BE INSTALLED, BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02317-04, 02317-05 AND 02317-09 AS APPLICABLE.
4. ALL STORM SEWER MANHOLES SHALL BE CITY OF HOUSTON TYPE "C" AND CONSTRUCTED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO.02081-03, 02081-04, AND 02081-05 UNLESS OTHERWISE NOTED.
5. ALL STORM SEWER INLETS SHALL BE CITY OF HOUSTON TYPE "B-B" AND CONSTRUCTED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAIL NO.02632-04 UNLESS OTHERWISE NOTED.
6. ALL PROPOSED PIPE STUB OUTS FROM MANHOLES AND INLETS ARE TO BE PLUGGED WITH EIGHT INCH (8") BRICK WALLS UNLESS OTHERWISE NOTED.
7. ALL STORM SEWERS UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1½SACK CEMENT/ CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)

   ALTERNATIVE TO CEMENT STABILIZED SAND BACKFILL FOR PIPES 54-INCH AND LARGER, FROM ONE FOOT (1') ABOVE THE TOP OF THE PIPE TO THE BOTTOM OF THE SUBGRADE. CONTRACTOR MAY BACKFILL WITH SUITABLE MATERIAL, PROVIDED THE BACKFILL MATERIAL IS PLACED IN 8-INCH LIFTS AND MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D-698. TESTS SHALL BE TAKEN AT 100-FOOT INTERVALS ON EACH LIFT. BEDDING AND BACKFILL TO 1-FOOT ABOVE THE TOP OF PIPE SHALL BE CEMENT STABILIZED SAND. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)
8. ALL STORM SEWERS CONSTRUCTED INSIDE LOT EASEMENTS SHALL BE R.C.P. (C-76, CLASS III). MINIMUM TWENTY FOOT (20') WIDE EASEMENTS SHALL BE PROVIDED.
9. ALL TEMPORARY AND PERMANENT SIGNAGE MUST COMPLY WITH THE MOST CURRENT EDITION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AS CURRENTLY AMENDED.
10. ALL CONSTRUCTION STORM RUNOFF SHALL COMPLY WITH THE FINAL DRAFT OF THE STORMWATER MANAGEMENT HANDBOOK FOR CONSTRUCTION ACTIVITIES AS PREPARED BY HARRIS COUNTY/H.C.F.C.D., AND THE CITY OF HOUSTON; ALL IN COMPLIANCE WITH THE NATIONAL POLLUTANT ELIMINATION SYSTEM (NPDES) REQUIREMENTS.
11. UTILITY CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING STAGE II INLETS AFTER COMPLETION OF PAVING. (NO SEPARATE PAY)

REVISED: 2/14/97

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE

OVERALL PAVING AND DRAINAGE LAYOUT

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

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ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

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FLOOD CONTROL

COUNTY ENGINEER

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JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

6-24-97 WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING	STREET & BRIDGE ENGINEERING
7-18-97 STORM SEWER ENGINEERING	CONSTRUCTION

OTHER DEPARTMENT

7-30-97 PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

CITY ENGINEER — DATE 7/22/97

DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 7/22/97

SUBMITTED:	DESIGNED BY: JLG
SCALE: 1" = 100'	DRAWN BY: RWLY,DD,SP
DATE:	SHEET NO 4 OF 42 SHEETS
SURVEY BY:	CITY DWG NO:
F B NO:	

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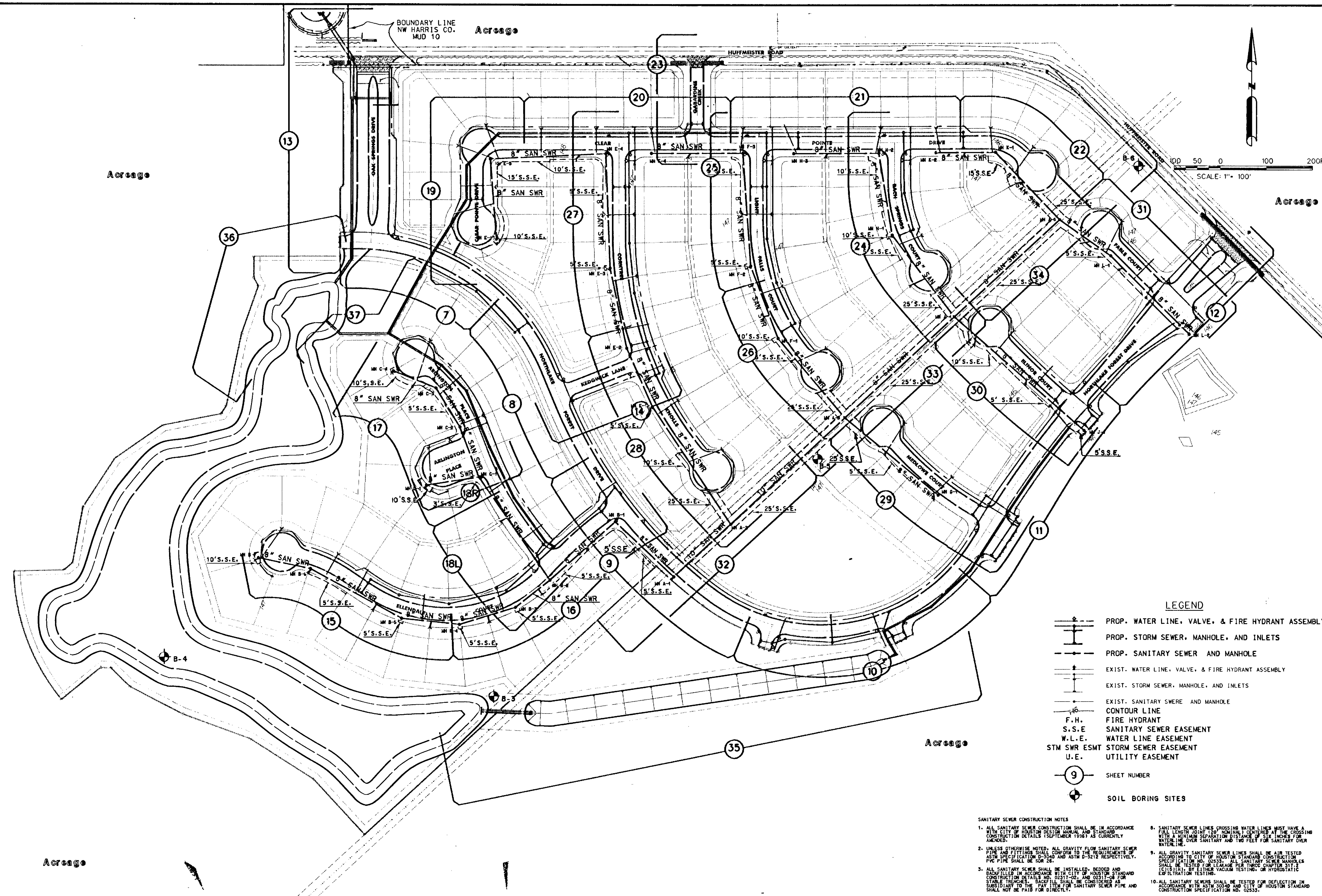

LEGEND

- PROP. WATER LINE, VALVE, & FIRE HYDRANT ASSEMBLY
- PROP. STORM SEWER, MANHOLE, AND INLETS
- PROP. SANITARY SEWER AND MANHOLE
- EXIST. WATER LINE, VALVE, & FIRE HYDRANT ASSEMBLY
- EXIST. STORM SEWER, MANHOLE, AND INLETS
- EXIST. SANITARY SWERE AND MANHOLE
- 146 — CONTOUR LINE
- F.H. — FIRE HYDRANT
- S.S.E — SANITARY SEWER EASEMENT
- W.L.E. — WATER LINE EASEMENT
- STM SWR ESMT — STORM SEWER EASEMENT
- U.E. — UTILITY EASEMENT
- (9) — SHEET NUMBER
- SOIL BORING SITES

100YR. FLOOD PLAIN
EL.= 146.00

NOTE:
ALL SANITARY SEWER MANHOLES (COVERS) SHALL BE SET AT ELEV. 146.00, OR GREATER.

SANITARY SEWER CONSTRUCTION NOTES

1. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON DESIGN MANUAL AND STANDARD CONSTRUCTION DETAILS (SEPTEMBER 1996) AS CURRENTLY AMENDED.
2. UNLESS OTHERWISE NOTED, ALL GRAVITY FLOW SANITARY SEWER PIPE AND FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION D-3040 AND ASTM D-3212 RESPECTIVELY. PVC PIPE SHALL BE SDR 26.
3. ALL SANITARY SEWER SHALL BE INSTALLED, BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02317-02, AND 02317-08 FOR STABLE TRENCHES. BACKFILL SHALL BE CONSIDERED AS SUBSIDIARY TO THE PAY ITEM FOR SANITARY SEWER PIPE AND SHALL NOT BE PAID FOR DIRECTLY.
4. ALL SANITARY SEWER MANHOLE CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02082-01, 02082-02, AND 02082-02N.
5. ALL SANITARY SEWER MANHOLE RIMS SHALL BE SET TWO (2) INCHES ABOVE THE SURROUNDING LEVELS OF FINISHED GRADE, BACKFILLED AND SLOPED FOR SURFACE WATER DRAINAGE AWAY FROM MANHOLE RIMS.
6. WHEN WATER LINES AND SANITARY SEWER LINES ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO EACH OTHER THAN NINE FEET (9') IN ALL DIRECTIONS AND PARALLEL LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHERE THE NINE FOOT (9') SEPARATION DISTANCE CANNOT BE ACHIEVED, THE GUIDELINES SET FORTH IN THE CITY OF HOUSTON DESIGN MANUAL (SEPTEMBER 1996) CHAPTER 7, 1.04.C AS CURRENTLY AMENDED SHALL GOVERN.
7. SANITARY SEWER LINE TRENCHES LOCATED UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1 1/2 SACK CEMENT/CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)
8. SANITARY SEWER LINES CROSSING WATER LINES MUST HAVE A FULL LENGTH JOINT (20' NOMINAL) CENTERED AT THE CROSSING WITH A MINIMUM SEPARATION DISTANCE OF SIX INCHES FOR WATERLINE OVER SANITARY AND TWO FEET FOR SANITARY OVER WATERLINE.
9. ALL GRAVITY SANITARY SEWER LINES SHALL BE AIR TESTED ACCORDING TO CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02533. ALL SANITARY SEWER MANHOLES SHALL BE TESTED FOR LEAKAGE PER TNRCC CHAPTER 317.2 (C)(5)(H), BY EITHER VACUUM TESTING, OR HYDROSTATIC EXFILTRATION TESTING.
10. ALL SANITARY SEWERS SHALL BE TESTED FOR DEFLECTION IN ACCORDANCE WITH ASTM 3034D AND CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02533.
11. NO CONNECTIONS SHALL BE MADE TO EXISTING SANITARY SEWER LINES UNTIL ALL PROPOSED SEWER LINES HAVE BEEN THOROUGHLY CLEANED, TESTED AND ACCEPTED BY THE ENGINEER.
12. STACKS SHALL BE SHOWN ON THE PLANS. EXACT LOCATION OF STACKS SHALL BE SUPPLIED TO THE ENGINEER AND THE CITY OF HOUSTON UPON COMPLETION OF CONSTRUCTION.
13. THE "Y" FITTING ON THE SANITARY SEWER LEAD SHALL BE INSIDE OF STREET RIGHT-OF-WAY OR IN AN EASEMENT.
14. IF THE SANITARY LEADS HAVE LESS THAN THREE (3) FEET OF TOP COVER USE DUCTILE IRON PIPE FOR SANITARY SEWER LEADS.
15. DUCTILE IRON PIPE SHALL HAVE 80 MILS OF POLYETHYLENE WRAP AND SHALL BE LINED WITH 40-50 MILS OF POLYETHYLENE LINING TO COVER ALL SURFACES EXPOSED TO SANITARY SEWAGE. USE "POLYLINE" BY US PIPE OR "POLYBOND" BY AMERICAN C.I.P.
16. CONTRACTOR SHALL OBTAIN & USE A COPY OF DESIGN MANUAL, STD SPEC & STD DETAILS OBTAIN FROM CITY OF HOUSTON 1801 MAIN FILE ROOM.

NOTE: FORMAL "NOTIFICATION APPROVED BY COMMISSIONERS COURT REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES WITHIN HARRIS COUNTY RIGHT-OF-WAY. CONTACT HARRIS COUNTY PERMIT DIVISION (713-956-3000)

REVISED: 2/14/97

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE

OVERALL
SANITARY SEWER LAYOUT

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD. APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70'

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RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
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NOTES

STATE OF TEXAS
J.L. GRAHAM, JR.
66480
PROFESSIONAL ENGINEER
6/18/97

FLOOD CONTROL

COUNTY ENGINEER

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JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING 6-24-97	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 7/1/97	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 7-8-97	CONSTRUCTION

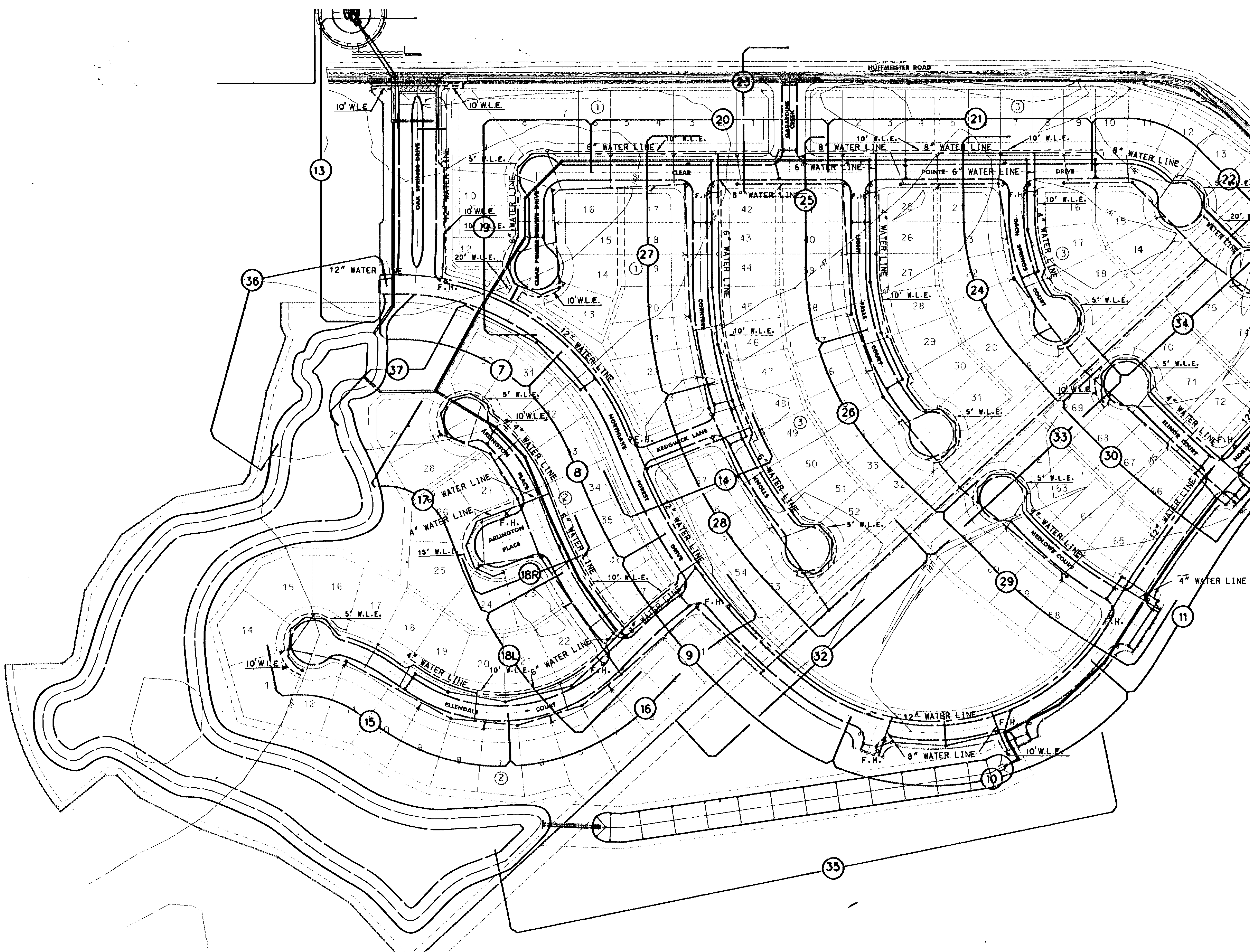
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT 7-30-97	SPONSOR DEPARTMENT

CITY ENGINEER — DATE 7/24/97
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 7/24/97

SUBMITTED:	DESIGNED BY: JLG
SCALE: 1" = 100'	DRAWN BY: RWLY,DD,SP
DATE:	SHEET NO 5 OF 42 SHEETS
SURVEY BY:	CITY DWG NO:
F B NO:	

P-600



100 50 0 100 200FT
SCALE: 1"= 100'

LEGEND

	PROP. STORM SEWER, MANHOLE, AND INLETS
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146	CONTOUR LINE
F.H.	FIRE HYDRANT
S.S.E	SANITARY SEWER EASEMENT
W.L.E.	WATER LINE EASEMENT
STM SWR ESMT	STORM SEWER EASEMENT
U.E.	UTILITY EASEMENT
(9)	SHEET NUMBER

WATER LINE CONSTRUCTION NOTES

1. WATER MAIN/METER CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON DESIGN MANUAL AND STANDARD CONSTRUCTION DETAILS (SEPTEMBER 1996) AS CURRENTLY AMENDED.
2. ALL WATER MAINS FOUR (4) INCHES THRU 12 INCHES IN DIAMETER, IF NOT SPECIFIED OTHERWISE, SHALL BE AWWA C-900 PVC PIPE, CLASS 150, DR18, WITH RUBBER GASKETED BELL AND SPIGOT PUSH ON JOINTS.
3. ALL VALVES SHALL BE GATE VALVES UNLESS OTHERWISE NOTED AND SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF AWWA C-500.
4. ALL WATER LINES SHALL BE ENCASED IN BANK SAND, AND BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAIL NO. 02511-01. COST OF BANK SAND TO BE INCLUDED IN UNIT COST FOR WATERLINE AND SHALL NOT BE PAID FOR DIRECTLY.
5. WHEN WATER LINES AND SANITARY SEWER LINES ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO EACH OTHER THAN NINE FEET (9') IN ALL DIRECTIONS AND PARALLEL LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHERE THE NINE FOOT (9') SEPARATION DISTANCE CANNOT BE ACHIEVED, THE GUIDELINES SET FORTH IN THE CITY OF HOUSTON DESIGN MANUAL (SEPTEMBER 1996) CHAPTER 7, 1.04.C AS CURRENTLY AMENDED SHALL GOVERN.
6. ALL WATER LINE TRENCHES LOCATED UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1½ SACK CEMENT/CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)
7. CONTRACTOR SHALL PROVIDE ADEQUATE THRUST BLOCKING TO WITHSTAND TEST PRESSURE SPECIFIED IN "SPECIFICATION FOR WATER MAIN CONSTRUCTION AND MATERIALS" WITH LATEST ADDENDA AND AMENDMENTS THERETO.
8. WATER LINE SHALL BE CONSTRUCTED SUCH THAT ALL CROSSES AND TEES WILL NOT BE LOCATED UNDER PROPOSED OR FUTURE PAVING.
9. WHERE A WATER LINE OR LEAD CROSSES OR COMES WITHIN 9 FEET OF AN EXISTING SANITARY SEWER OR SANITARY SEWER LEAD AND THAT SANITARY SEWER IS FOUND TO BE LEAKING, REPLACE A 20 FOOT SECTION OF THE SEWER WITH C900 DR 18 PVC OR DUCTILE IRON PIPE CENTERED ON THE CLOSEST POINT.
10. ALL STATIONS ARE CENTERLINE OF THE STREET RIGHT-OF-WAY UNLESS OTHERWISE NOTED.
11. ALL FIRE HYDRANTS SHALL BE LOCATED AS SHOWN ON THE PLANS AND SET THREE FEET (3') BEHIND BACK OF CURB (EXCEPT WITHIN ESPLANADES: WHERE FIRE HYDRANTS SHALL BE SEVEN
12. UTILITY CONTRACTOR TO TURN FIRE HYDRANTS AND MAKE ALL FINAL ADJUSTMENTS AFTER COMPLETION OF PAVING. (NO SEPARATE PAY)
13. SANITARY PRECAUTIONS MUST BE TAKEN DURING WATERLINE CONSTRUCTION, AS CALLED FOR BY AWWA STANDARDS AND CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02514.
14. NEW MAINS SHALL BE THOROUGHLY DISINFECTED IN ACCORDANCE WITH AWWA SPECIFICATIONS C-651 AND THEN FLUSHED AND SAMPLED BEFORE BEING PLACED IN SERVICE. SAMPLES SHALL BE COLLECTED FOR BACTERIOLOGICAL ANALYSIS TO CHECK THE EFFICIENCY OF THE DISINFECTING PROCEDURE, WHICH SHALL BE REPEATED IF CONTAMINATION PERSISTS. A MINIMUM ONE SAMPLE FOR EACH 1,000 FEET OF COMPLETED WATER MAIN WILL BE REQUIRED. WATER SAMPLES MUST MEET TEXAS STATE DEPARTMENT OF HEALTH AND CITY OF HOUSTON REQUIREMENTS PRIOR TO PLACING THE LINES INTO SERVICE.
15. ALL WATER LINES TO BE HYDROSTATICALLY TESTED BY CONTRACTOR AT 125 PSI IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02515 AS CURRENTLY AMENDED.

NOTE: FORMAL "NOTIFICATION APPROVED BY COMMISSIONERS COURT REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES WITHIN HARRIS COUNTY RIGHT-OF-WAY. CONTACT HARRIS COUNTY PERMIT DIVISION (713-956-3000)

REVISED: 2/14/97

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE

OVERALL WATER LINE LAYOUT

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

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TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

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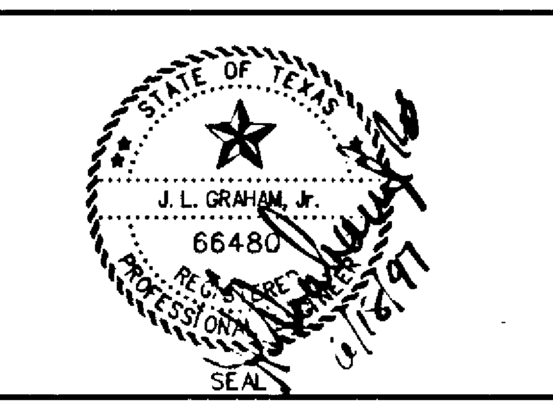
SEAL

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COUNTY ENGINEER

Steffek & VanDeWiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

6-24-97 WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
7/1/97 WASTEWATER ENGINEERING	STREET & BRIDGE ENGINEERING
7-18-97 STORM SEWER ENGINEERING	CONSTRUCTION

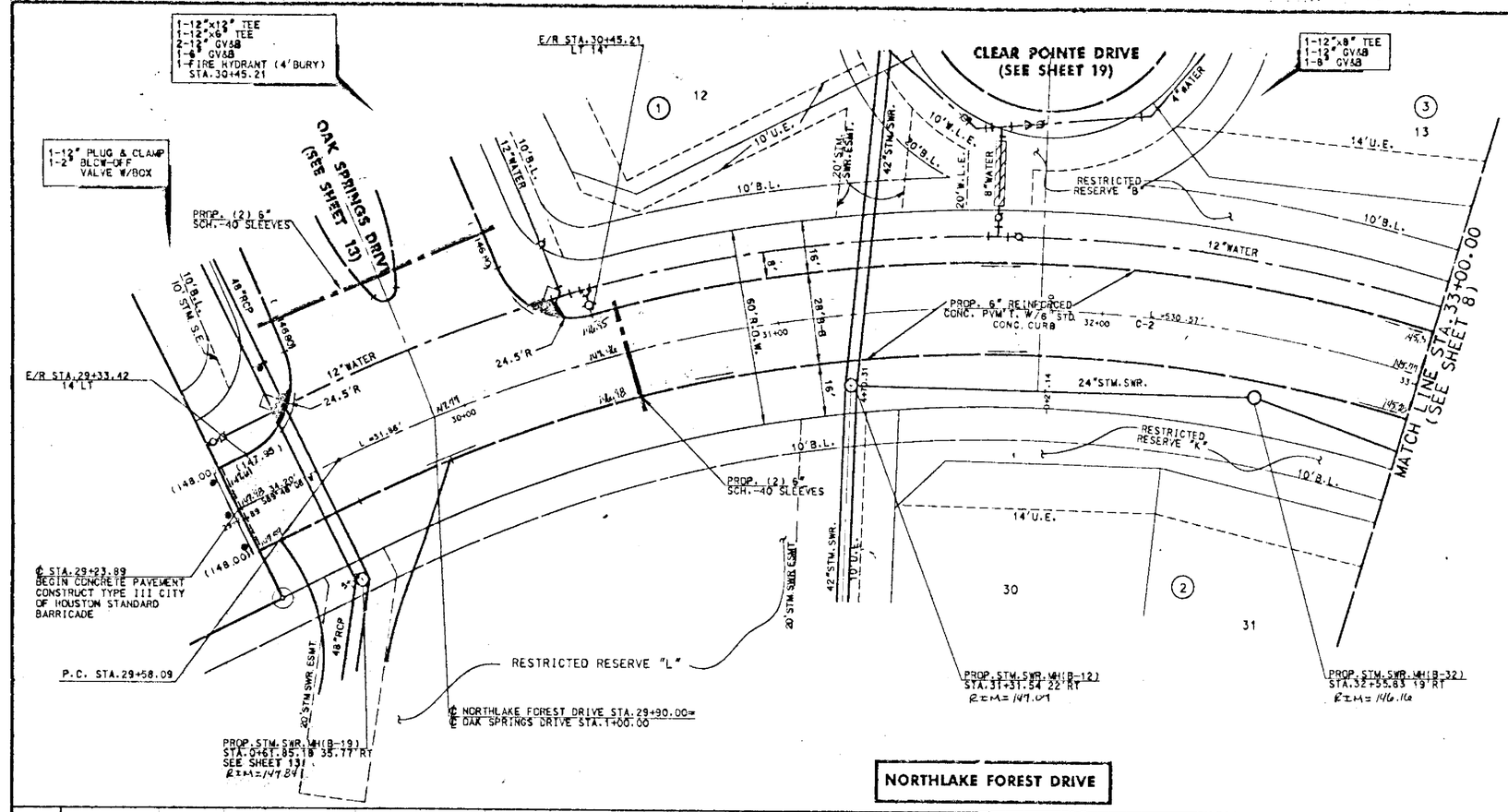
OTHER DEPARTMENT

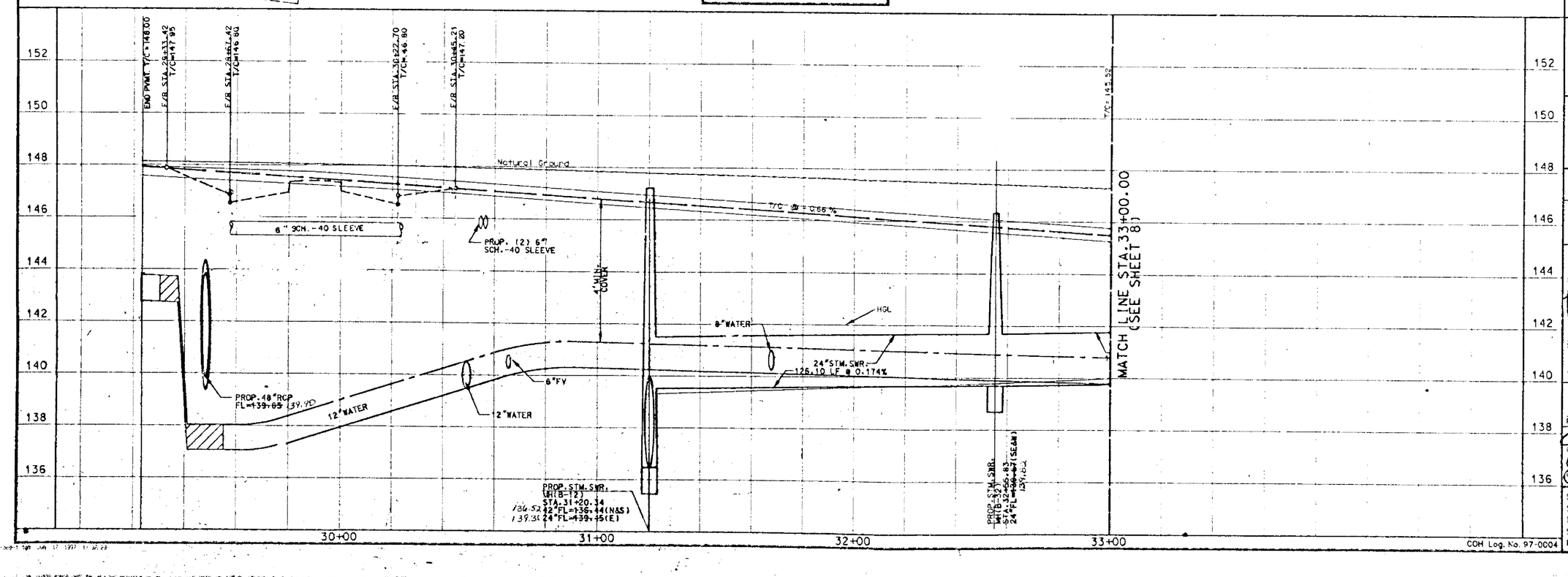
7-30-97 PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

CITY ENGINEER — DATE 7/31/97
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:	DESIGNED BY: JLG
SCALE: 1" = 100'	DRAWN BY: RWLY,DD,SP
DATE:	SHEET NO 6 OF 42 SHEETS
SURVEY BY:	CITY DWG NO:
F B NO:	

P-600





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 29+23.89 TO STA. 33+00

BENCH MARK

REFERENCE BENCHMARK
NW 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED: for County Engineer
1/30/97
Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS
R.L. GRAHAM, JR.
66430
REGISTERED PROFESSIONAL ENGINEER
9/17/97
SEAL

FLOOD CONTROL

REVISIONS
1 REVISED 12/29/97 CHANGED PAVEMENT TO 6" REINFORCED CONCRETE PAVEMENT
2 REVISED 12/29/97 CHANGED TRANSITION TO 8" REINFORCED CONCRETE PAVEMENT

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3718
713/782-0042

JOB NO. 10902-001-1-0TL | SHEET NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 7/14/97	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING	CONSTRUCTION

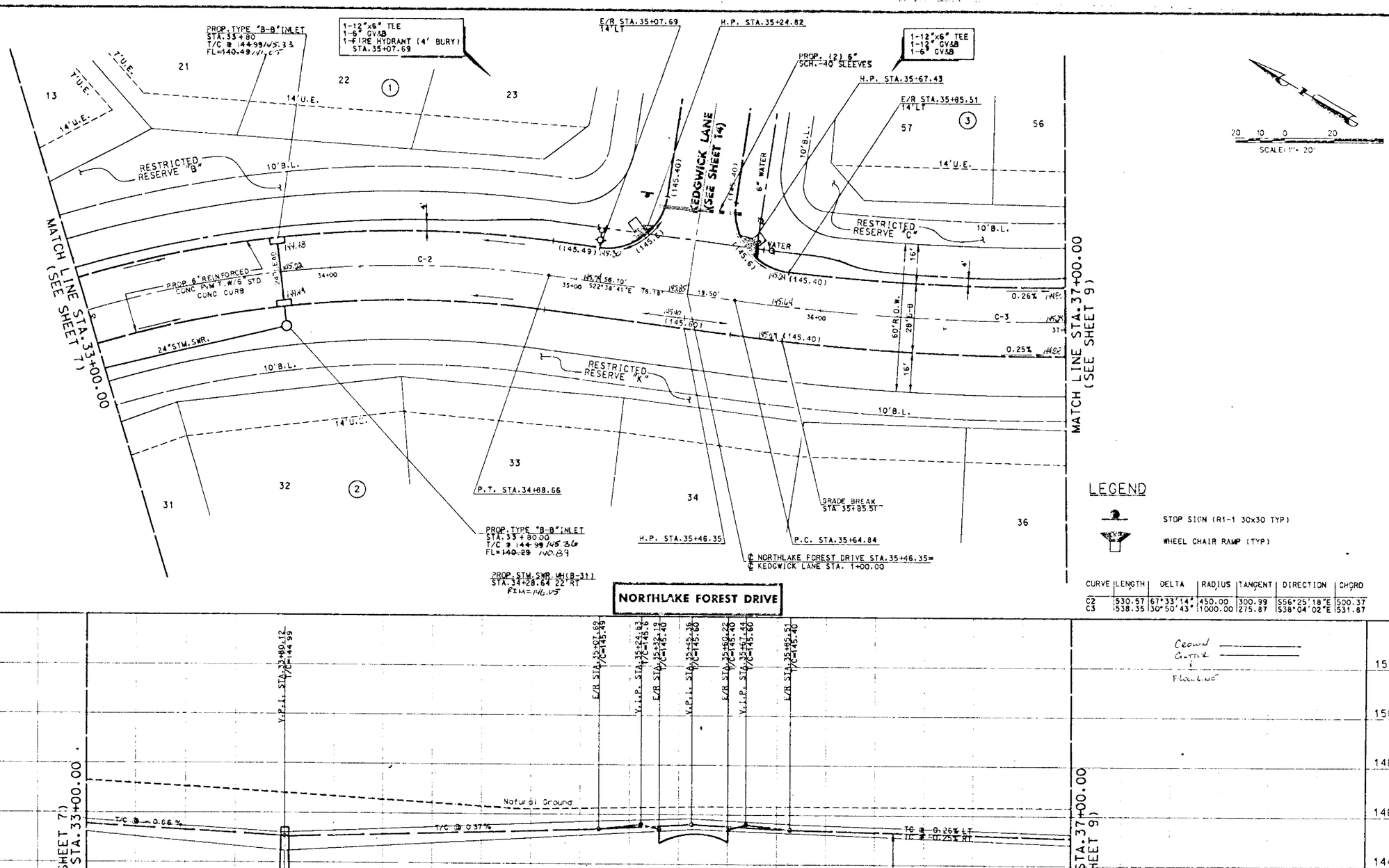
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT 2-20-97	SPONSOR DEPARTMENT
CITY ENGINEER DATE 2/26/97	
DIRECTOR OF PUBLIC WORKS AND ENGINEERING DATE 3/4/97	

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 7 OF 42 SHEETS
CITY DWG NO:

P-600

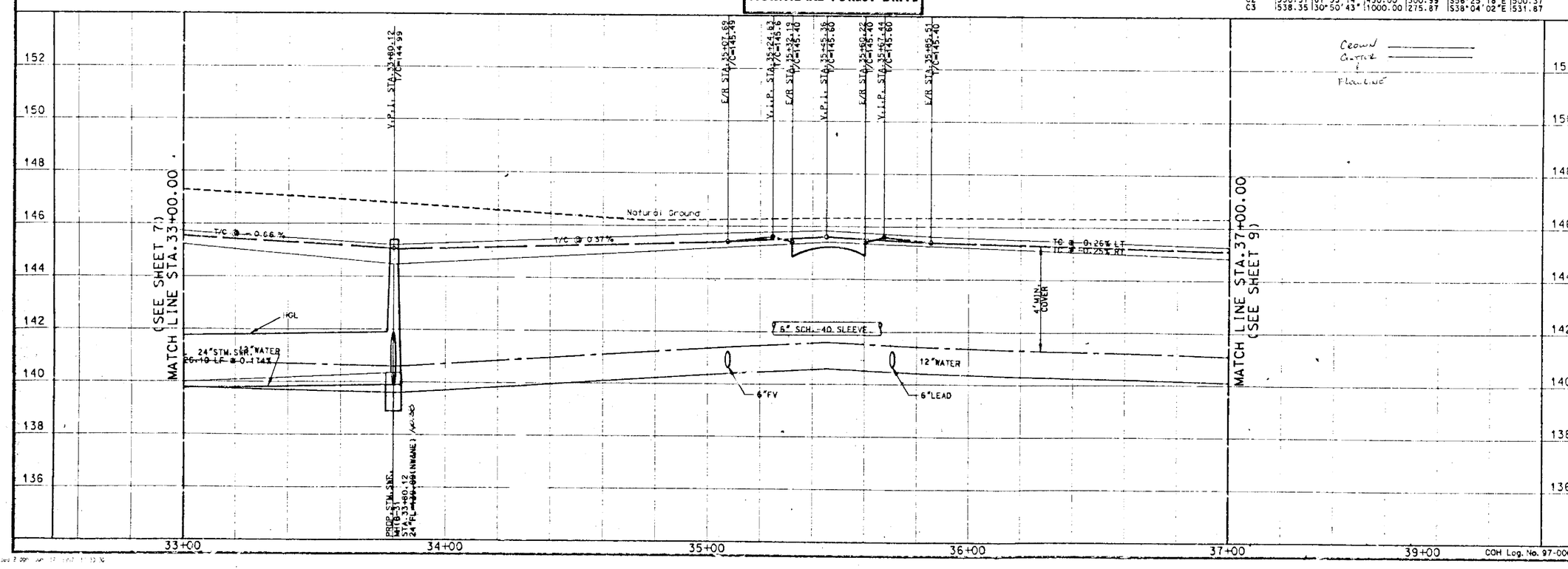


LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C2	530.57	67°33'14"	450.00	300.99	S56°25'18"E	500.37
C3	538.35	30°50'43"	1000.00	275.87	S38°04'02"E	531.87



COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 33+00.00 TO STA. 37+00.00

BENCH MARK

REFERENCE BENCHMARK
RM NO.4 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED: for County Engineer
Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS — J.L. GRAHAM — 66480 — REGISTERED PROFESSIONAL ENGINEER — SEAL

FLOOD CONTROL

REVISIONS
1. REVISED 2/29/97 CHANGED PAVEMENT TO 6" REINFORCED CONCRETE PAVEMENT
2. REVISED 2/29/97 CHANGED TRANSITION TO 6" REINFORCED CONCRETE PAVEMENT

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275, Houston, Texas 77042-3718, 713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F B NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 8 OF 48 SHEETS
CITY DWG NO:

P-600

Monday, December 18 2000

℄ NORTHLAKE FOREST DRIVE STA.38+25.23=
℄ ELLENDALE COURT STA.9+48.69

1-12"x9" TEE
1-12" GV&B

1-12"x6" TEE
1-6" GV&B
1-FIRE HYDRANT (4' BURY)
STA.38+60.20

PROP. TYPE "B-B" INLET
STA.37+85.00
T/C @ 144+68 Lt & Rt
FL=140+39

P.C.C. STA.41+03.20

(SEE SHEET 32)

30' TRUNKLINE GAS CO. ESM'T
VOL. 2268, PG. 327 HOUR

SCALE: 1" = 20'

MATCH LINE (SEE SHEET 8) STA.37+00.00

MATCH LINE (SEE SHEET 10) STA.42+00.00

RESTRICTED RESERVE "H"

RESTRICTED RESERVE "C"

RESTRICTED RESERVE "K"

RESTRICTED RESERVE "J"

100' VERTICAL CURVE

150' VERTICAL CURVE

12"WATER

8"SAN.SWR.

PROP. 6"REINFORCED CONC. PVMT. W/6" STD. CONC. CURB

PROP. (2) 6" SCH.-40 SLEEVES

E/R STA.37+86.01 14' RT

E/R STA.38+60.20 14' RT

H.P. STA.40+20.00

ELLENDALE COURT (SEE SHEET 16)

PROP. SAN.SWR. MH (B-1) STA.38+45.46, 31.37' RT

PROP. SAN.SWR. DROP MH (A-1) (SEE SHEET 32)

NORTHLAKE FOREST DRIVE

LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C3	538.35	30°50'43"	1000.00	275.87	S38°04'02"E	531.87
C4	656.99	94°06'25"	400.00	429.75	N79°27'24"E	585.59

PROP. FILL W/8" LIFTS & COMPACTED TO 95% STND. PROC. DENS.

Crown
Gutter
℄
Pvmt Line

TC @ 3.05%

TC @ -0.26% LT
TC @ -0.25% RT

Natural ground

150' V.C. V.P.I. STA.39+90.00 T/C=149.80 a=0.83

PROP. (2) 6" SCH-40 SLEEVES

Gas Line' ELEV. = 5' CORRECT → TOP OF GAS LINE @ ℄ ROADWAY = 142.71

CAUTION
EXISTING 24" HIGH PRESSURE TEXAS EASTERN TRANSMISSION CORP PIPELINE, CONTRACTOR SHALL CONTACT MR. BILL CASLE PRIOR TO ANY EXCAVATION ACTIVITY AT 281-373-0821

EXIST 24" GAS

6"F.V.

5' MIN

12" WATER

8"WATER

SCH.-40 SLEEVE

8"SAN.SWR. 175 LF @ 0.44%

PROP. STA.39+35.00 MH(B-11) (SEE SHEET 15) 24"FL=139.81(SWASE) 24"FL=140.19(NE)

PROP. SAN.SWR. MH(B-11) STA.38+45.46 8"FL=136.10(SWASE)

PROP. SAN.SWR. DROP MH(A-17) (SEE SHEET 32) 8"FL=131.98(SW&NE) 8"FL=135.33(NW)

37+00 38+00 39+00 40+00 41+00 42+00

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 37+00.00 TO STA. 42+00.00

BENCH MARK

REFERENCE BENCHMARK
TM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED for County Engineer
8/20/97

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid For 1 Year Only

J.L. GRAMLEY
66480
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
SEAL
8/14/97

FLOOD CONTROL

REVISIONS
1. REVISED 12/29/97 CHANGED PAVEMENT TO 6" REINFORCED CONCRETE PAVEMENT
2. REVISED 2/25/97 CHANGED TRANSITION TO 6" REINFORCED CONCRETE PAVEMENT

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3718
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

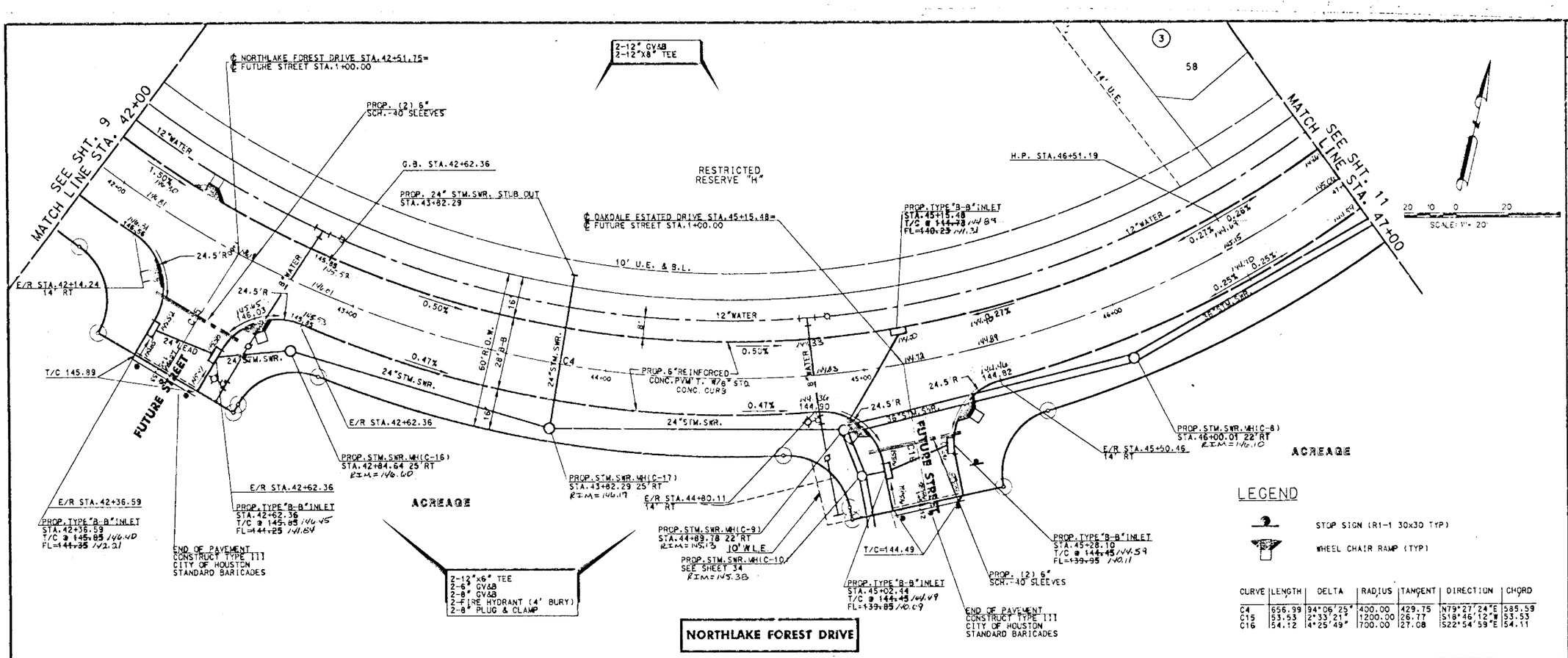
WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE 7/30/97
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 7/29/97

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 9 OF 42 SHEETS
CITY DWG NO:

P-600



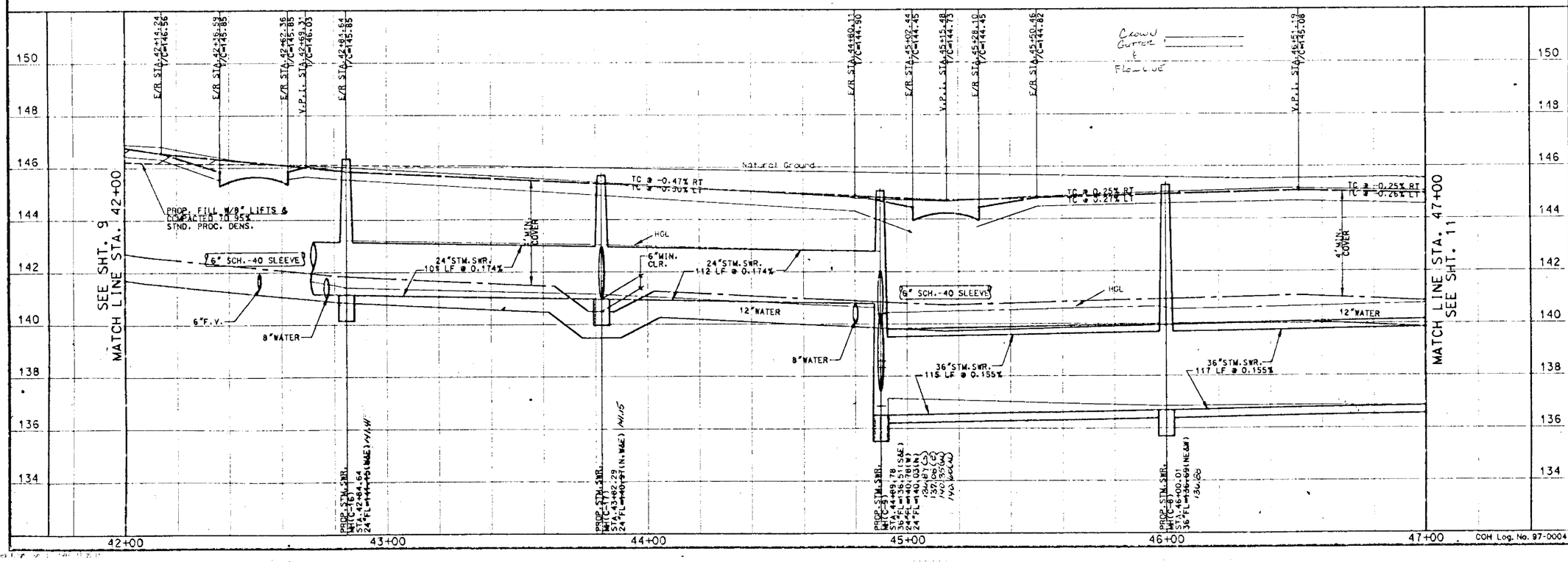
LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C4	656.99	94°06'25"	400.00	429.75	N79°27'24"E	585.59
C15	53.53	2°33'21"	1200.00	26.77	S18°46'12"W	53.53
C16	54.12	4°25'49"	700.00	27.08	S22°54'59"E	54.11

NORTHLAKE FOREST DRIVE



COH Log. No. 97-0004

P-600

NORTH-WEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 42+00.00 TO STA. 47+00.00

BENCH MARK

REFERENCE BENCHMARK
TM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED for County Engineer
8/20/97
DATE

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization Is Valid for 1 Year Only

STATE OF TEXAS
A. L. GRAHAM
66480
REGISTERED PROFESSIONAL ENGINEER
SEAL
8/19/97

FLOOD CONTROL

REVISIONS
1 REVISED 12/29/97 CHANGED PAVEMENT TO 6" REINFORCED CONCRETE PAVEMENT
2 REVISED 12/29/97 CHANGED TRANSITION TO 6" RE INFORCED CONCRETE PAVEMENT.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

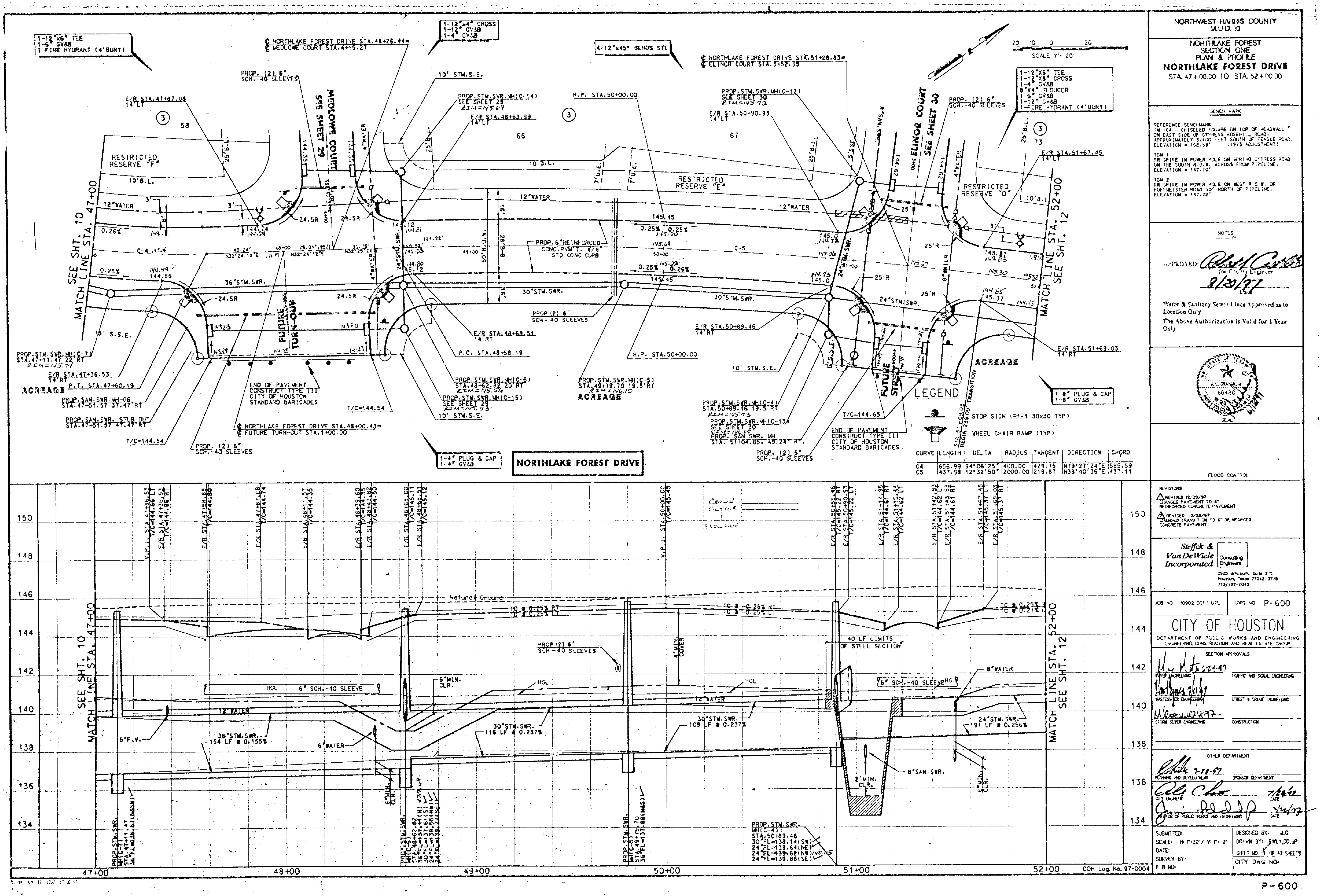
WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING
CONSTRUCTION

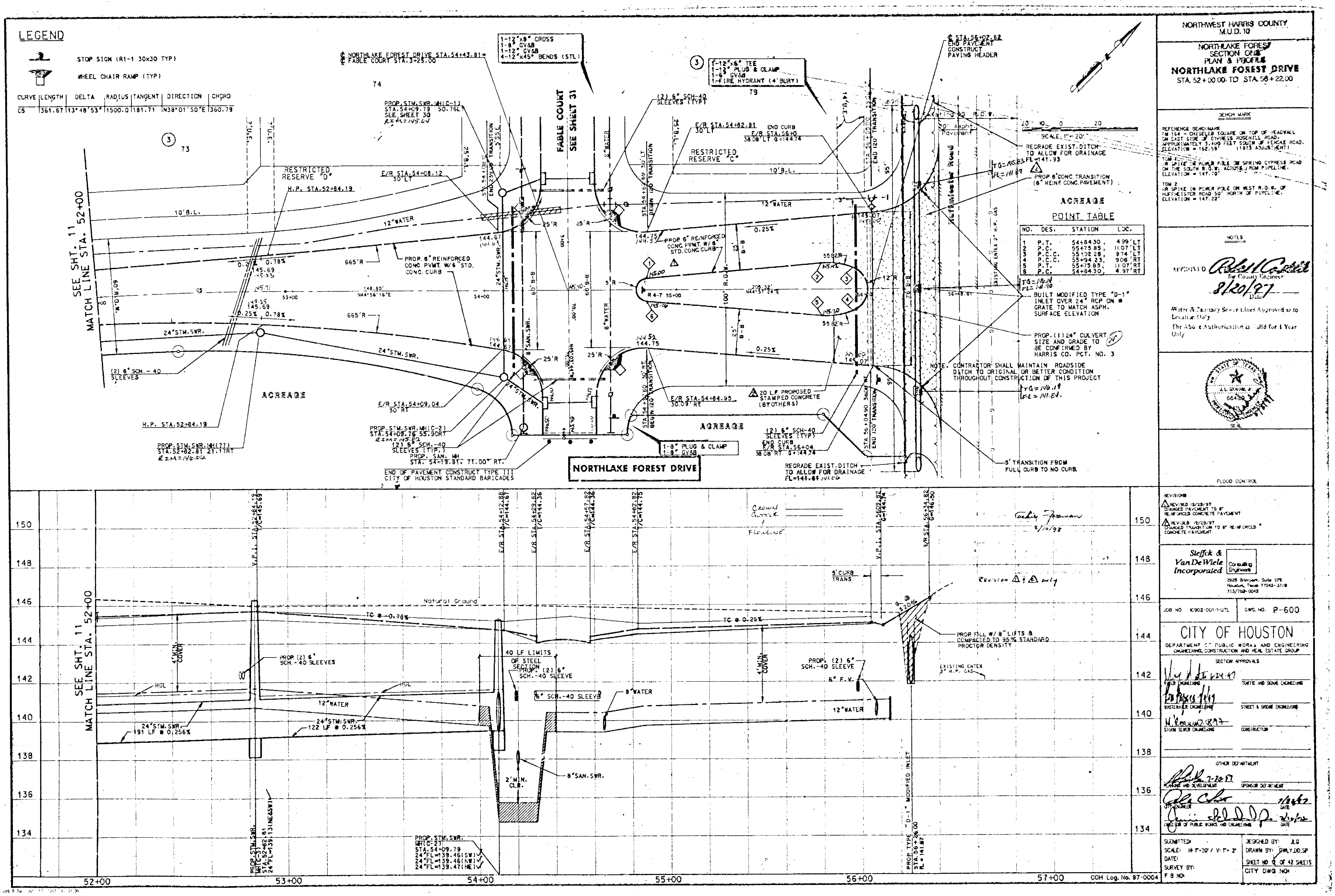
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT
CITY ENGINEER — DATE 2/24/98
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 2/24/98

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWLY, DO, SP
SHEET NO. 10 OF 42 SHEETS
CITY DWG NO:


NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 47+00.00 TO STA. 52+00.00
BENCH MARK
NOTES
FLOOD CONTROL
REVISIONS
Steffek & VanDeWiele Incorporated Consulting Engineers
JOB NO. 10902-001-1-UTL
DWG. NO. P-600
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
SECTION APPROVALS
COH Log. No. 97-0004
NORTHLAKE FOREST DRIVE
MEDLOWE COURT SEE SHEET 29
ELINOR COURT SEE SHEET 30
RESTRICTED RESERVE "F"
RESTRICTED RESERVE "E"
RESTRICTED RESERVE "D"
ACREAGE
MATCH LINE STA. 47+00 SEE SHT. 10
MATCH LINE STA. 52+00 SEE SHT. 12
LEGEND
STOP SIGN (R1-1 30X30 TYP)
WHEEL CHAIR RAMP (TYP)
Natural Ground
47+00
48+00
49+00
50+00
51+00
52+00
P-600


NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
NORTHLAKE FOREST DRIVE
STA. 52+00.00 TO STA. 56+22.00
LEGEND
STOP SIGN (R1-1 30x30 TYP)
WHEEL CHAIR RAMP (TYP)
CURVE | LENGTH | DELTA | RADIUS | TANGENT | DIRECTION | CHORD
C5 | 361.67 | 13°48'53" | 1500.0 | 181.71 | N38°01'50"E | 360.79
FABLE COURT SEE SHEET 31
NORTHLAKE FOREST DRIVE
RESTRICTED RESERVE "D"
RESTRICTED RESERVE "C"
ACREAGE
SEE SHT. 11 MATCH LINE STA. 52+00
ACREAGE POINT TABLE
NO. | DES. | STATION | LOC.
1 | P.T. | 54+84.30 | 4.99' LT
2 | P.C. | 55+75.85 | 11.07' LT
3 | P.C.C. | 55+102.28 | 9.74' LT
4 | P.C.C. | 55+94.23 | 9.06' RT
5 | P.T. | 55+75.85 | 11.07' RT
6 | P.C. | 54+84.30 | 4.97' RT
NOTE: CONTRACTOR SHALL MAINTAIN ROADSIDE DITCH TO ORIGINAL OR BETTER CONDITION THROUGHOUT CONSTRUCTION OF THIS PROJECT
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
Steffek & VanDeWiele Incorporated Consulting Engineers
JOB NO. 10902-001-1-UTL
DWG. NO. P-600
52+00
53+00
54+00
55+00
56+00
57+00
COH Log. No. 97-0004
SCALE: 1"=20'

POINT TABLE

NO.	DES.	STATION	LOC.
1	P.C.	1+40.97	3.67'LT
2	P.R.C.	1+73.31	10.00'LT
3	P.T.	2+36.44	10.00'LT
4	P.C.	4+25.88	10.00'LT
5	P.C.C.	4+58.91	3.72'LT
6	P.C.C.	4+58.91	3.72'RT
7	P.T.	4+25.88	10.00'RT
8	P.C.	2+36.44	10.00'RT
9	P.C.C.	1+74.84	10.00'RT
10	P.C.C.	1+41.06	3.77'RT

PROP. STM. SWR. M.H. (B-16) STA. 0+67.85 38.49'LT
E/M = 147.69

END OF PAVEMENT CONSTRUCT TYPE III CITY OF HOUSTON STANDARD BARICADES & PAVING HEADER

STA. 1+00.00 OAK SPRINGS DRIVE = STA. 29+90.00 NORTHLAKE FOREST DRIVE

P.T. STA. 2+36.44

E/R STA. 1+35.90 35'LT

V.P.I. STA. 1+92.71

30' STM. SWR. EASE.

48" RCP

10' B.L.

RESTRICTED RESERVE "A"

10' STM. S.E.

(SEE NOTE)

48" RCP

PROP. TYPE "C-2A" INLET W/10' EXT. EA. SIDE STA. 4+14.88 T/C @ 145.92 146.37 FL=140.22 140.72

PROP. STM. SWR. MH (B-17) STA. 4+14.88 FL=139.00 E/M = 147.39

END CURB E/R STA. 4+71.20 35'LT G=147.03

FL=140.84(S) 143.00(W) PROP. (2) 30" RCP CULVERT DRAIN EXISTING DITCH TO 7'x4' CULV'T. @ FL 143.4

PROP. STM. SWR. MH (B-18) STA. 5+00.38, 44.5'LT FL=138.79 E/M = 147.98

PROP. (2) 6" SCH.-40 SLEEVES

10' W.L.E.

7'x4' BOX CULVERT

FOR SLOPE PAVING, SEE DETAIL SHT 4 OF 42

Existing 60' R.O.W.

20' Asphalt Pavement 20'

CONSTRUCTION JOINT AROUND M.H. (B-18) ALL SIDES

42" CMP RESTRICTOR PIPE (SEE NOTE)

DITCH, (NIC) L 106-00-00

END TRIP HAZ

BACKSLOPE DITCH (NIC)

149' DRAINAGE EASEMENT

PROP. STM. SWR. (B-19) STA. 5+72.88, 93.38'LT FL=138.58 E/M = 148.11

PROP 6" CONC. TRANSITION (6" REINF CONC. PAVEMENT)

NOTE: 42" C.M.P. AND 48" R.C.P. TO BE REPLACED WITH A 7'X4' BOX CULVERT WHEN SECTION TWO IS CONSTRUCTED

RESTRICTED RESERVE "B"

PROP. TYPE "C-2A" INLET W/10' EXT. EA. SIDE STA. 4+14.88 T/C @ 145.98 146.32 FL=140.42 140.88

PROP. 6" REINFORCED CONC. PVMT. W/6" STD. CONC. CURB

PROP. 6" REINFORCED CONC. PVM'T. W/ CURB

1-12"x12" TEE
2-12" GATE VALVE & BOX
3-12" 45° PLUG & CLAMP
2-12" 45° BENDS

END CURB E/R STA. 4+71.20 35'RT G=147.03

PROP. 12" WATER

FILL - GRADE TO DRAIN

1495'R

1515'R

90'R

4'R

C-1

N00°11'59"W 250.00

2+00

3+00

4+00

25'B-B

20'B-B

90' R.O.W.

36" LEAD

12" WATER

10' W.L.E.

20' B.L.

14' U.E.

E/R STA. 1+34.76 35'RT

V.P.I. STA. 1+92.71

NORTHLAKE FOREST DRIVE (SEE SHEET 7)

PROP. (2) 6" SCH.-40 SLEEVES

12 11 10 9

OAK SPRINGS DRIVE

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C1	136.44	5°11'40"	68.27	181.71	S2°23'55"W	136.40

ACREAGE

LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

NOTE: CONTRACTOR SHALL MAINTAIN ROADSIDE DITCH TO ORIGINAL OR BETTER CONDITION THROUGHOUT CONSTRUCTION OF THIS PROJECT

SCALE: 1"= 20'

Crown
Gutter
Flowline

E/R STA. 1+40.97 T/C=147.95 LT
E/R STA. 1+11.33 T/C=147.29 RT
E/R STA. 1+35.90 T/C=146.80
E/R STA. 4+71.20 G=147.03
E/R STA. 5+06.2 EXISTING ROAD SURFACE
VPI STA. 4+41.54 EL=146.17
VPI STA. 4+14.88 EL=145.92

59.32' V.C.

5' CURB TRANS.

Natural Ground

T/C @ -0.32%

TC @ 0.25%

6" SCH.-40 SLEEVE

PROP. (2) 6" SCH.-40 SLEEVE

PROP. (2) 6" SCH.-40 SLEEVE

4'W.W. COVER

349 LF 48" RCP @ 0.24%

12" WATER

139.85

PROP. 12" WATER 7'x4' STM. SWR. BOX CULVERT 85.5 LF @ 0.24%

7'x4' STM. SWR. BOX CULVERT 67.5 LF @ 0.24%

BORE & JACK 35 L.F.

PROP. FILL W/8" LIFTS & COMPACTED TO 95% STANDARD PROCTOR DENSITY.

PROP BACKSLOPE DITCH (NIC)

PROP 42" CMP 54.5 LF @ 0.15% RESTRICTOR PIPE

BEGIN DITCH STA. 6+18.14 (124.08' LT.) FL=138.50 (136.69)

END PROP. 42" CMP STA. 6+18.14 (124.08' LT) FL=138.50 (136.69)

END SLOPE PAVING STA. 6+18.14 (124.08' LT.)

PROP. STM. SWR. (B-16) STA. 0+67.85 48"FL=139.66(NAS#) (137.90)

PROP. STM. SWR. MH (B-17) STA. 4+14.88 36"FL=140.12(E) 48"FL=139.00(S) 7'x4' BOX FL=139.00 (N)

PROP. (2) 30" RCP STA. 4+32.61 FL=139.70(W) 36"

PROP. STM. SWR. MH (B-18) STA. 5+00.38 RCP FL=138.79 (136.69)

PROP. STM. SWR. (B-19) STA. 5+72.88 48"FL=138.58(NAS) (136.77)

152 150 148 146 144 142 140 138 136

1+00 2+00 3+00 4+00 5+00 6+00

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

OAK SPRINGS DRIVE

STA. 1+00.00 TO STA. 5+06.19

BENCH MARK

REFERENCE BENCHMARK
RM 1G4 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 152.99' (1973 ADJUSTMENT)

TBM 1
SR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
SR SPIKE IN POWER POLE ON WEST R.O.W. OF HOFFMEISTER ROAD 30' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

- PROP. CULVERT SIZE & GRADE TO BE CONFIRMED BY HARRIS COUNTY PRECINCT 3

APPROVED Robert Catalena (for County Engineer) 8/20/97 Date

Water & Sanitary Sewer Layout approved as to location only.

The above Authorization is Valid for 1 Year Only

STATE OF TEXAS J. L. GRAHAM JR. 66480 REGISTERED PROFESSIONAL ENGINEER SEAL 8/11/97

FLOOD CONTROL

REVISIONS
1 REVISED 12/29/97 CHANGED PAVEMENT TO 6" REINFORCED CONCRETE PAVEMENT
2 REVISED 12/29/97 CHANGED TRANSITION TO 6" REINFORCED CONCRETE PAVEMENT.

Revisions 1 & 2 only 2/10/98

Steffek & Van De Wiele Incorporated, Consulting Engineers
2925 Briarpark, Suite 275, Houston, Texas 77042-3778, 713/782-0042

JOB NO. 10902-001-1.UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

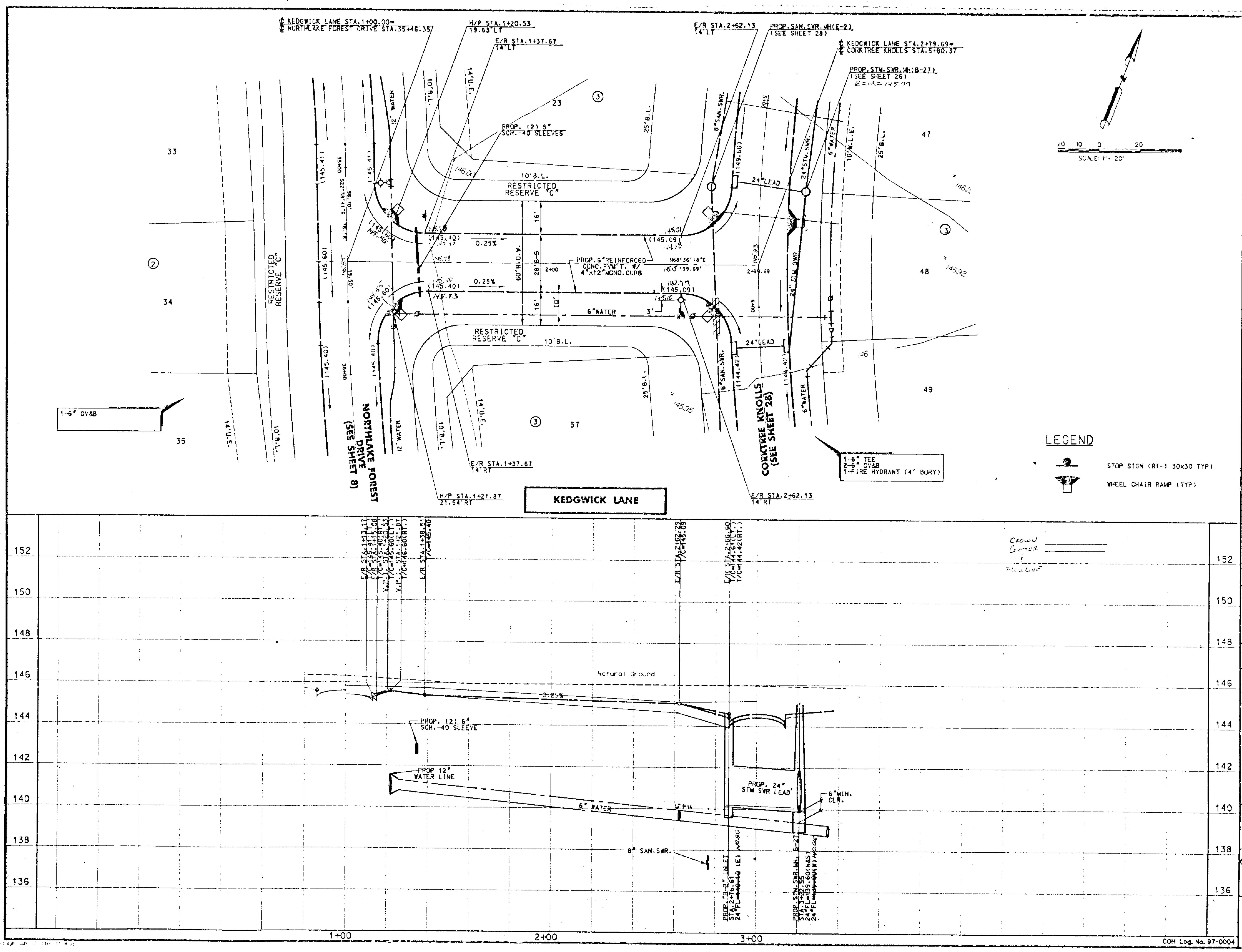
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE 7/9/98
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 7/9/98

SUBMITTED:
SCALE: H 1"=20' / V 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWL,DD,SP
SHEET NO 5 OF 42 SHEETS
CITY DWG NO:

Monday, December 18 2000



NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
KEDGWICK LANE
STA. 1+00.00 TO STA. 2+99.69

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD. APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED: [signature] for County Engineer
8/20/97
Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS
J. L. GRAHAM, Jr.
66480

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902 001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

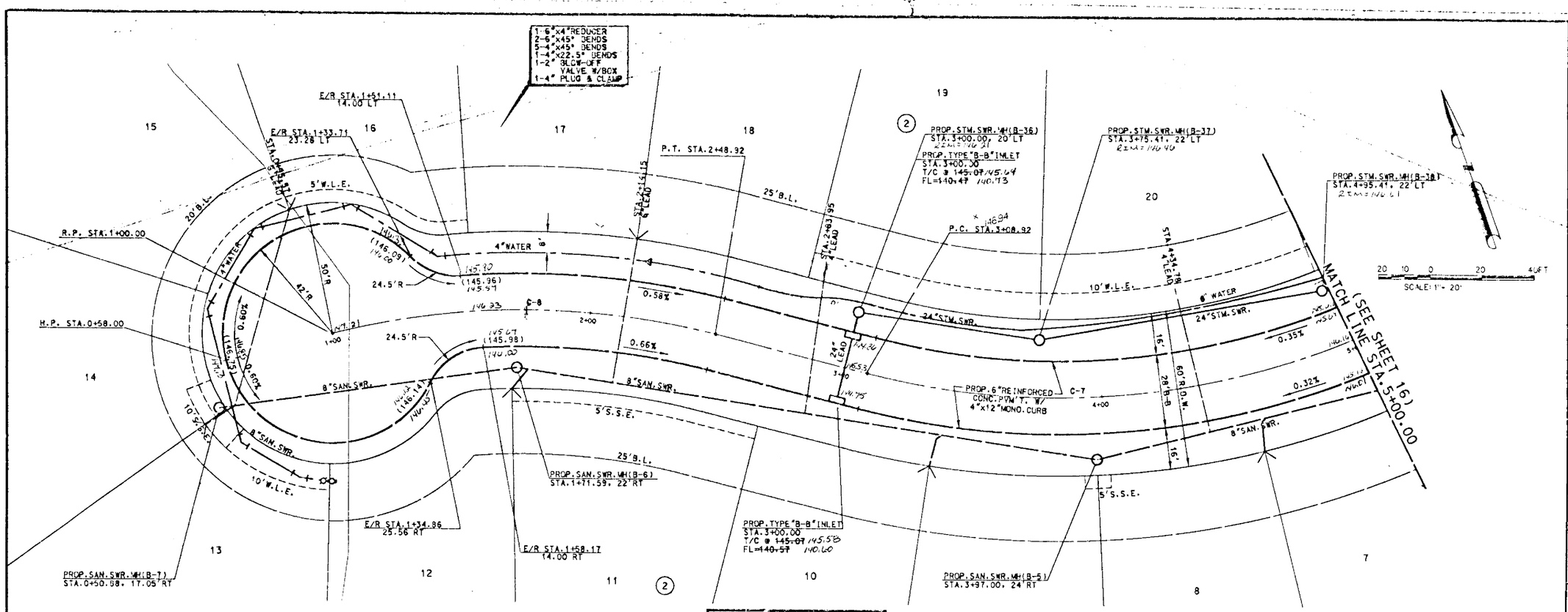
WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F B NO:
DESIGNED BY: JLG
DRAWN BY: RWLY,DO,SP
SHEET NO 14 OF 42 SHEETS
CITY DWG NO:

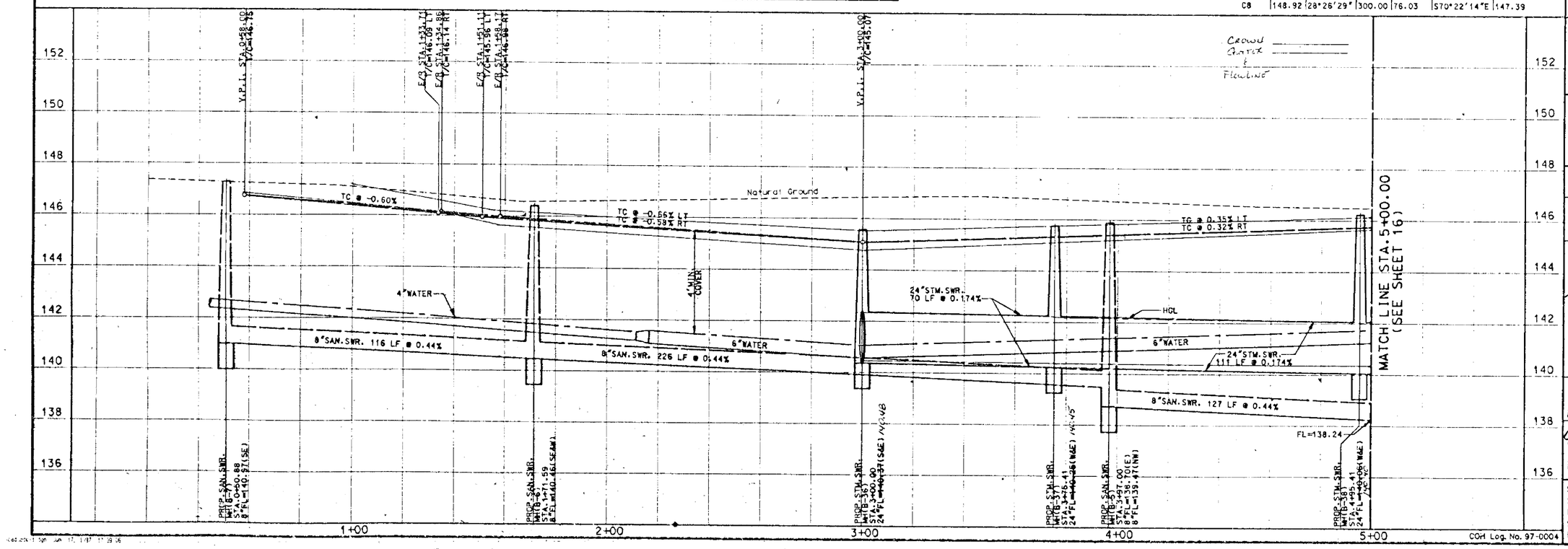
P-600

Monday, December 18
2000



ELLENDALE COURT

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C7	416.67	79°34'39"	300.00	249.85	N84°03'41"E	383.98
C8	148.92	28°26'29"	300.00	76.03	S70°22'14"E	147.39



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
ELLENDALE COURT
STA. 1+00.00 TO STA. 5+00.00

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED
for County Engineer
8/20/97
Date

Water & Sanitary Sewer Layout Approved as to Location Only
The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS J.L. GRAHAM JR. 66480 REGISTERED PROFESSIONAL ENGINEER 7/11/97
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10502.001-1-DTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

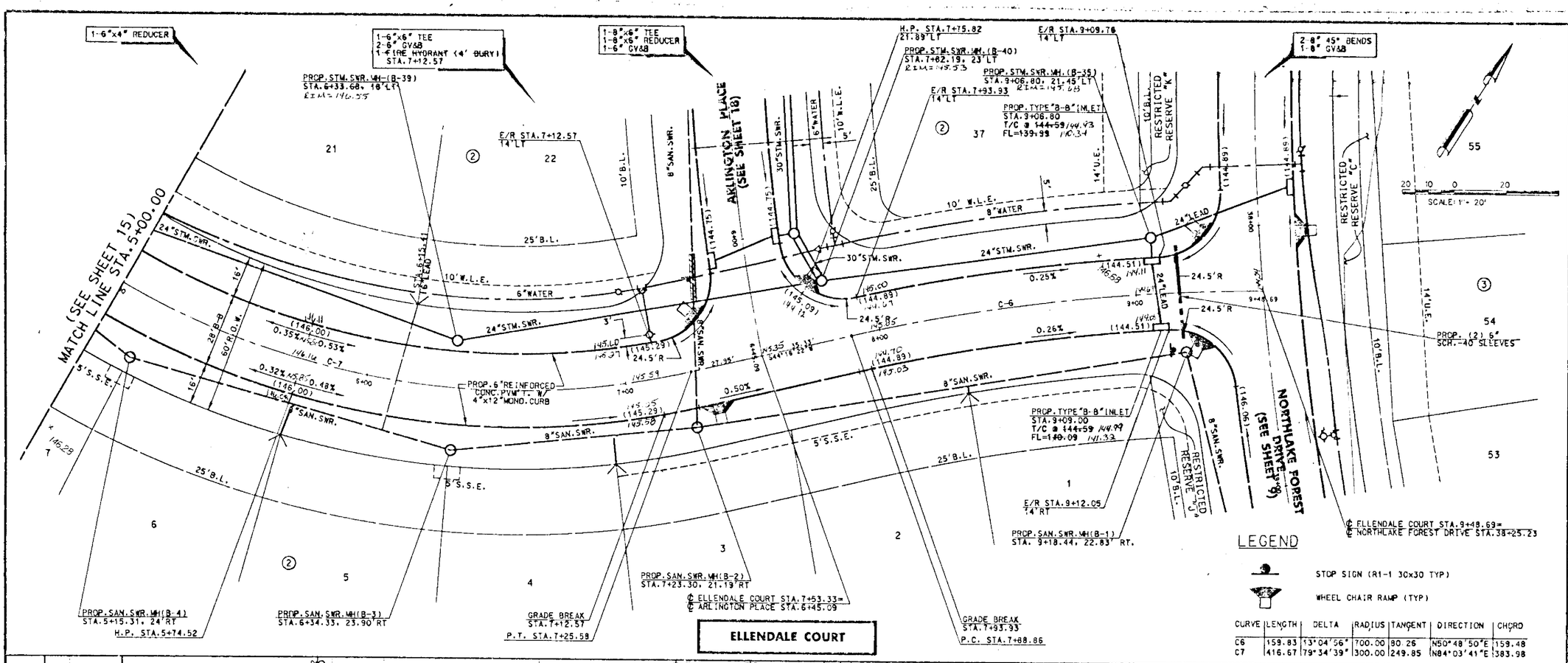
OTHER DEPARTMENT
PLANNING AND DEVELOPMENT — SPARSUR DEPARTMENT
CITY ENGINEER
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

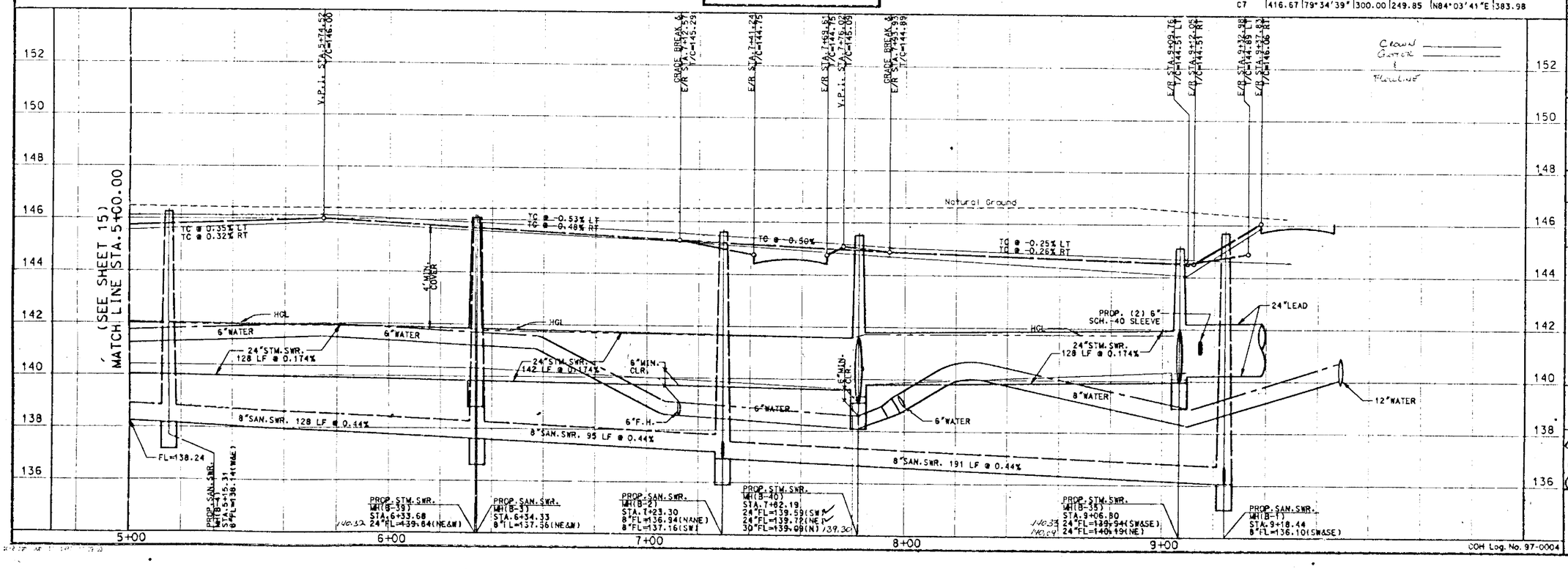
DESIGNED BY: JLG
DRAWN BY: RWL,Y,DD,SP
SHEET NO. 8 OF 42 SHEETS
CITY ZONE NO.

COH Log. No. 97-0004

P-600



CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C6	159.83	13°04'56"	700.00	80.26	N50°48'50"E	159.48
C7	416.67	79°34'39"	300.00	249.85	N84°03'41"E	383.98



COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

ELLENDALE COURT

STA. 5+00.00 TO STA. 9+13.36

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.10'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED _____ for County Engineer
Date 9/30/97

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

J. L. GRAHAM, JR. 56435 REGISTERED PROFESSIONAL ENGINEER 9/19/97 SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & VanDeWiele Incorporated, Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING	CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT
CITY ENGINEER	DATE 12/4/97
DIRECTOR OF PUBLIC WORKS AND ENGINEERING	DATE 3/11/98

SUBMITTED:
SCALE: H 1"=20' / V 1"= 2'
DATE:
SURVEY BY:
F B NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 18 OF 42 SHEETS
CITY DWG NO:

P-600

4-4° 45° BEND
1-4" 22.5° BEND
1-2" BLOW-OFF VALVE W/BOX

1-6"x6" TEE
1-6"x4" REDUCER
1-4" GV&B

PROP. STM. SWR. MH-(B-13)
STA. 0+55.78, 13.56' LT

R.P. STA. 1+00.00

E/R STA. 1+33.71
23.26' LT

E/R STA. 1+15.11
14' LT

PROP. STM. SWR. MH-(B-45)
STA. 1+53.97, 22' LT
RIM = 146.13

PROP. TYPE "B-B" INLET
STA. 1+53.97
T/C @ ~~144.77~~ 145.19
FL= ~~140.19~~ 140.37

PROP. STM. SWR. MH-(B-44)
STA. 2+24.96, 26' LT
RIM = 145.60

GRADE BREAK
STA. 2+87.45

P.T. STA. 2+95.81

PROP. STM. SWR. MH-(B-43)
STA. 3+51.97, 20' LT
RIM = 145.93

H.P. STA. 3+55.42

℄ ARLINGTON PLACE STA. 3+55.42 =
℄ ARLINGTON PLACE COURT STA. 1+91.98

P.C. STA. 3+59.09

SCALE: 1" = 20'

DETENTION POND
(SEE SHEET 38)

P.I. 3+00.02

PROP. STM. SWR. MH-(B13)
SEE SHT. 37
RIM = 137.30

20' STM SWR ESMT

42" STM. SWR.

36" STM. SWR.

20' STM. SWR. ESMT.

20' B.L.

5' W.L.E.

4" WATER

30" STM. SWR.

0.33%

0.36%

0.25%

0.60%

0.95%

C-9

PROP. 6" REINFORCED CONC. PVMT. 4'x12' MONO. CURB

C-10

8" SAN. SWR.

5' S.S.E.

10' B.L.

42' R

50' R

24.5' R

60' R.O.W.

28' B-B

2+00

3+00

4+00

6" WATER

63.28'

59.71'

3.57'

PROP. TYPE "B-B" INLET
STA. 1+61.31
T/C @ ~~144.79~~ 145.16
FL= ~~140.29~~ 140.54

ARLINGTON PLACE
(SEE SHEET 18)

20' B.L.

15' W.L.E.

5'

MATCH LINE STA. 4+50.00
(SEE SHEET 18)

EDGE OF PAVEMENT
H.P. STA. 0+59.85
12.31' LT
EL=145.50

PROP. SAN. SWR. MH-(C-4)
STA. 0+73.80, 48.79' RT

PROP. SAN. SWR. MH-(C-3)
STA. 1+79.04, 21.67' RT

E/R STA. 2+87.45
14' RT

PROP. SAN. SWR. MH-(C-2)
STA. 2+87.45 24.15' RT

PROP. SAN. SWR. MH-(C-1)
STA. 4+02.93 26.18' RT

E/R STA. 4+19.29
14' RT

E/R STA. 1+34.86
25.56' RT

E/R STA. 1+58.17
14' RT

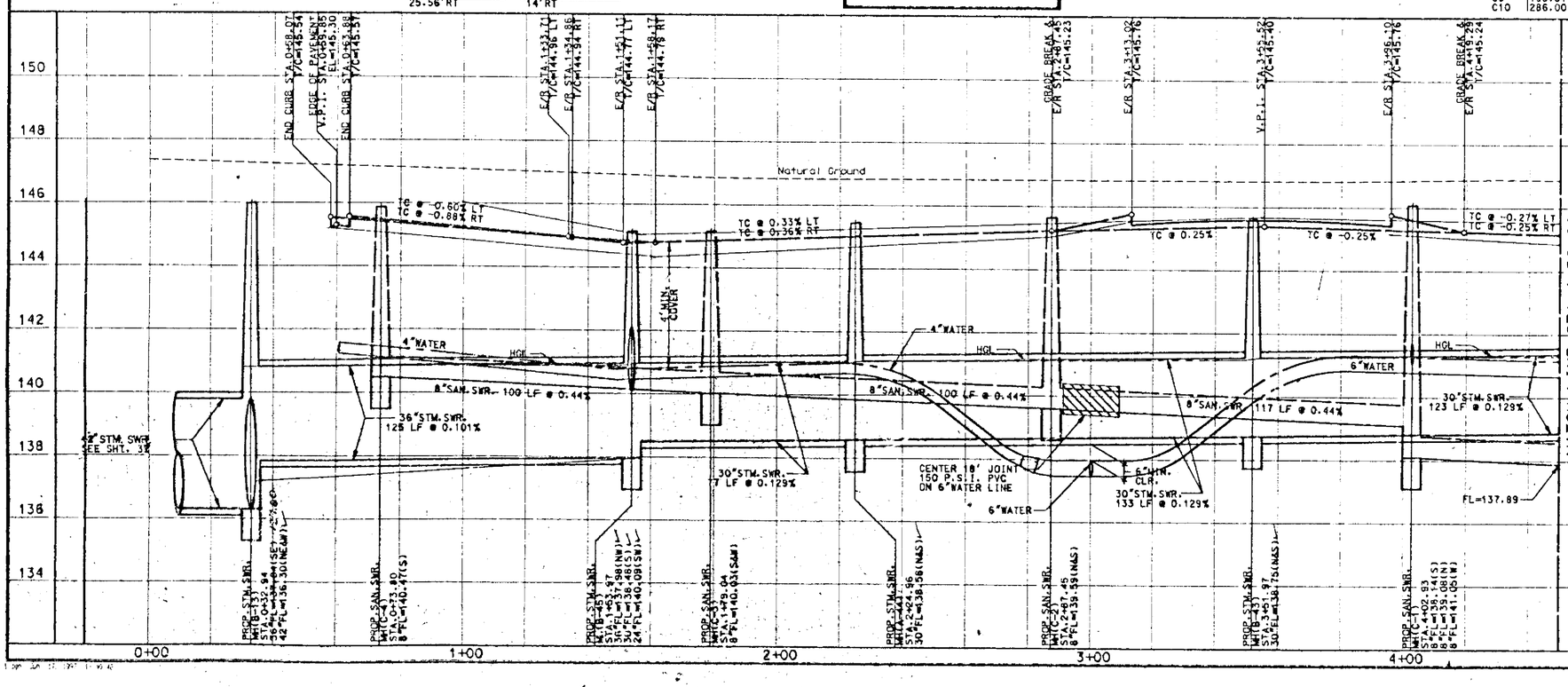
LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C9	195.81	37°23'52"	300.00	101.54	S39°48'20"E	192.36
C10	286.00	23°24'34"	700.00	145.02	S32°48'41"E	284.02

ARLINGTON PLACE



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
ARLINGTON PLACE
STA. 1+00.00 TO STA. 4+50.00

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED Robert L. Carroll for County Engineer
8/20/97
DATE

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS
A.L. GRAHAM, JR.
66480
REGISTERED PROFESSIONAL ENGINEER
7/31/97
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 7/24/97
STREET & DRAINS ENGINEERING
STORM SEWER ENGINEERING 8-8-97
CONSTRUCTION

OTHER DEPARTMENT

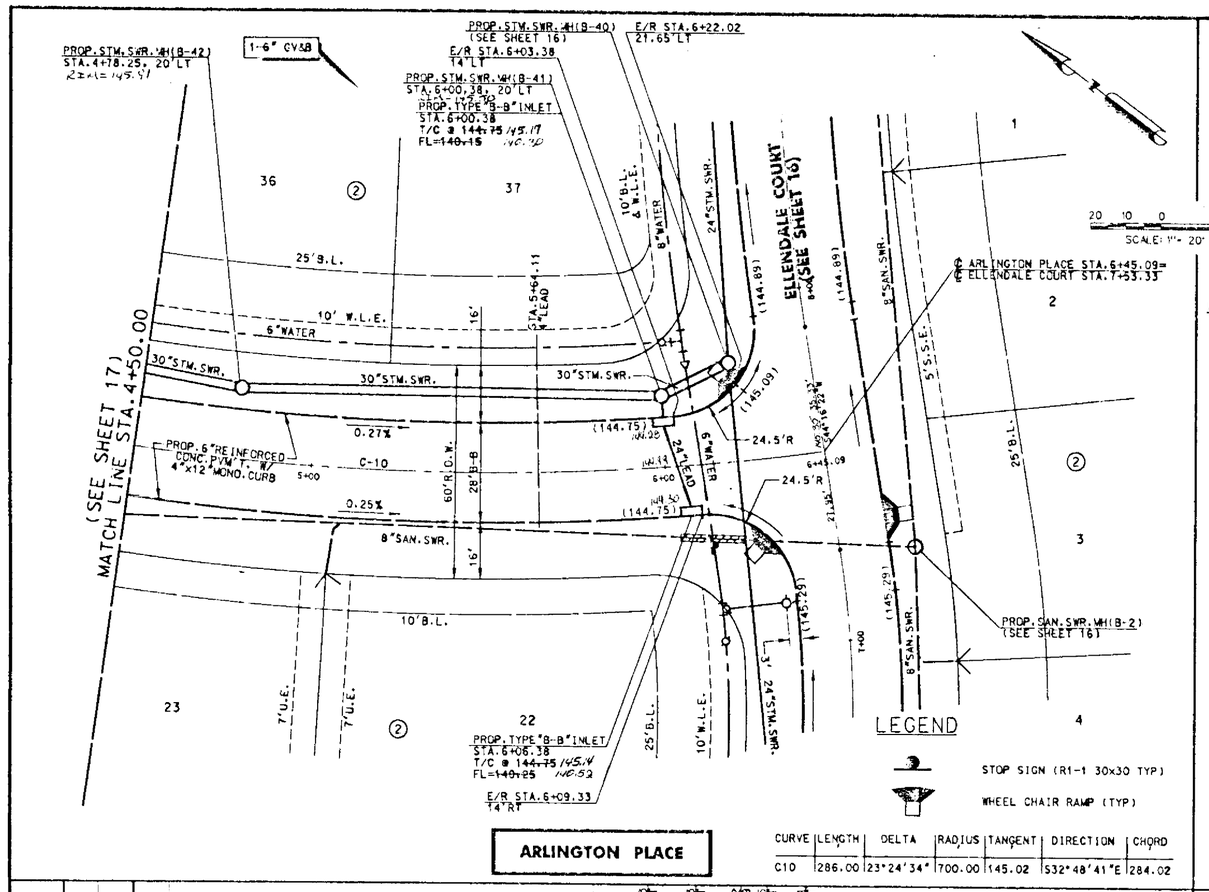
PLANNING AND DEVELOPMENT 7-22-97
SPONSOR DEPARTMENT
CITY ENGINEER 7/24/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 7/24/97 DATE

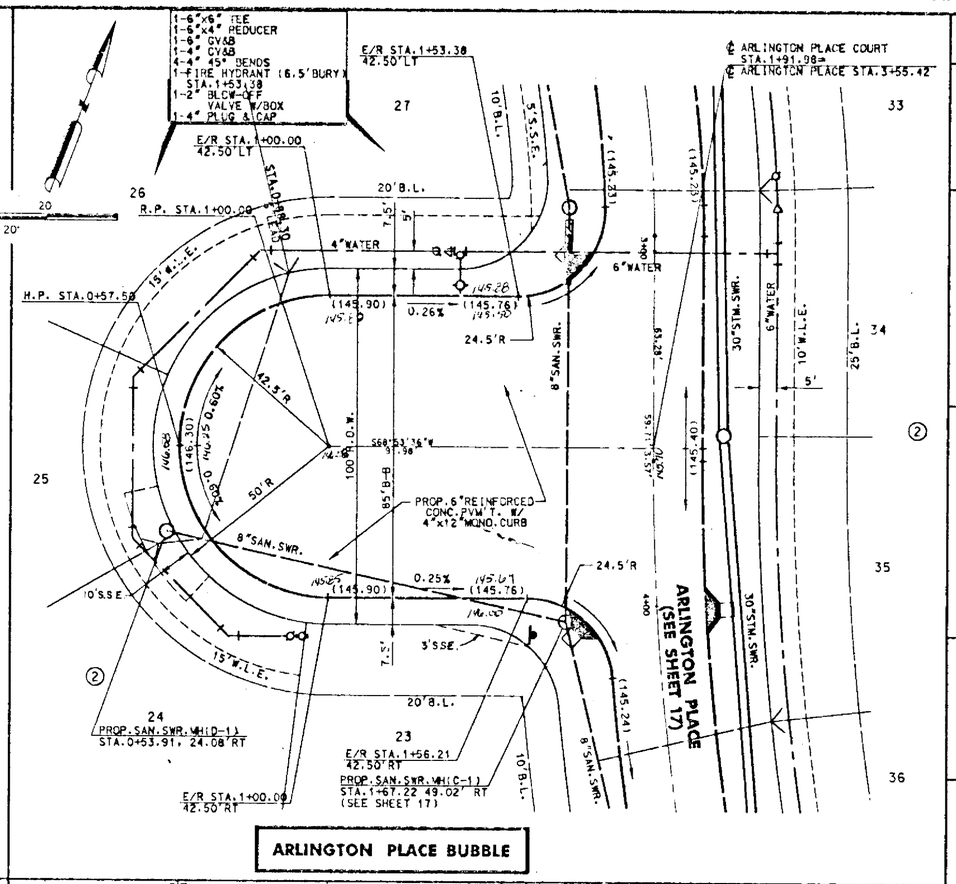
SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: KWLY, DD, SP
SHEET NO. 17 OF 42 SHEETS
CITY DWG NO:

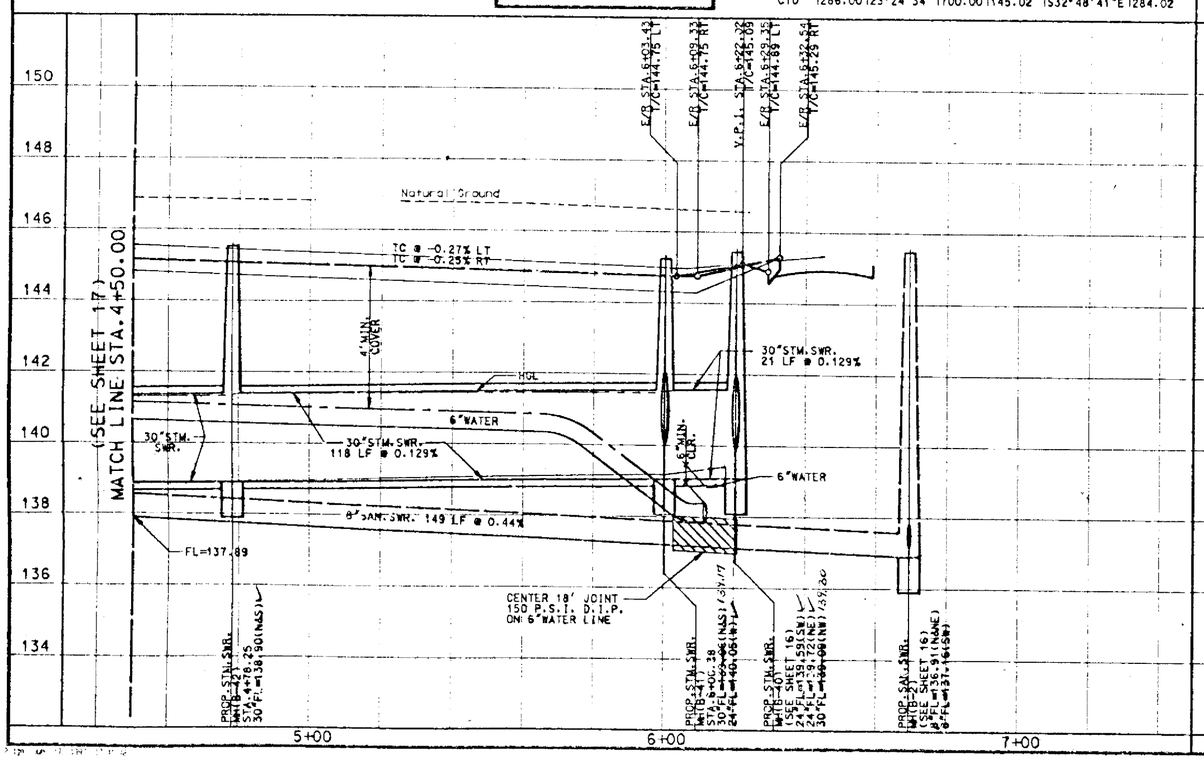
COH Log. No. 97-0004

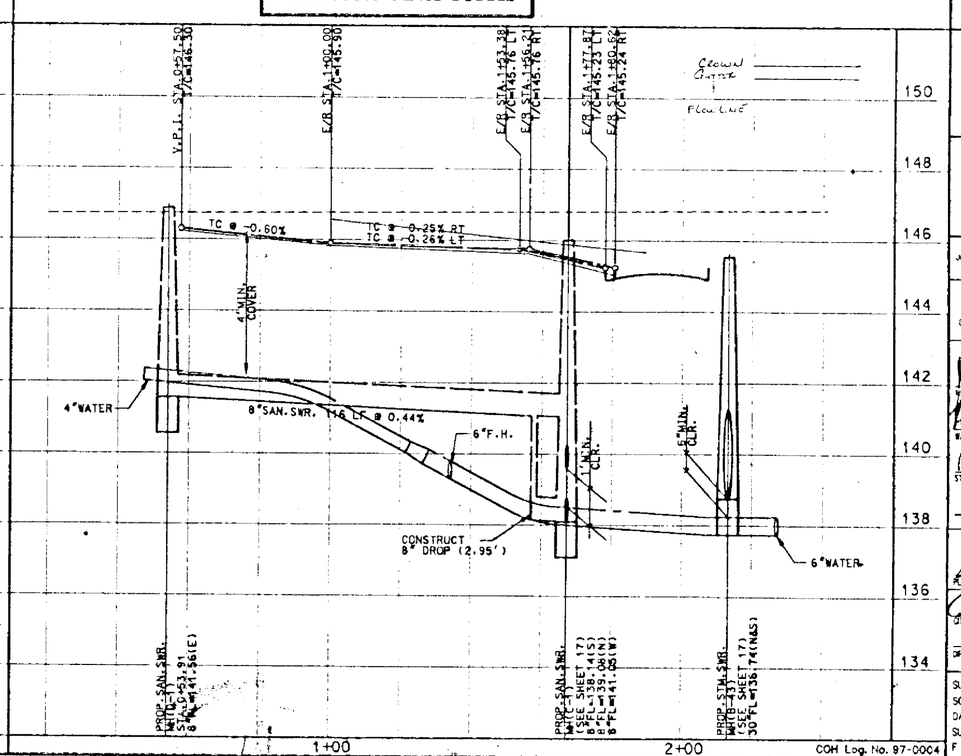
P-600





ARLINGTON PLACE BUBBLE





COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

ARLINGTON PLACE

STA. 4+50.00 TO STA. 8+45.09

ARLINGTON PLACE BUBBLE

BENCH MARK

REFERENCE BENCHMARK
TBM 154 - CHISELLED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSCHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

NOTES

APPROVED for County Engineer
8/29/97 DATE

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS — A. L. GRAHAM — 66480 — REGISTERED PROFESSIONAL ENGINEER — SEAL — 10/1/97

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3798
713/782-0042

JOB NO. 10902-001-1 (UT). DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

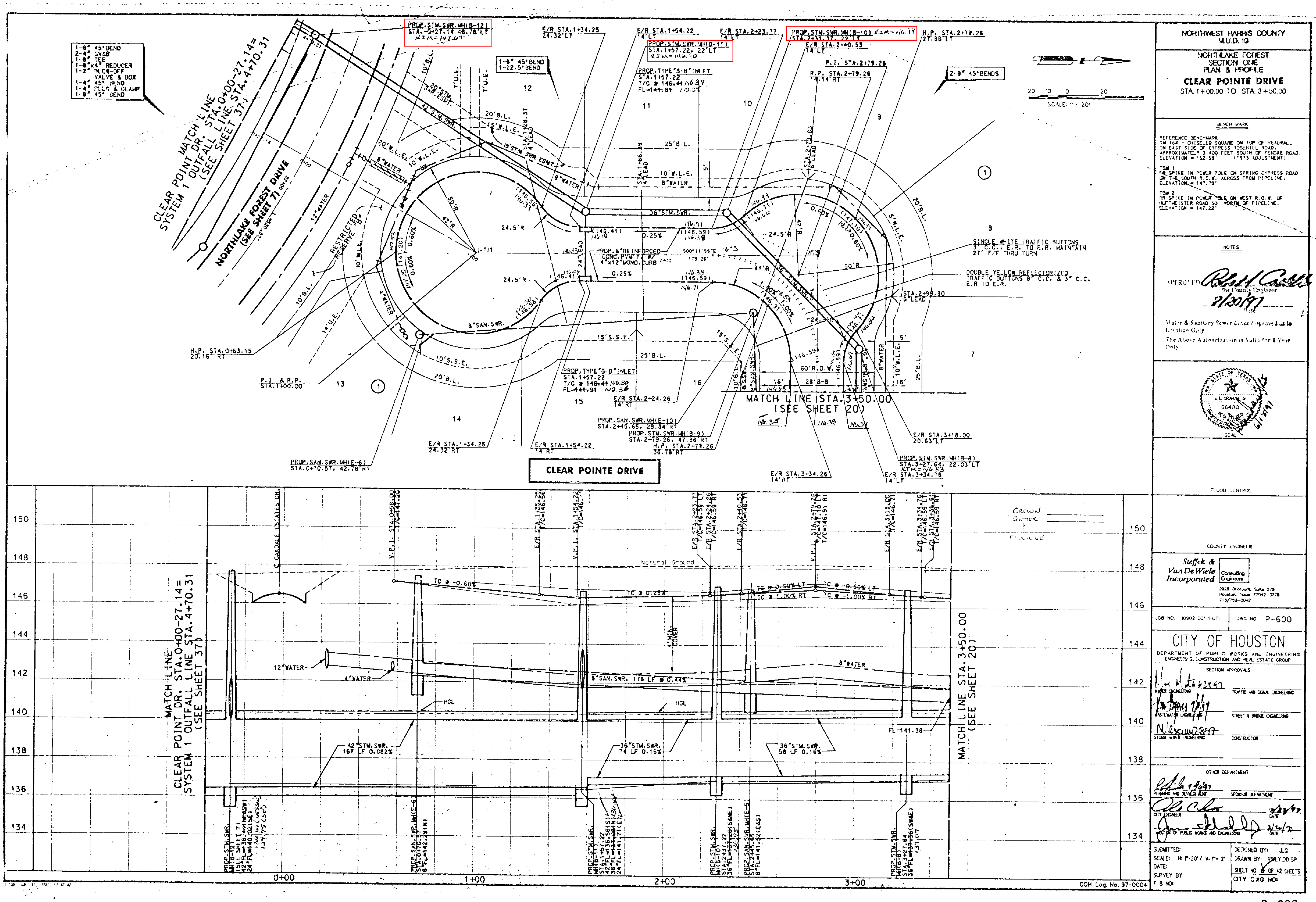
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — 7/24/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — 7/24/97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F. B. NO:

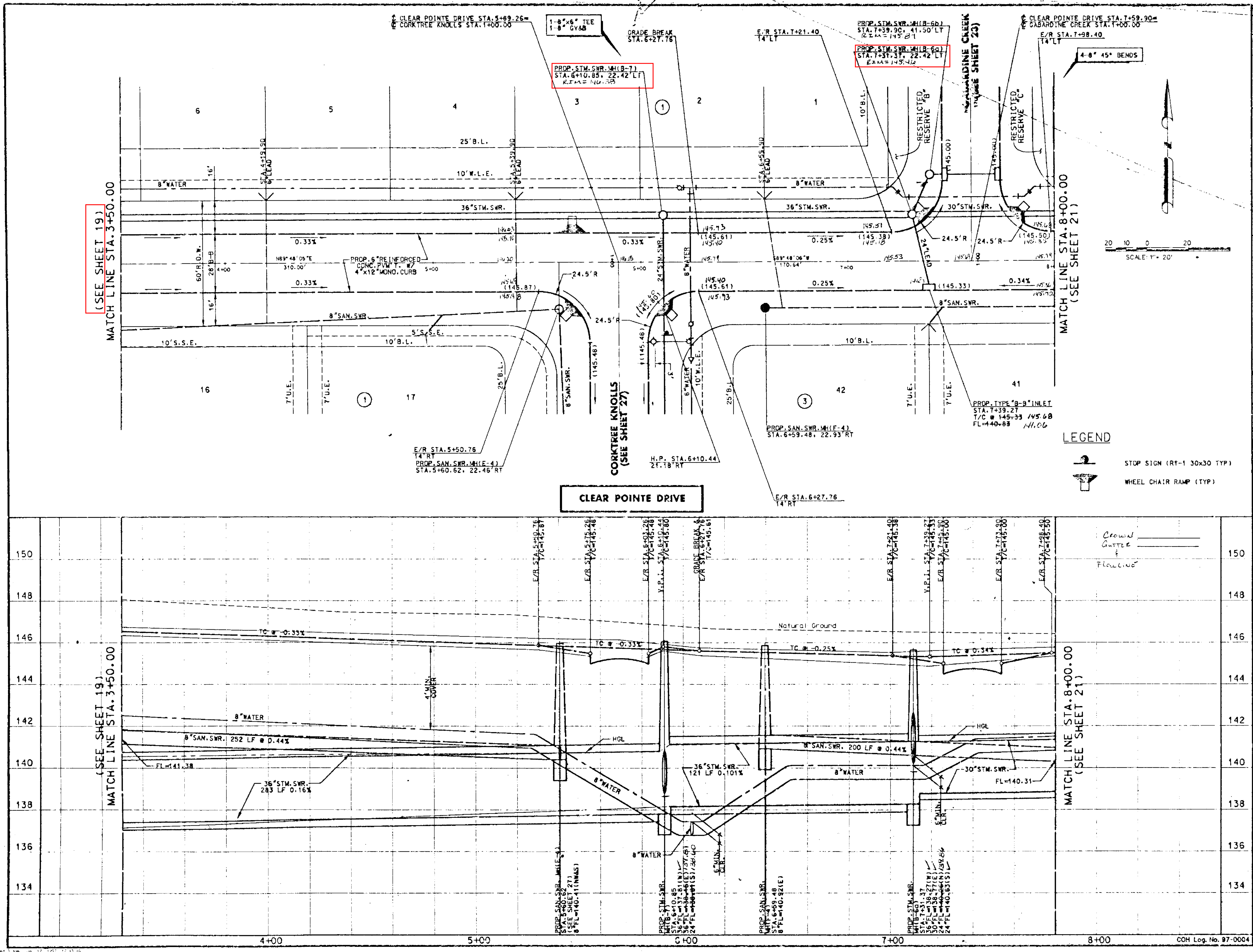
DESIGNED BY: JLG
DRAWN BY: RWLY, DD, SP
SHEET NO. 8 OF 42 SHEETS
CITY DWG NO:

P-600

Monday, December 18 2000


NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
CLEAR POINTE DRIVE
STA. 1+00.00 TO STA. 3+50.00
SCALE: 1" = 20'
BENCH MARK
NOTES
FLOOD CONTROL
COUNTY ENGINEER
Steffek & Van De Wiele Incorporated
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
SECTION APPROVALS
DWG. NO. P-600
CLEAR POINTE DRIVE
MATCH LINE CLEAR POINT DR. STA.0+00=27.14= SYSTEM 1 OUTFALL LINE STA.4+70.31 (SEE SHEET 37)
MATCH LINE STA. 3+50.00 (SEE SHEET 20)
NORTHLAKE FOREST DRIVE (SEE SHEET 7)
PROP. STM. SWR. MH(B-12) STA. 0+27.14 46.18' LT
PROP. STM. SWR. MH(B-11) STA. 1+57.22, 22' LT
PROP. STM. SWR. MH(B-10) STA. 2+31.37, 22' LT
PROP. TYPE "B-B" INLET STA. 1+57.22
PROP. SAN. SWR. MH(E-6) STA. 0+70.57, 42.78' RT
PROP. SAN. SWR. MH(E-10) STA. 2+45.65, 29.84' RT
PROP. STM. SWR. MH(B-9) STA. 2+79.26, 47.86' RT
PROP. STM. SWR. MH(B-8) STA. 3+27.64, 22.03' LT
SINGLE WHITE TRAFFIC BUTTONS
DOUBLE YELLOW REFLECTORIZED TRAFFIC BUTTONS
8" SAN. SWR. 176 LF @ 0.44%
42" STM. SWR. 167 LF 0.082%
36" STM. SWR. 74 LF 0.16%
36" STM. SWR. 58 LF 0.16%
12" WATER
8" WATER
4" WATER
HGL
0+00
1+00
2+00
3+00
COH Log. No. 97-0004

P-600



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE

CLEAR POINTE DRIVE

STA. 3+50.00 TO STA. 8+00.00

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD. APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED [signature] for County Engineer
8/20/97 Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS
J. L. GRAHAM, JR.
66480
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL

DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING [signature] 6-24-97	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING [signature]	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING [signature]	CONSTRUCTION

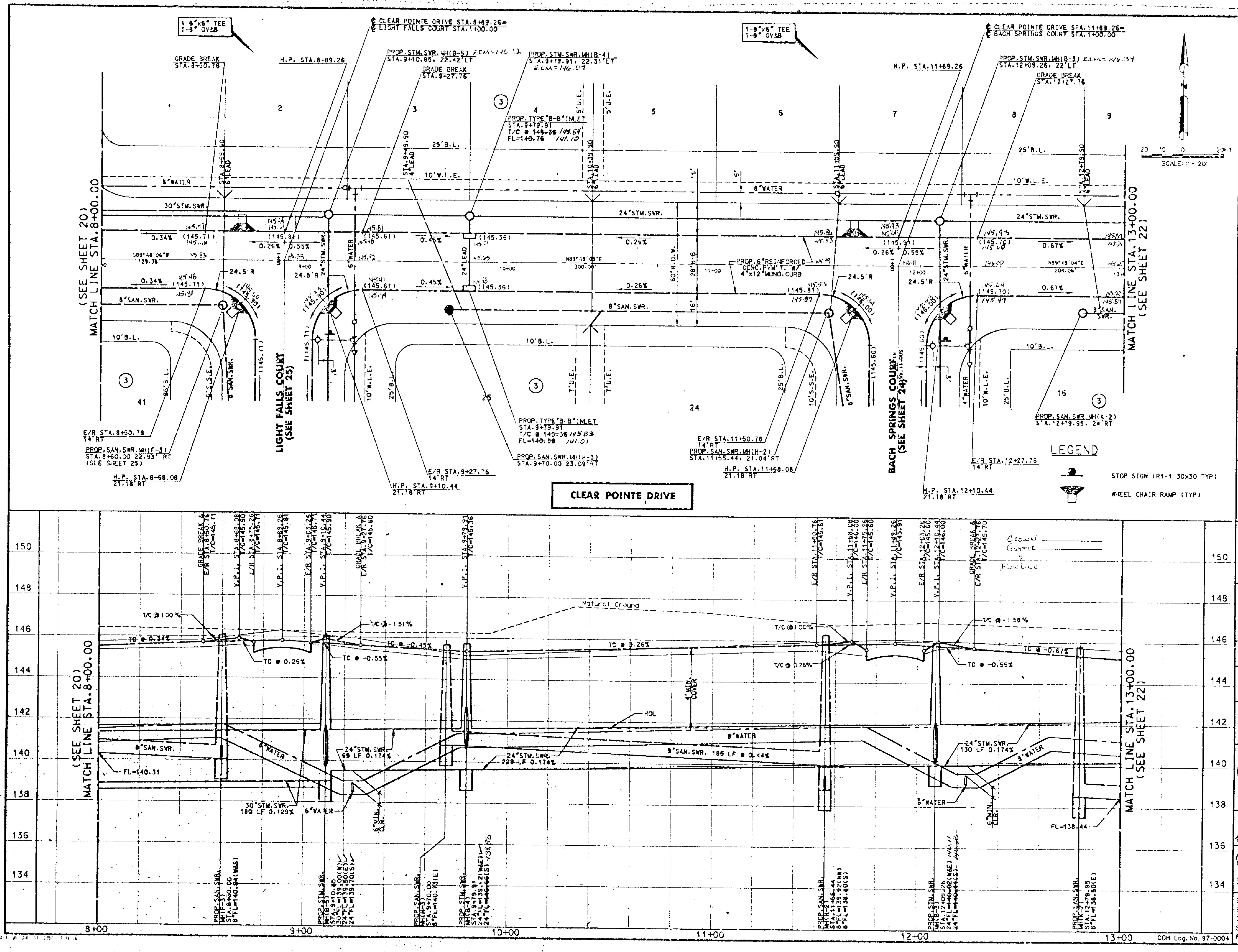
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT [signature] 9-20-97	SPONSOR DEPARTMENT

CITY ENGINEER [signature] DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING [signature] DATE

SUBMITTED:	DESIGNED BY: JLG
SCALE: H: 1"=20' / V: 1"= 2'	DRAWN BY: RWLY,DD,SP
DATE:	SHEET NO. 20 OF 42 SHEETS
SURVEY BY:	CITY DWG NO:
F B NO:	

P-600



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

CLEAR POINTE DRIVE

STA. 8+00.00 TO STA. 13+00.00

BENCH MARK

REFERENCE BENCHMARK: RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1: RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2: RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization Is Valid for 1 Year Only

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers

JOB NO. 10902-001-1-UTL — DWG. NO. P-600

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING — ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

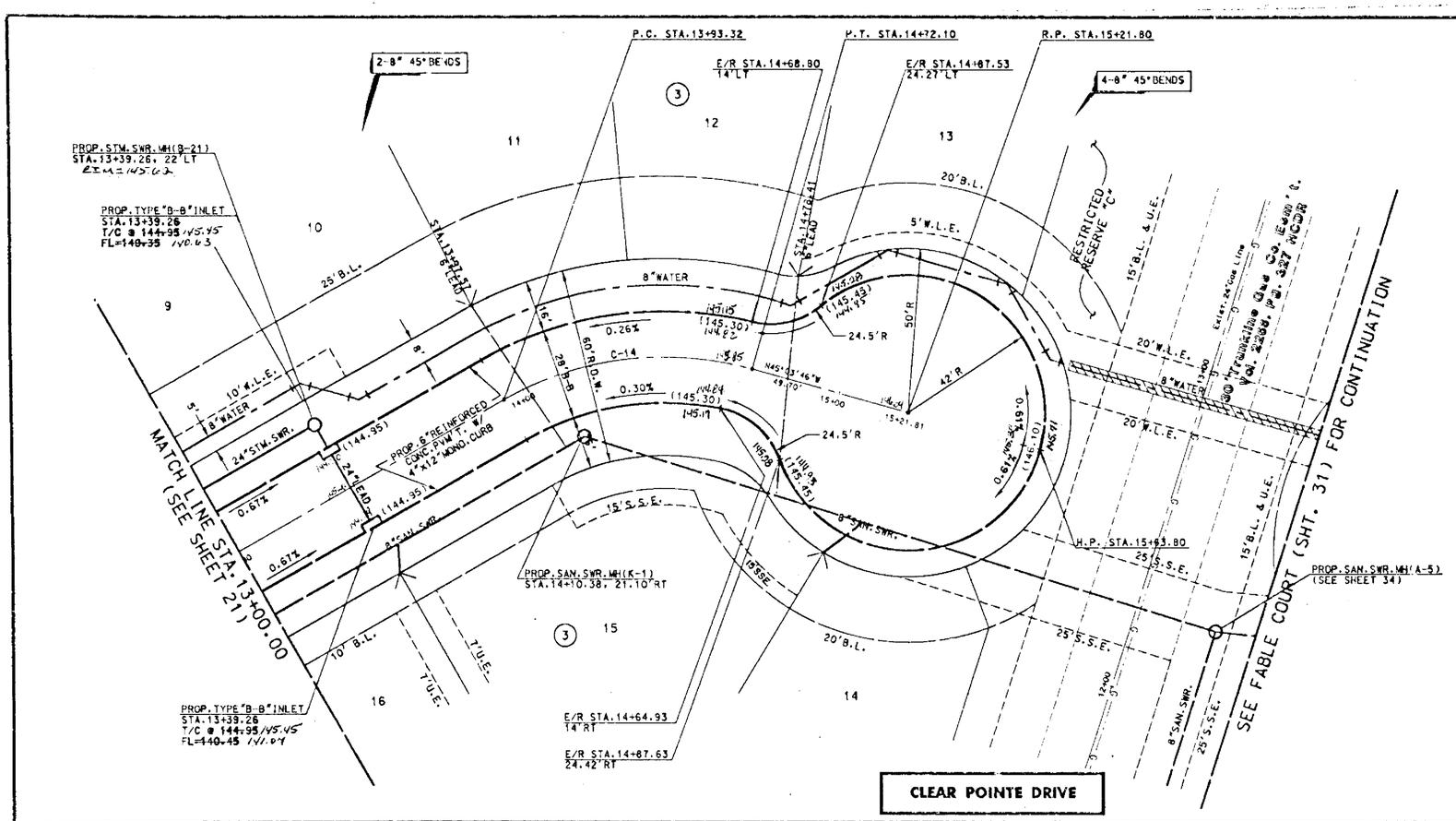
DESIGNED BY: JLG

DRAWN BY: DWLY,DD,SP

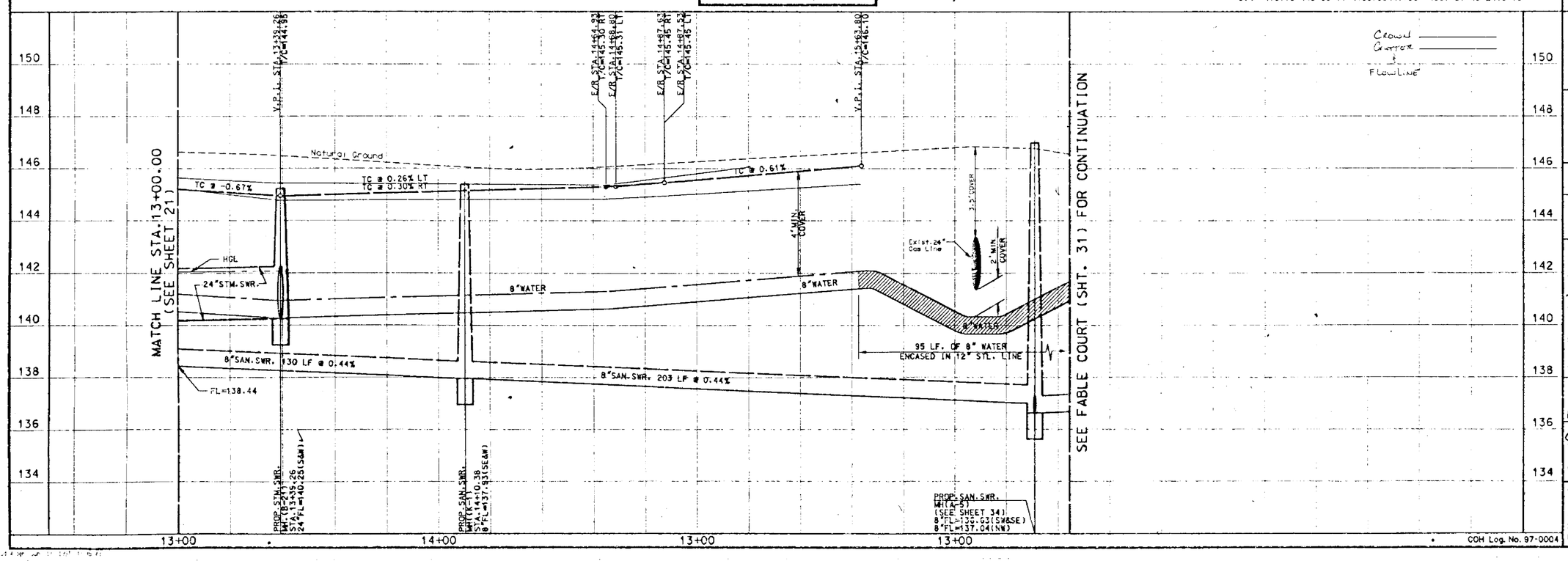
SCALE: H 1"=20' / V 1"=2'

SHEET NO. 21 OF 42 SHEETS

P-600



CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C14	78.78	45°08'11"	100.00	41.56	S67°37'49"E	76.76



Crown
Gutter
Flow Line

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE

CLEAR POINTE DRIVE

STA. 13+00.00 TO STA. 15+21.80

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED Robert Caruso for County Engineer
8/20/97 Date

Water & Sanitary Sewer Lines Approved as Location Only

The Above Authorization is Valid for 1 Year Only

J.L. GRAHAM, JR. 66480 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

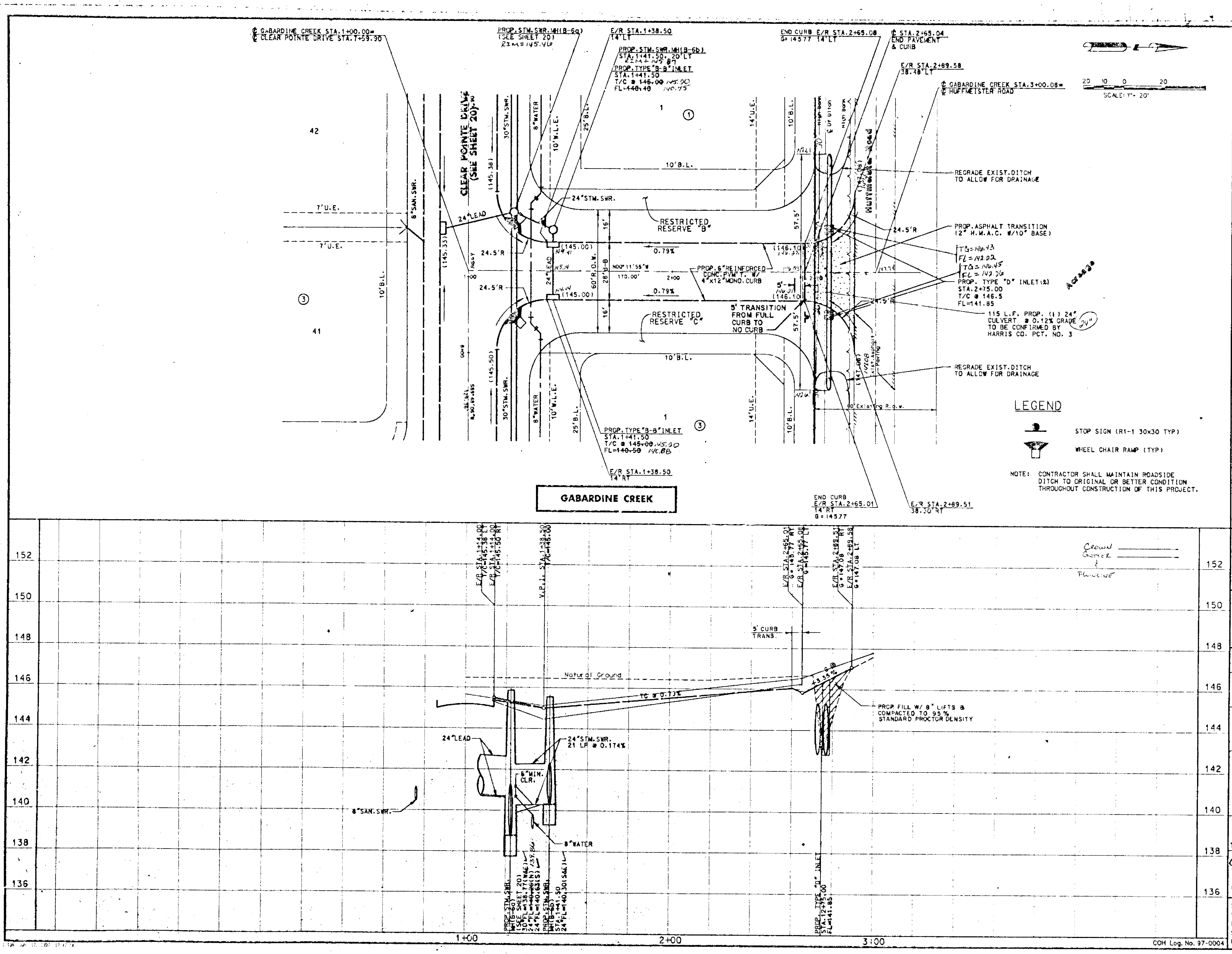
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — 8/27/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — 9/24/97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: DWLY,DD,SP
SHEET NO. 22 OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600



NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
GABARDINE COURT
STA. 1+00.00 TO STA. 2+89.55

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

For County Engineer
8/20/97

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers

JOB NO. 10902-001-1 UTL | DWG NO. P-600

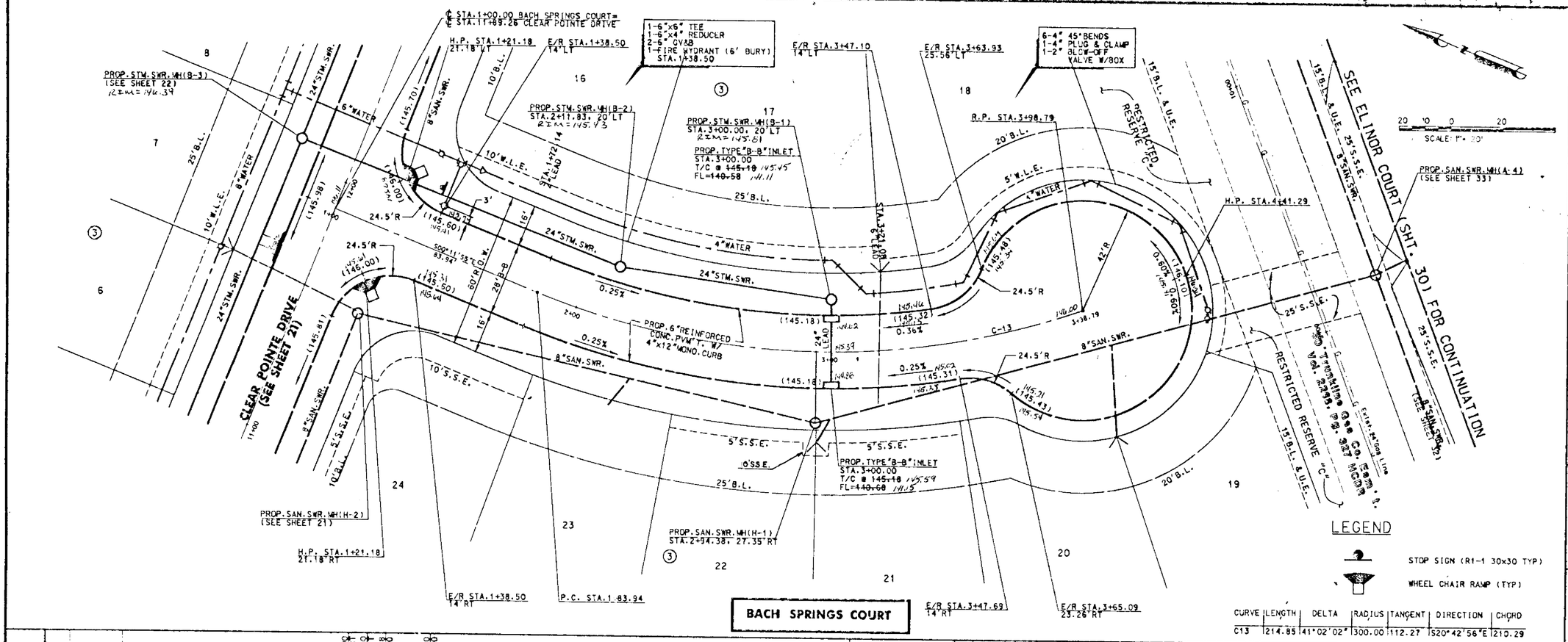
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

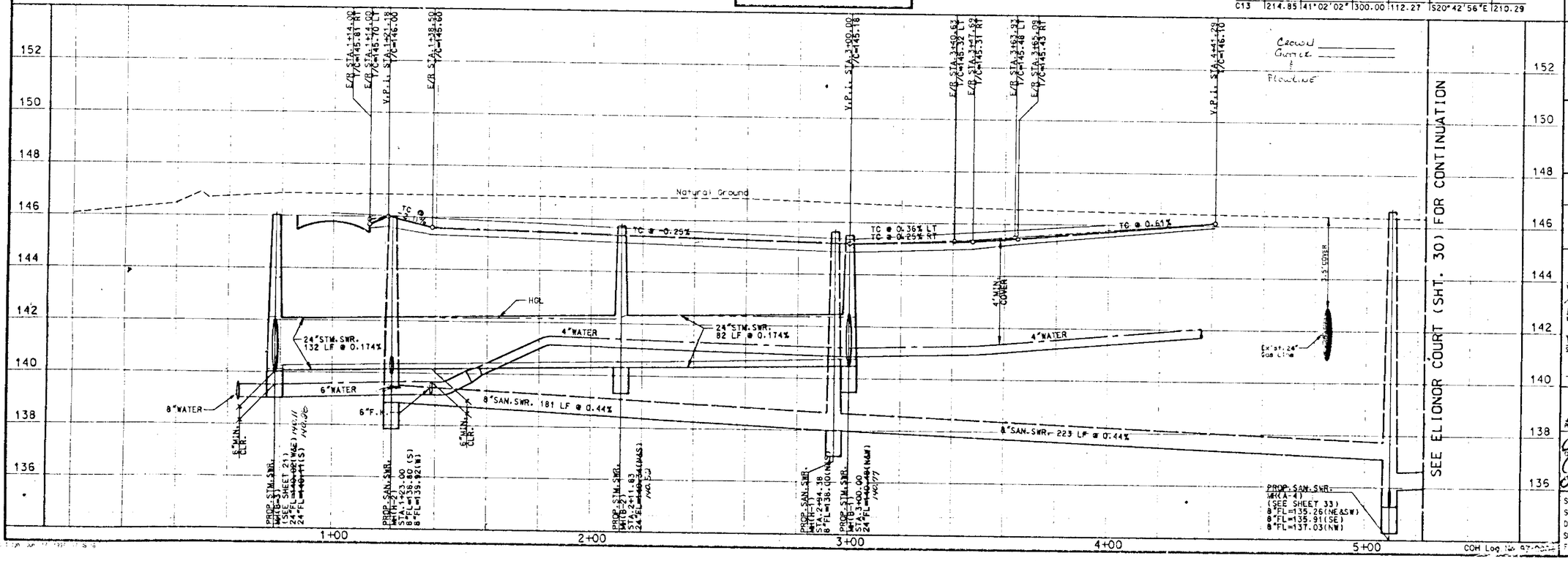
SECTION APPROVALS
TRAFFIC AND SIGNAL ENGINEERING
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT
CITY ENGINEER
DIRECTOR OF PUBLIC WORKS AND ENGINEERING

SUBMITTED:
SCALE: H 1"=20' / V 1"=2'
DATE:
SURVEY BY:
F B NO:
DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 23 OF 42 SHEETS
CITY DWG NO:

P-600





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

BACH SPRINGS COURT

BENCH MARK

REFERENCE BENCHMARK
BM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFSMEISTER ROAD 30' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED _____ for County Engineer
Date: 8/20/97

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

J. L. GRAHAM 56480 REGISTERED PROFESSIONAL ENGINEER 9/18/97
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated, Consulting Engineers
2925 Briarpark, Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

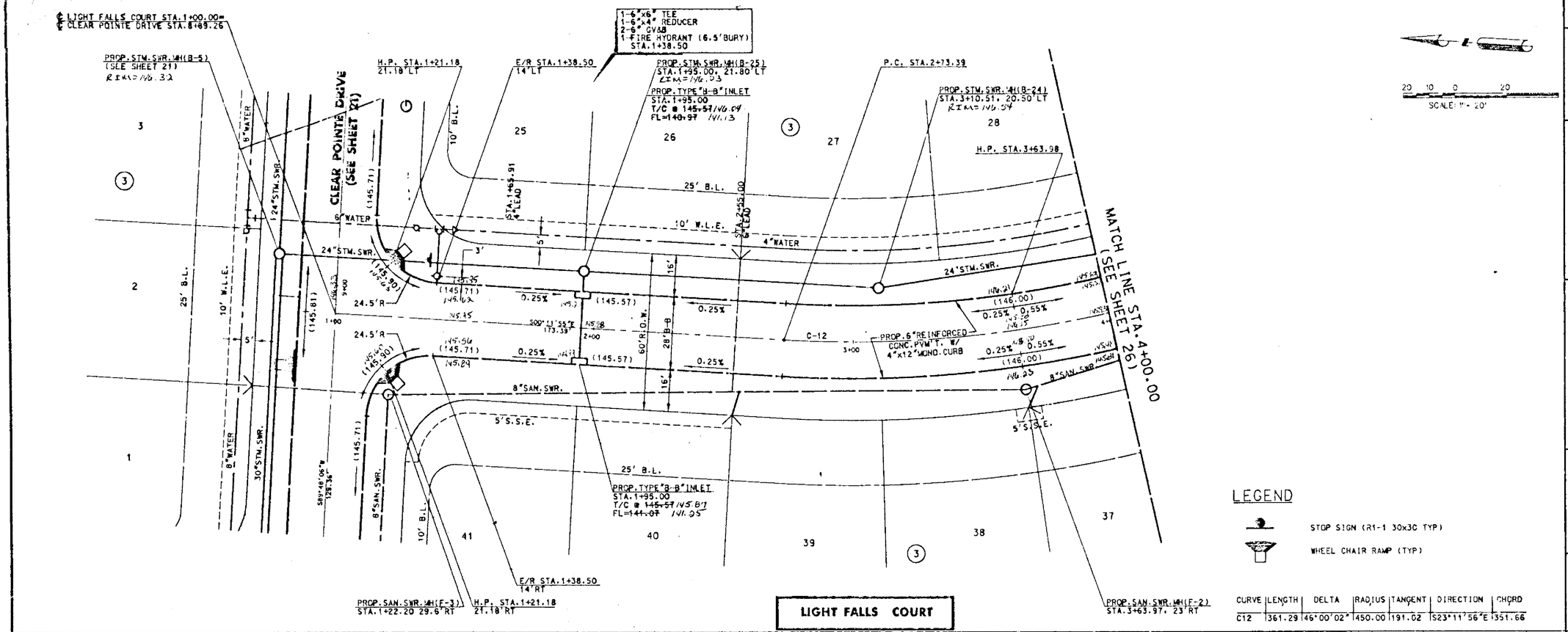
WATER ENGINEERING
WASTEWATER ENGINEERING
STORM SEWER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
STREET & BRIDGE ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT 7-10-97
SPONSOR DEPARTMENT
CITY ENGINEER 8/8/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 8/20/97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. No.:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET 24 OF 42 SHEETS
CITY DWG NO.:



SCALE: 1"= 20'

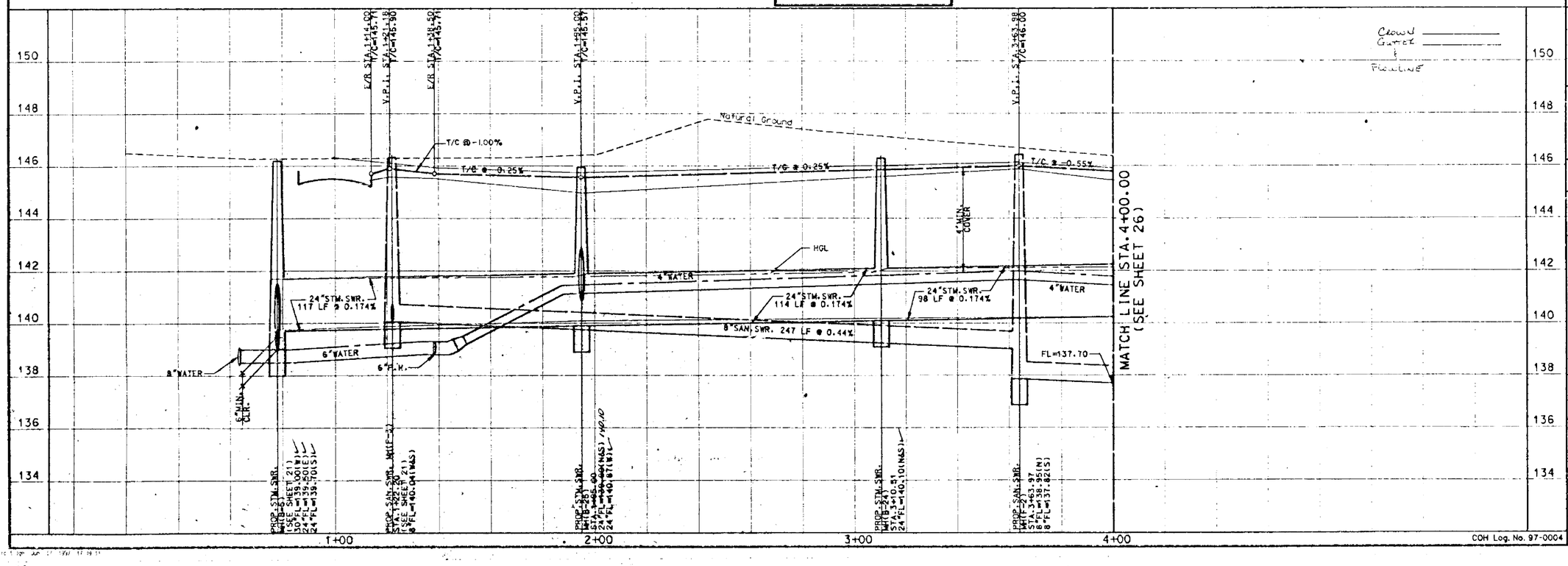
LEGEND

STOP SIGN (R1-1 30x30 TYP)

WHEEL CHAIR RAMP (TYP)

CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C12	361.29	46°00'02"	450.00	191.02	S23°11'56"E	351.66

LIGHT FALLS COURT



COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

LIGHT FALLS COURT

STA.1+00.00 TO STA.4+00.00

BENCH MARK

REFERENCE BENCHMARK
BM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED for County Engineer 2/20/97 Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS J.L. GRAHAM, JR. 66436 REGISTERED PROFESSIONAL ENGINEER SEAL 1/31/97

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SEWAGE ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

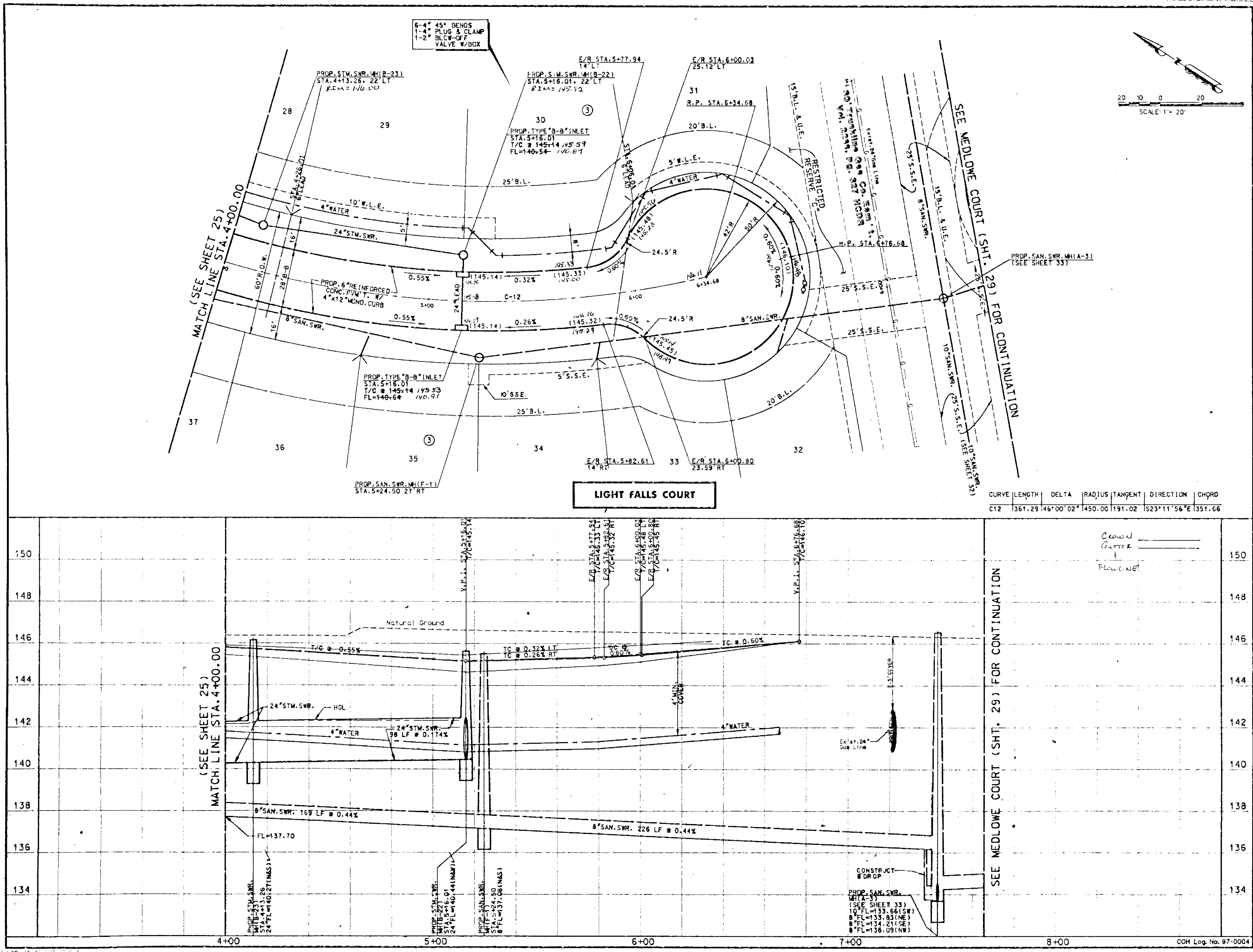
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

CITY ENGINEER 2/28/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 2/24/97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: SWLY,DD,SP
SHEET NO 25 OF 42 SHEETS
CITY DWG NO:

P-600



CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C12	361.29	46°00'02"	450.00	191.02	S23°11'56"E	351.66

NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE

LIGHT FALLS COURT

STA. 4+00.00 TO STA. 6+34.68

BENCH MARK

REFERENCE BENCHMARK
RM 164 – CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED for County Engineer
8/29/97
Date

Water & Sanitary Sewer Lines Approved as to Location Only
The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS
J. L. GRAHAM, Jr.
66480
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL
DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING	CONSTRUCTION

OTHER DEPARTMENT

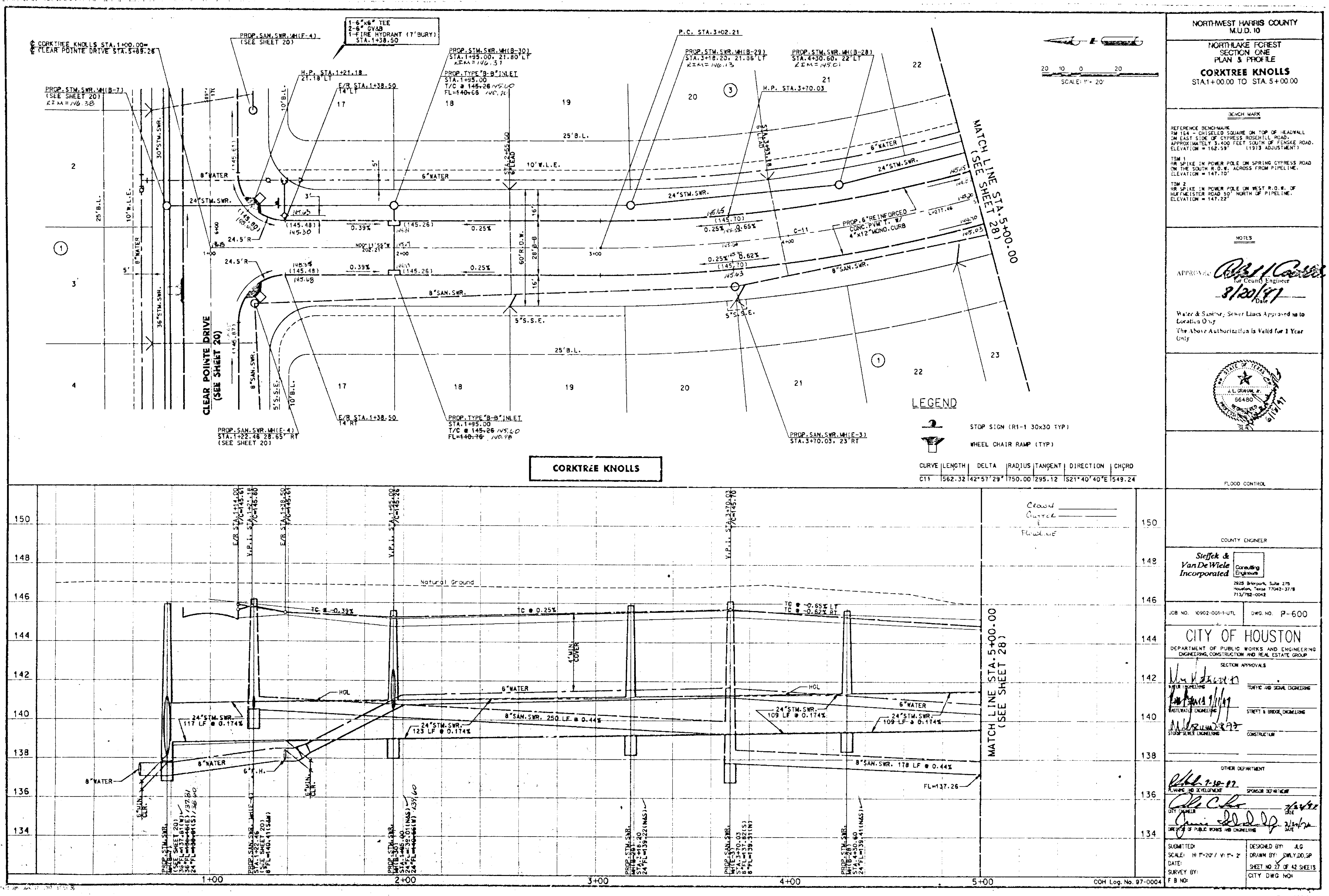
PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

CITY ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

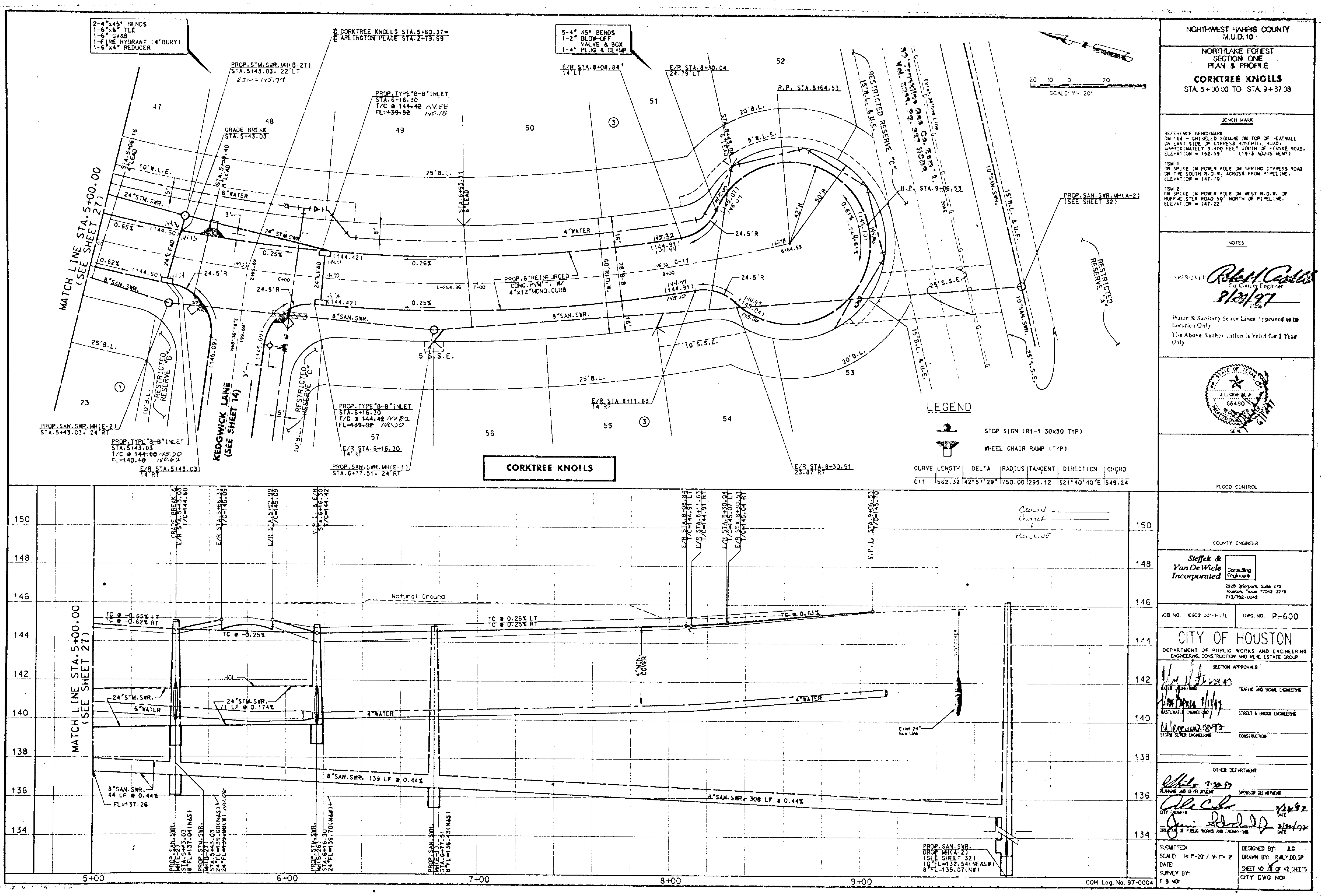
SUBMITTED:	DESIGNED BY: JLG
SCALE: H: 1"=20' / V: 1"= 2'	DRAWN BY: RWLY,DD,SP
DATE:	SHEET NO 26 OF 42 SHEETS
SURVEY BY:	CITY DWG NO:
F B NO:	

P-600

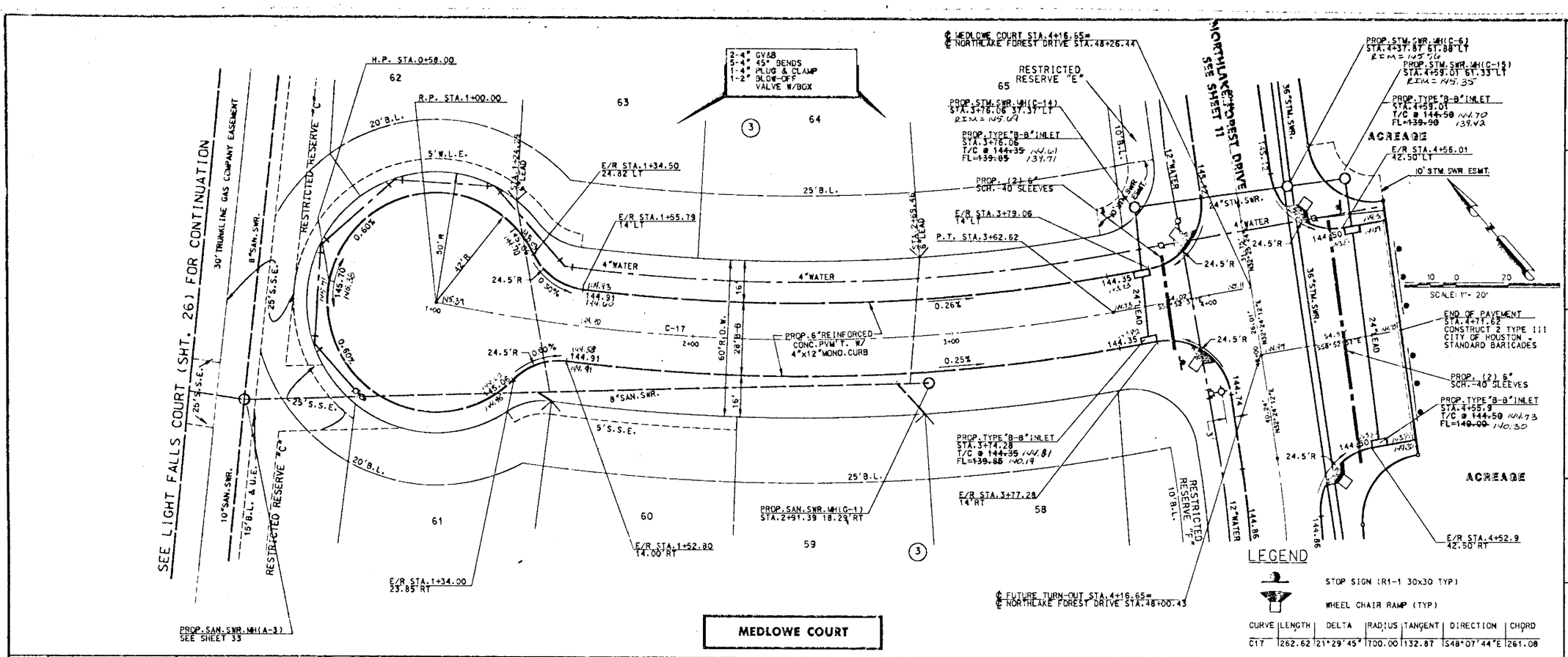
Monday, December 18
2000

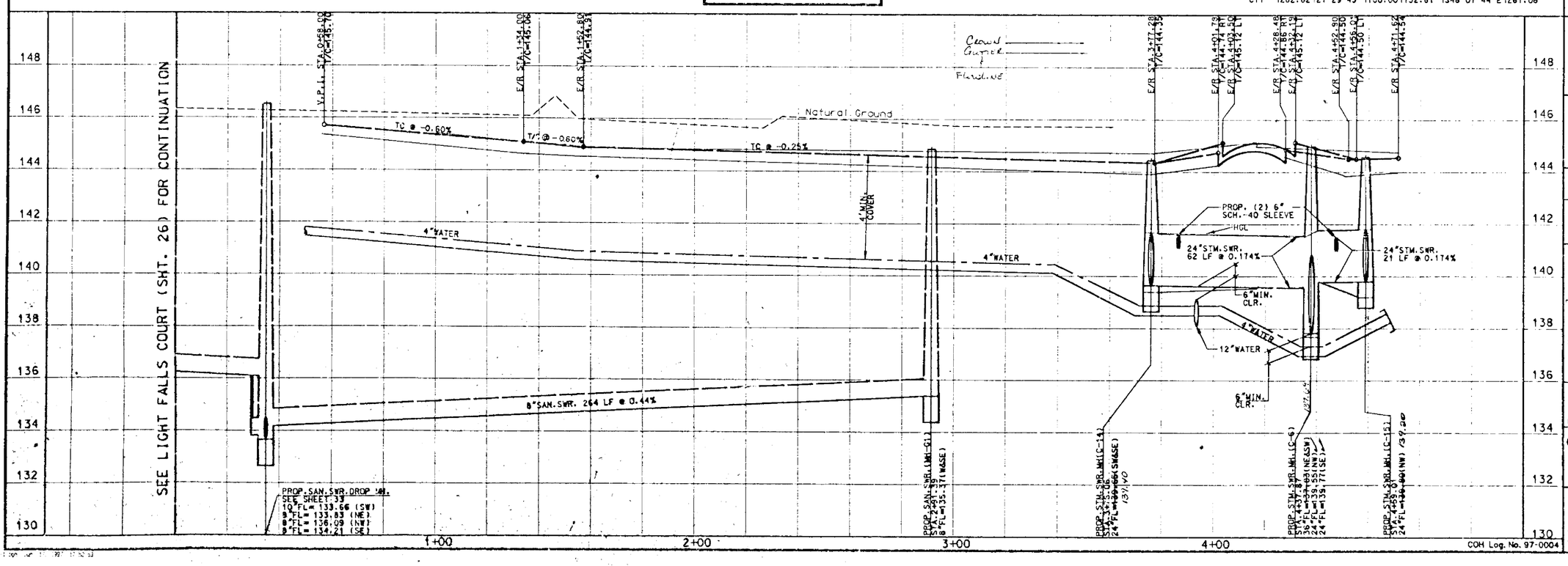

NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
CORKTREE KNOLLS
STA.1+00.00 TO STA. 5+00.00
BENCH MARK
NOTES
FLOOD CONTROL
COUNTY ENGINEER
Steffek & Van De Wiele Incorporated
Consulting Engineers
JOB NO. 10902-001-1-UTL
DWG. NO. P-600
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP
SECTION APPROVALS
OTHER DEPARTMENT
SCALE: H: 1"=20' / V: 1"= 2'
DESIGNED BY: JLG
CITY DWG NO:
CORKTREE KNOLLS
CLEAR POINTE DRIVE (SEE SHEET 20)
MATCH LINE STA. 5+00.00 (SEE SHEET 28)
LEGEND
STOP SIGN (R1-1 30x30 TYP)
WHEEL CHAIR RAMP (TYP)
CURVE | LENGTH | DELTA | RADIUS | TANGENT | DIRECTION | CHORD
C11 | 562.32 | 42°57'29" | 750.00 | 295.12 | S21°40'40"E | 549.24
Water & Sanitary Sewer Lines Approved as to Location Only
The Above Authorization is Valid for 1 Year Only
Natural Ground
HGL
6" WATER
8" SAN. SWR. 250 LF @ 0.44%
8" SAN. SWR. 178 LF @ 0.44%
24" STM. SWR. 117 LF @ 0.174%
24" STM. SWR. 123 LF @ 0.174%
24" STM. SWR. 109 LF @ 0.174%
FL=137.26
1+00
2+00
3+00
4+00
5+00
COH Log. No. 97-0004

P-600



NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
CORKTREE KNOLLS
STA. 5+00.00 TO STA. 9+87.38
BENCH MARK
NOTES
Water & Sanitary Sewer Lines Approved as to Location Only
The Above Authorization Is Valid for 1 Year Only
FLOOD CONTROL
COUNTY ENGINEER
Steffek & Van De Wiele Incorporated
Consulting Engineers
JOB NO. 10902-001-1-UTL
DWG. NO. P-600
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP
SECTION APPROVALS
TRAFFIC AND SIGNAL ENGINEERING
STREET & BRIDGE ENGINEERING
CONSTRUCTION
STORM SEWER ENGINEERING
OTHER DEPARTMENT
SPONSOR DEPARTMENT
CITY ENGINEER
SUBMITTED:
DESIGNED BY: JLG
SCALE: H 1"=20' / V 1"=2'
DATE:
SURVEY BY:
F.B. NO:
CITY DWG NO:
MATCH LINE STA. 5+00.00 (SEE SHEET 27)
KEDGWICK LANE (SEE SHEET 14)
CORKTREE KNOLLS
RESTRICTED RESERVE "A"
RESTRICTED RESERVE "B"
RESTRICTED RESERVE "C"
LEGEND
STOP SIGN (R1-1 30x30 TYP)
WHEEL CHAIR RAMP (TYP)
CURVE | LENGTH | DELTA | RADIUS | TANGENT | DIRECTION | CHORD
C11 | 562.32 | 42°57'29" | 750.00 | 295.12 | S21°40'40"E | 549.24
2-4"x45° BENDS
1-6"x6" TEE
1-6" GV&B
1-FIRE HYDRANT (4' BURY)
1-6"x4" REDUCER
5-4" 45° BENDS
1-2" BLOW-OFF VALVE & BOX
1-4" PLUG & CLAMP
℄ CORKTREE KNOLLS STA. 5+80.37 = ℄ ARLINGTON PLACE STA. 2+79.69
Natural Ground
8" SAN. SWR. 139 LF @ 0.44%
8" SAN. SWR. 308 LF @ 0.44%
4" WATER
24" STM. SWR.
6" WATER
5+00
6+00
7+00
8+00
9+00
COH Log. No. 97-0004
P-600





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

MEDLOWE COURT

STA.1+00.00 TO STA. 4+69.75

BENCH MARK

REFERENCE BENCHMARK
DM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.72

NOTES

for County Engineer
3/20/97

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year only

J.L. GRAHAM, JR. 66480 REGISTERED PROFESSIONAL ENGINEER STATE OF TEXAS SEAL 3/14/97

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated, Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-7042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND PROJECT MANAGEMENT GROUP

SECTION APPROVALS

WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 2/6/97
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT

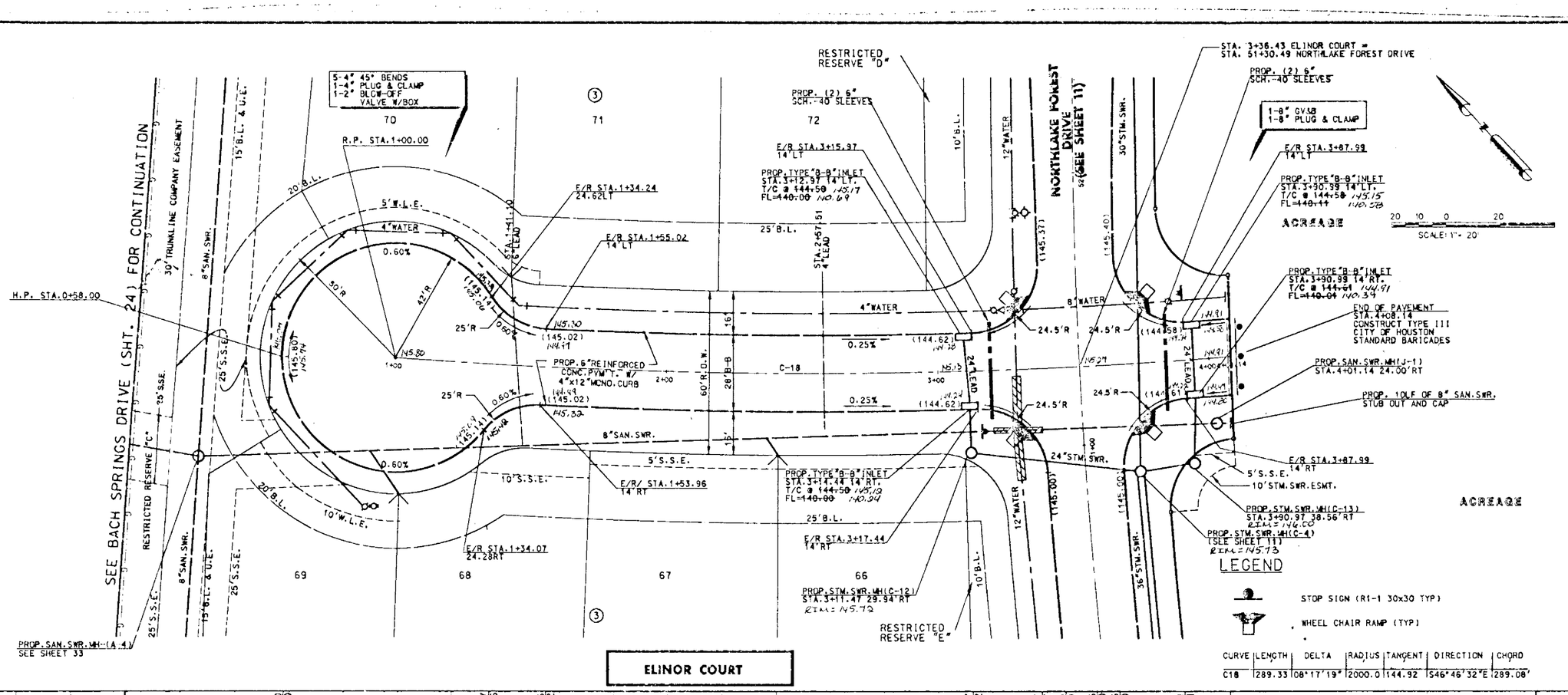
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT
CITY ENGINEER 2/4/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 12/12/96 DATE

SUBMITTED:
SCALE: H: 1"= 20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

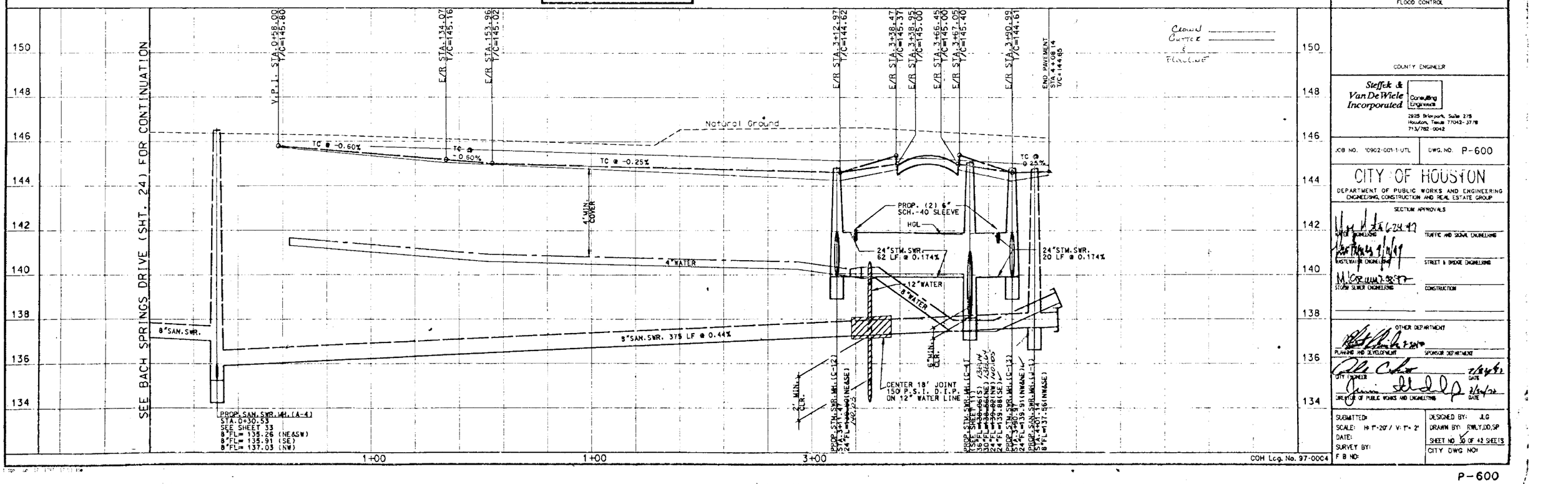
DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 29 OF 42 SHEETS
CITY DWG. NO:

P-600

Monday, December 18 2000



CURVE	LENGTH	DELTA	RADIUS	TANGENT	DIRECTION	CHORD
C18	289.33	08°17'19"	2000.0	144.92	S46°46'32"E	289.08'



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE
ELINOR COURT
STA. 1+00.00 TO STA. 3+36.43

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 152.58' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

APPROVED: for County Engineer
8/24/97
Date

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

STATE OF TEXAS — A.L. GRAHAM JR. — 66480 — REGISTERED — PROFESSIONAL — ENGINEER — SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 1/16/97	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING	CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT | SPONSOR DEPARTMENT

CITY ENGINEER 2/24/97 DATE

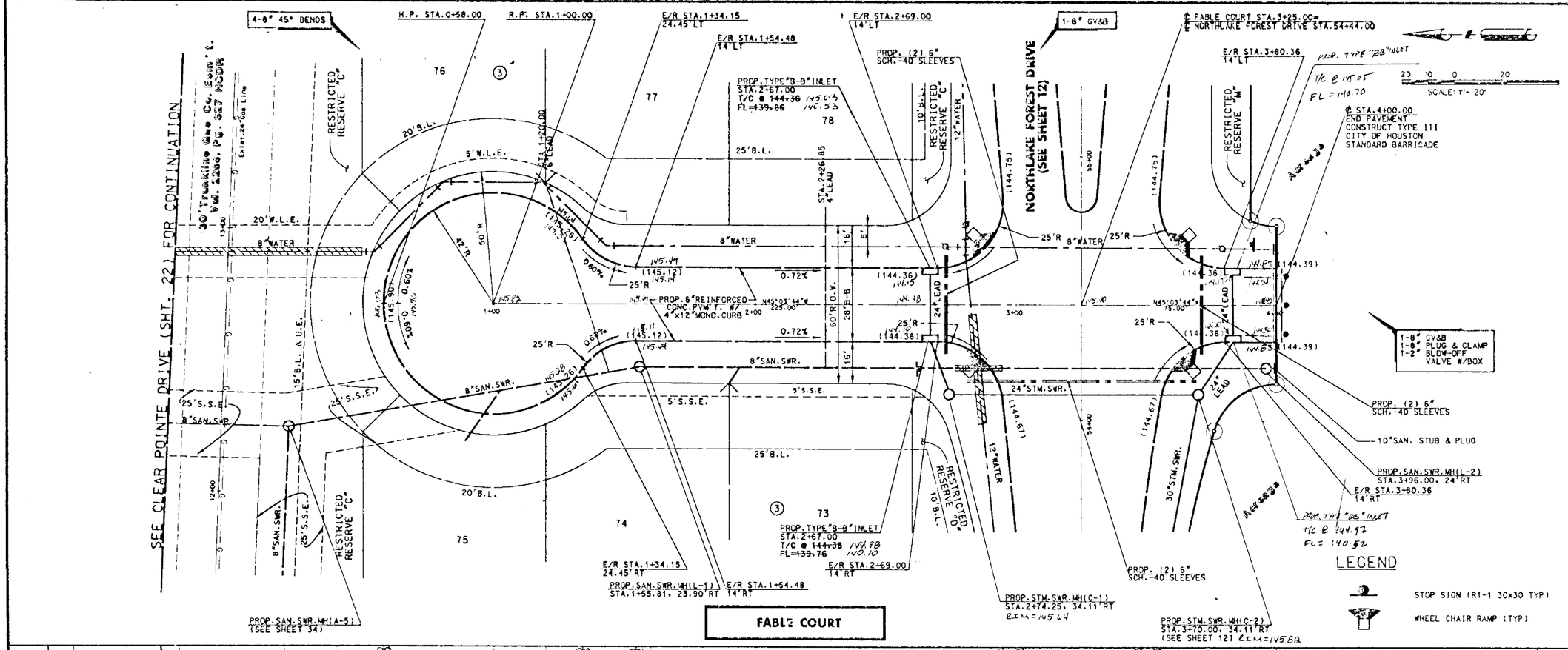
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 2/24/97 DATE

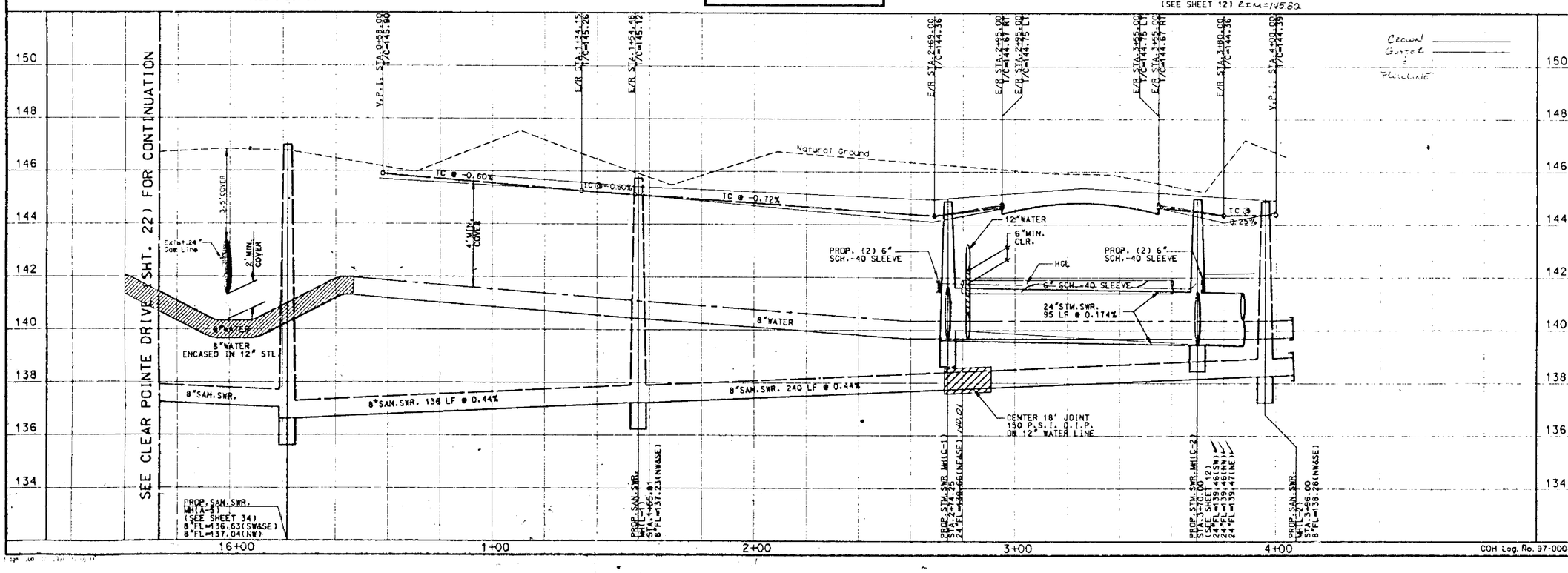
SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 10 OF 42 SHEETS
CITY DWG NO:

COH Lcg. No. 97-0004

P-600





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE **FABLE COURT**

BENCH MARK

REFERENCE BENCHMARK
TBM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF TENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

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NOTES

APPROVED Robert Carter for County Engineer 8/29/97 DATE

Water & Sanitary Sewer Lines Approved as to Location Only

The Above Authorization is Valid for 1 Year Only

SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3718
713/782-0042

JOB NO. 10902-001-1-UTL | DWG NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

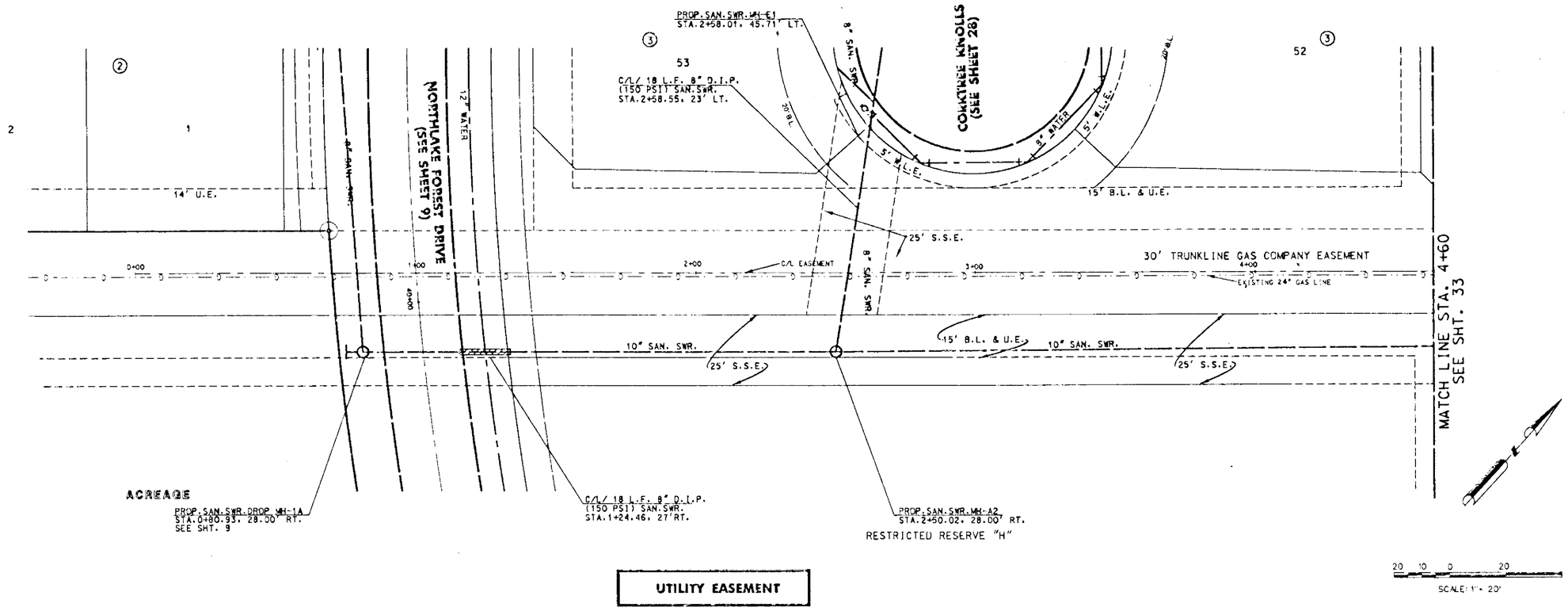
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — 8/29/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — 2/11/97 DATE

SUBMITTED:
SCALE: H 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

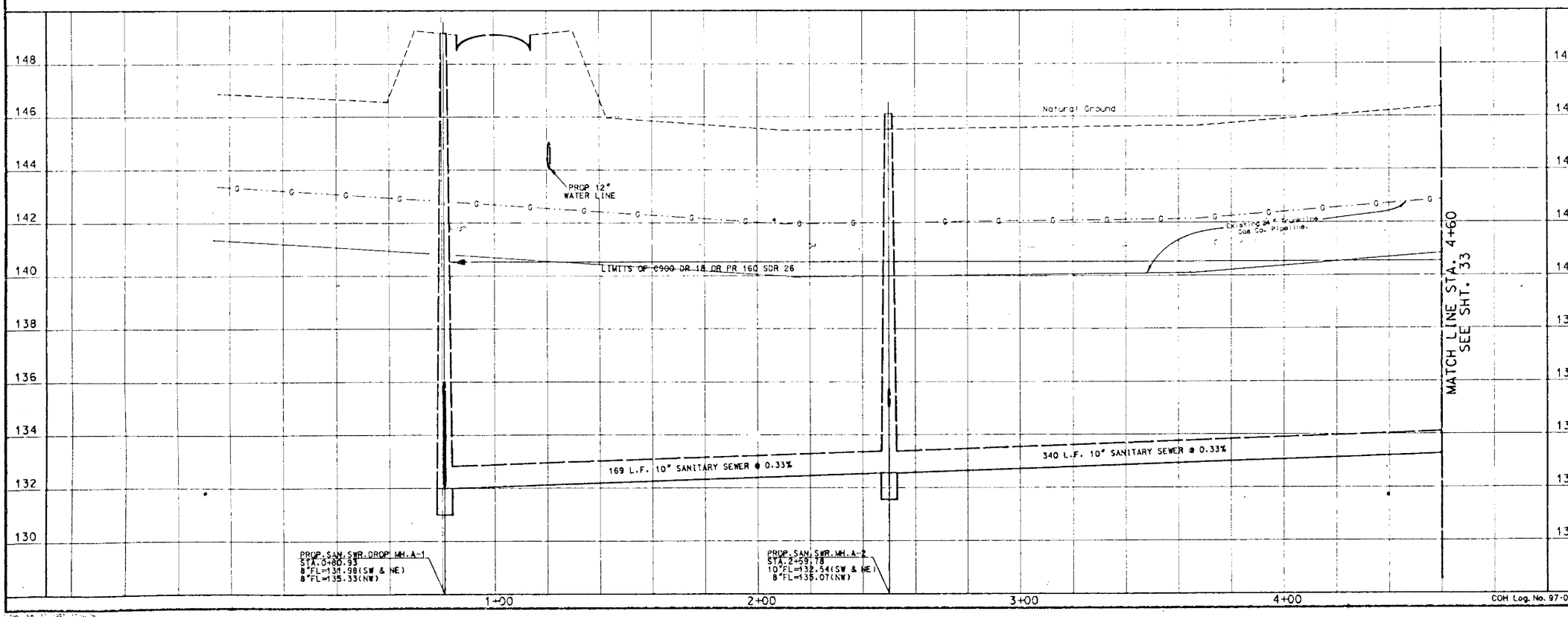
DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. 21 OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600



UTILITY EASEMENT



NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
UTILITY EASEMENT
STA. 0+61.82 TO STA. 4+60.00

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE IN TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

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NOTES

STATE OF TEXAS
J. E. GRAHAM
66480
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902.001-1-UTL | DWG NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING
WASTEWATER ENGINEERING 7/1/99
STORM SEWER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
STREET & BRIDGE ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT

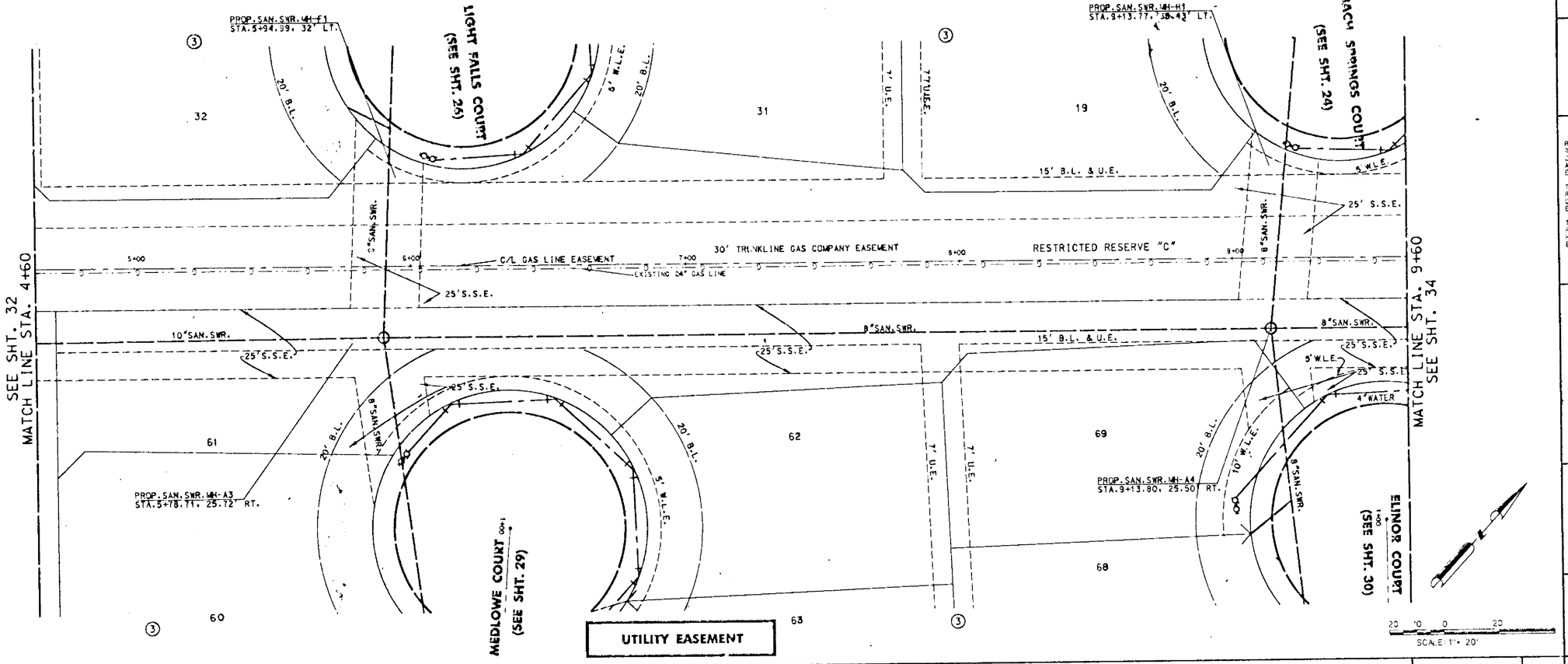
PLANNING AND DEVELOPMENT 1-20-99
SPONSOR DEPARTMENT
CITY ENGINEER 2/24/99 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 2/24/99 DATE

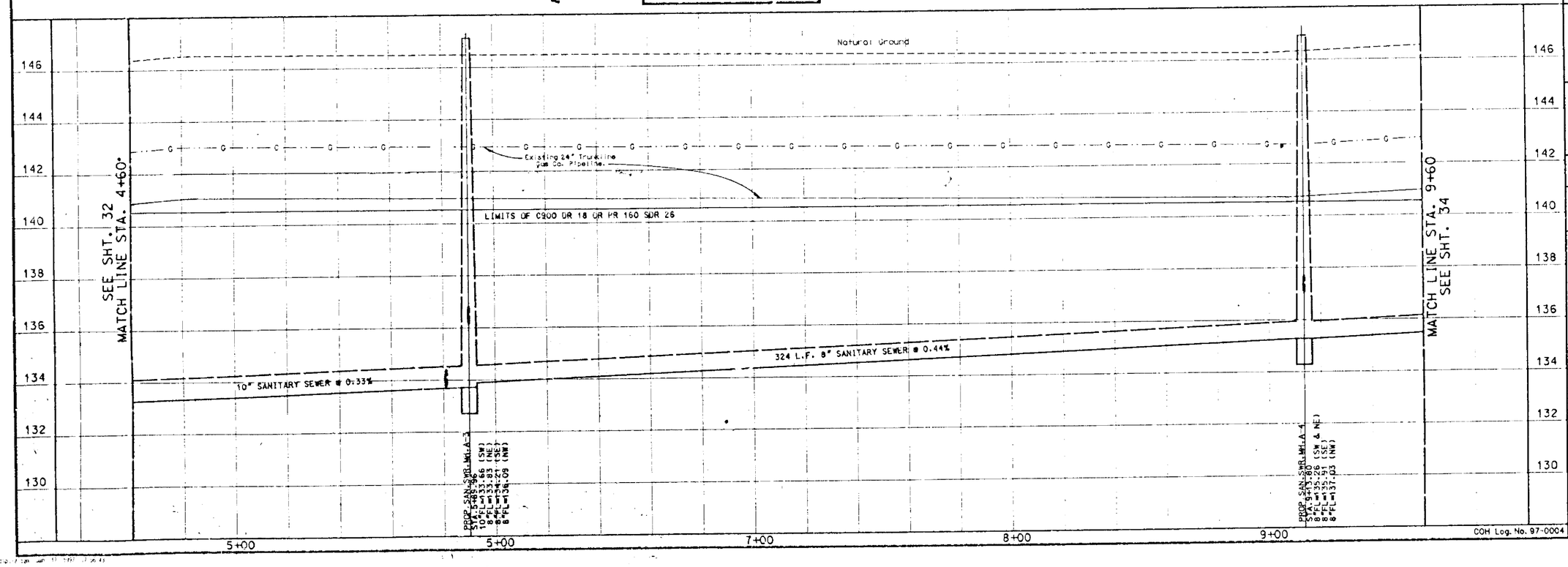
SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F & B NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 32 OF 42 SHEETS
CITY DWG NO:

P-600

Monday, December 18
2000





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
UTILITY EASEMENT
STA. 4+60.00 TO STA. 9+60.00

BENCH MARK

REFERENCE BENCHMARK
BM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

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TBM 2
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NOTES

STATE OF TEXAS — J.L. GRIMM JR. — 66480 — REGISTERED PROFESSIONAL ENGINEER — SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

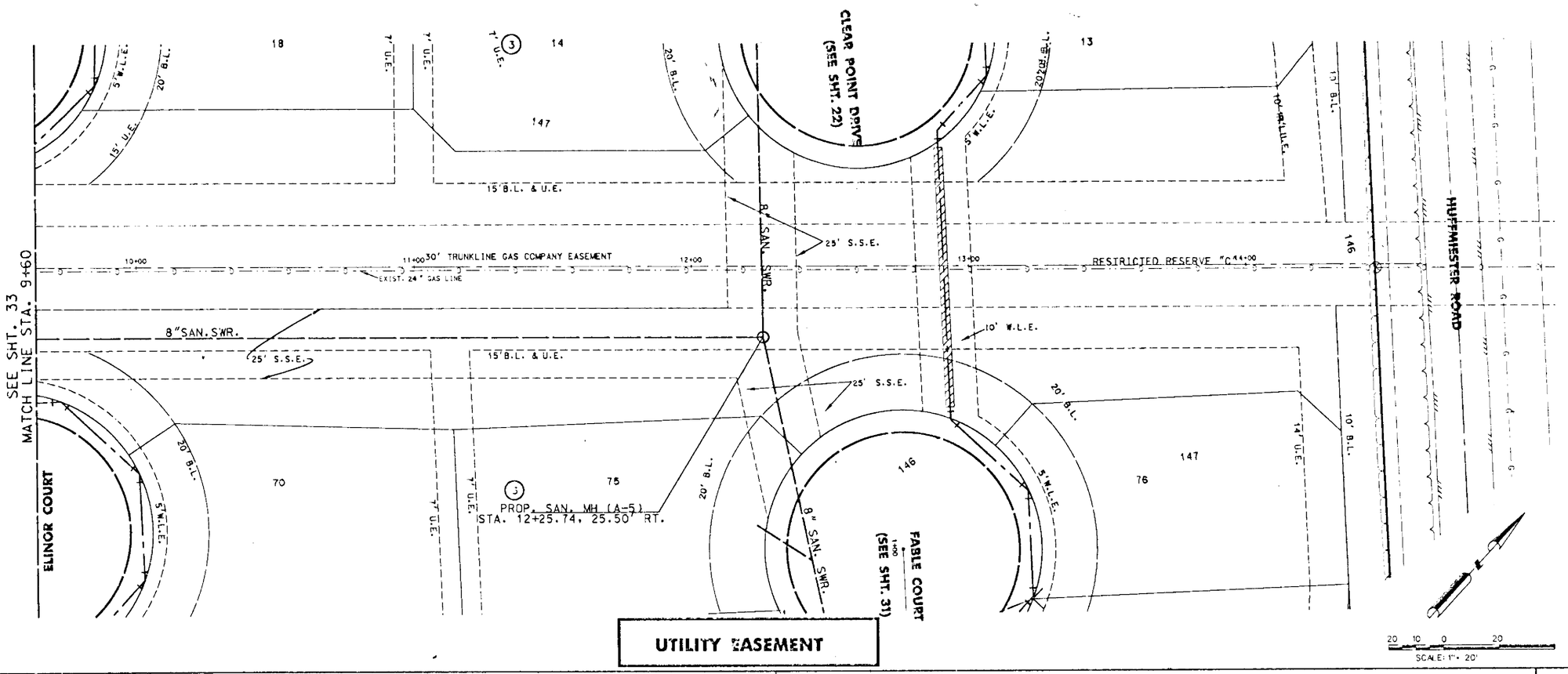
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — 2/14/97 DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — 2/20/97 DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

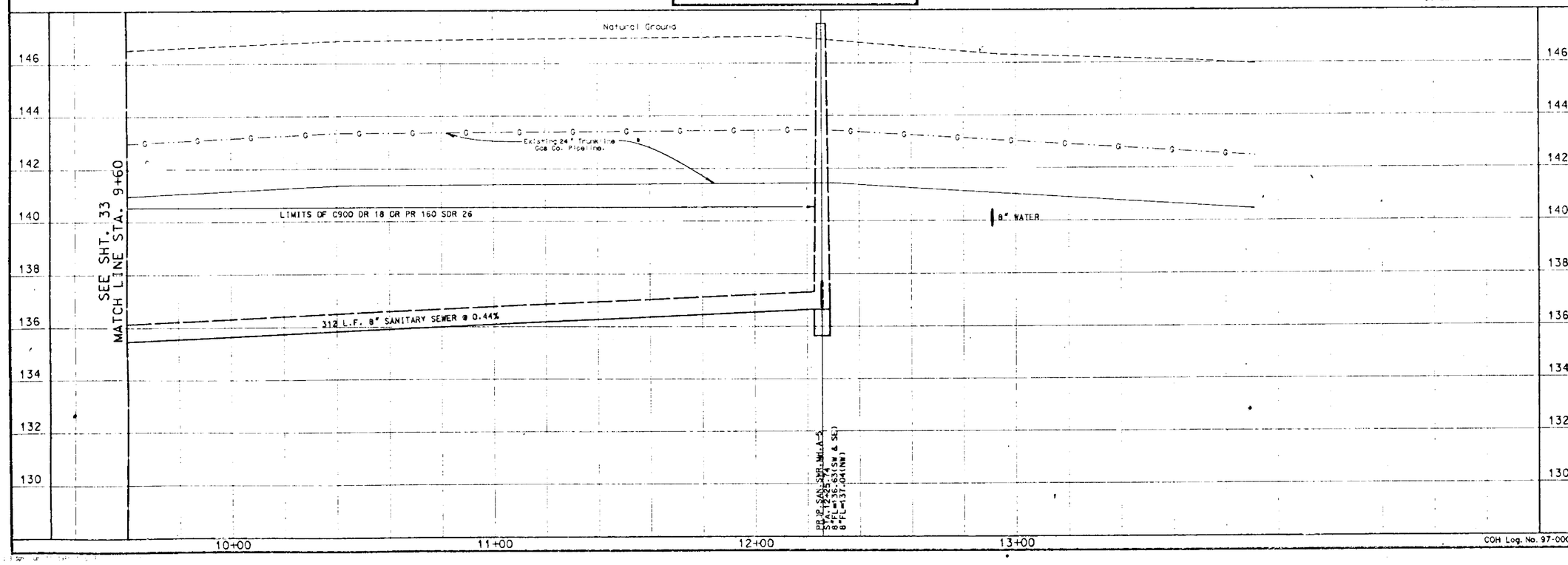
DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 33 OF 42 SHEETS
CITY DWG NO:

P-600

18 16 14.5 12 — Monday, December 18 2000 — 0 24X — 12 14.5 16 18 20



UTILITY EASEMENT



NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
UTILITY EASEMENT
STA. 9+60.00 TO STA. 13+10.00

BENCH MARK

REFERENCE BENCHMARK
TM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
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ELEVATION = 147.70'

TBM 2
HR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

NOTES

J.L. GRAVES
66480
REGISTERED
PROFESSIONAL ENGINEER
STATE OF TEXAS
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3776
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

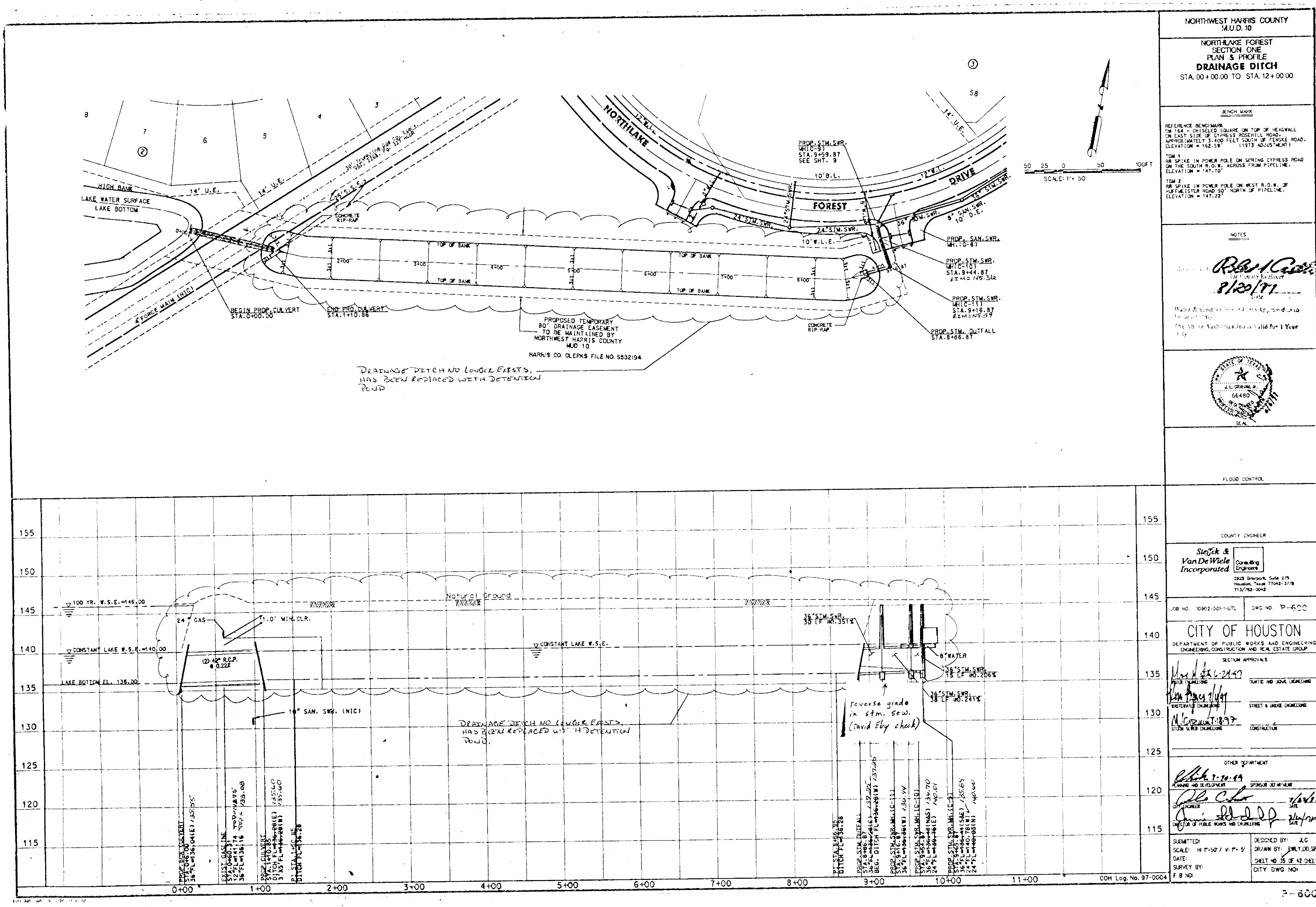
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE 12/4/97
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE 12/4/97

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F.B. NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO 34 OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600



NORTHWEST HARRIS COUNTY M.U.D. 10
NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
DRAINAGE DITCH
STA. 00+00.00 TO STA. 12+00.00
BENCH MARK
REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD. APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)
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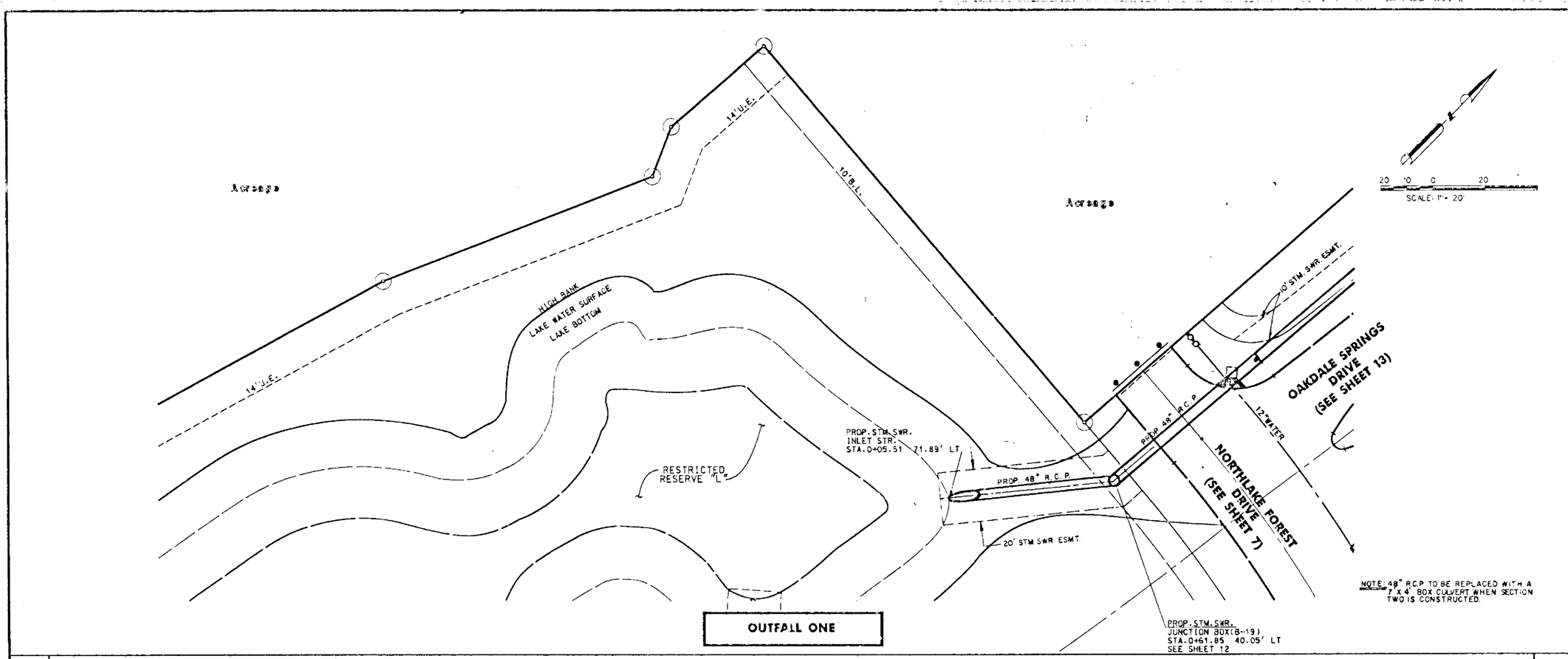
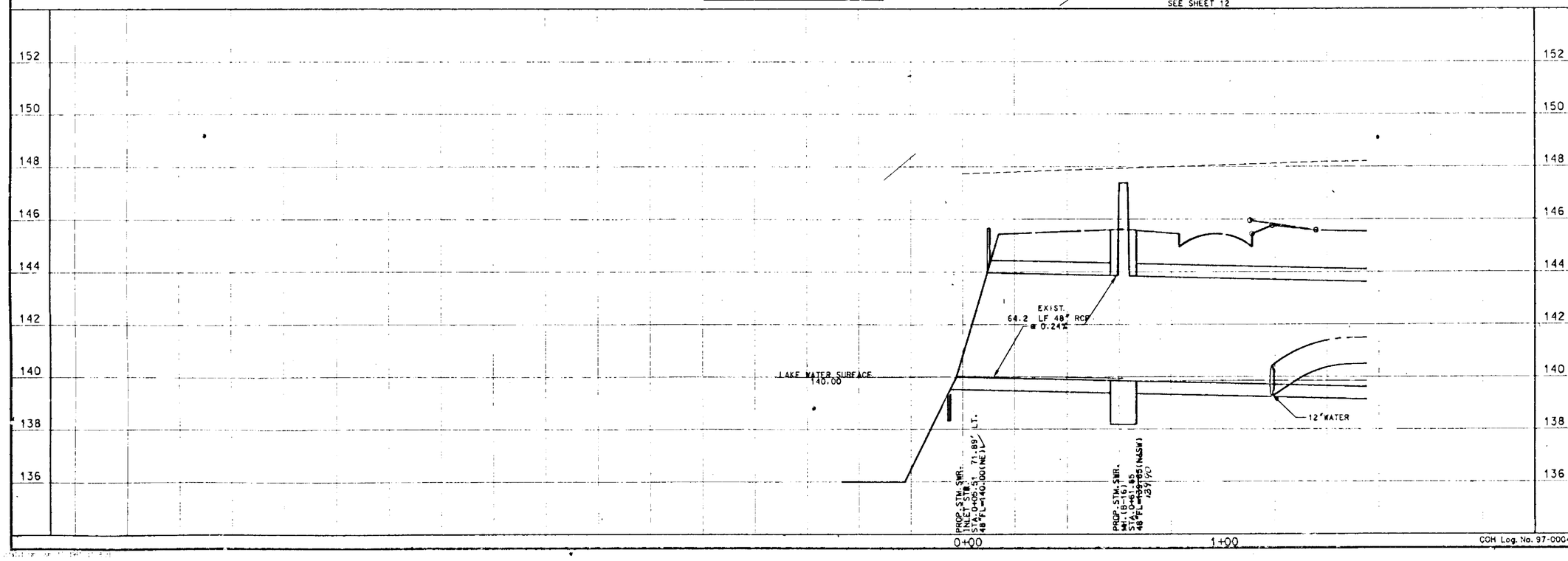
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'
NOTES
for County Engineer
8/20/97
Date
The Above Authorization is Valid for 1 Year
STATE OF TEXAS
J.L. GRAHAM, Jr.
66480
SEAL
FLOOD CONTROL
COUNTY ENGINEER
Stejjek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042
JOB NO. 10902-001-1-UTL
DWG. NO. P-600
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP
SECTION APPROVALS
WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING
CONSTRUCTION
OTHER DEPARTMENT
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT
CITY ENGINEER
DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING
SUBMITTED:
SCALE: H: 1"=50' / V: 1"=5'
DATE:
SURVEY BY:
F B NO:
DESIGNED BY: JLG
DRAWN BY: BWLY,DD,SP
SHEET NO 35 OF 42 SHEETS
CITY DWG NO:
COH Log. No. 97-0004
NORTHLAKE FOREST DRIVE
HIGH BANK
LAKE WATER SURFACE
LAKE BOTTOM
14' U.E.
FORCE MAIN (NIC)
BEGIN PROP. CULVERT STA. 0+00.00
END PROP. CULVERT STA. 1+10.86
CONCRETE RIP-RAP
TOP OF BANK
PROPOSED TEMPORARY 80' DRAINAGE EASEMENT TO BE MAINTAINED BY NORTHWEST HARRIS COUNTY MUD 10
HARRIS CO. CLERKS FILE NO. S832194
DRAINAGE DITCH NO LONGER EXISTS, HAS BEEN REPLACED WITH DETENTION POND
PROP. STM. SWR. MH(C-9) STA. 9+59.87 SEE SHT. 9
PROP. SAN. SWR. MH. (C-8)
PROP. STM. SWR. MH(C-10) STA. 9+44.87
PROP. STM. SWR. MH(C-11) STA. 9+16.87
PROP. STM. OUTFALL STA. 8+86.87
24" STM. SWR.
10' B.L.
10' W.L.E.
8" SAN. SWR. 10' D.E.
SCALE: 1"=50'
100 YR. W.S.E.=146.00
CONSTANT LAKE W.S.E.=140.00
LAKE BOTTOM EL. 135.00
24" GAS
1.0' MIN. CLR.
(2) 42" R.C.P. @ 0.22%
10" SAN. SWR. (NIC)
Natural Ground
CONSTANT LAKE W.S.E.
36" STM. SWR. 30 LF @0.35%
8" WATER
36" STM. SWR. 15 LF @0.206%
36" STM. SWR. 30 LF @0.24%
reverse grade in stm. sew. (David Eby check)
DRAINAGE DITCH NO LONGER EXISTS, HAS BEEN REPLACED WITH DETENTION POND
155
150
145
140
135
130
125
120
115
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
P-600





NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE PLAN & PROFILE

BENCH MARK

REFERENCE BENCHMARK
DM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD. ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W., ACROSS FROM PIPELINE. ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE. ELEVATION = 147.22'

NOTES

Robert Caldwell
for the City Engineer
3/20/97
Date

Water & Sanitary Sewer Lines Approved as to location only.

The above Authorization is good for 1 Year only.

STATE OF TEXAS
A.L. GRAHAM, JR.
56480
REGISTERED PROFESSIONAL ENGINEER
11/19/96
SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 0902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
CITY ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

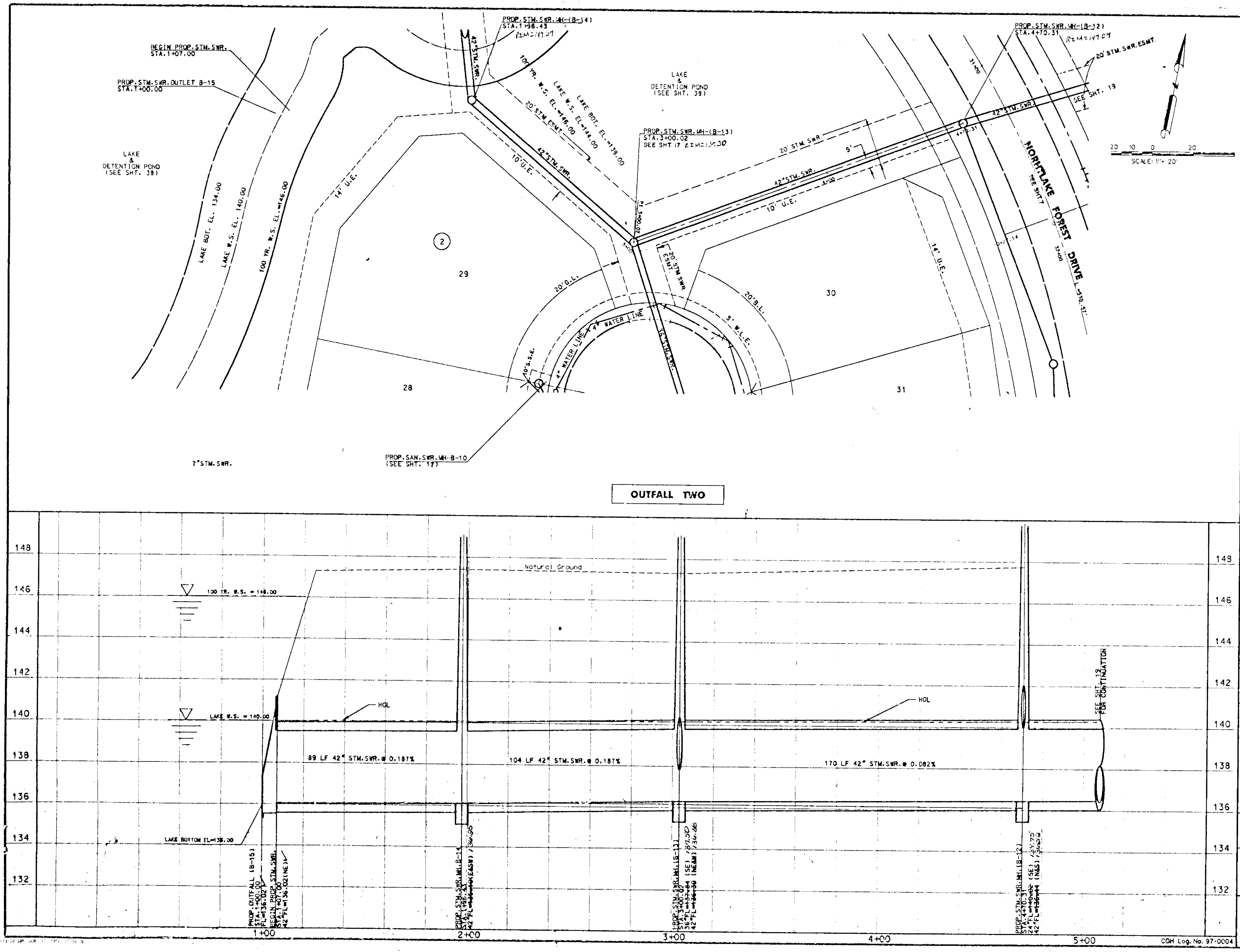
SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F B NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO. X OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600

Monday, December 18
2000



NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION ONE
PLAN & PROFILE
SYSTEM 1 OUTFALL LINE
STA. 1+00.00 TO STA. 4+80.18

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD, ELEVATION = 162.59' (1973 ADJUSTMENT)

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NOTES

APPROVED County Engineer 8/20/97 Date

Water & Sanitary Sewer Lines approved as to location only.

The Above Approval is Valid for 1 Year Only

SEAL

FLOOD CONTROL

COUNTY ENGINEER

Steffek & Van De Wiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT 7-30-97 — SPONSOR DEPARTMENT
CITY ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:
SCALE: H: 1"=20' / V: 1"= 2'
DATE:
SURVEY BY:
F B NO:

DESIGNED BY: JLG
DRAWN BY: BWLY,DO,SP
SHEET NO 37 OF 42 SHEETS
CITY DWG NO:

COH Log. No. 97-0004

P-600

50 25 0 50 100
SCALE: 1"= 50'

100 - YEAR DESIGNS

Design of Outfall Pipe (from lake to MH#17)

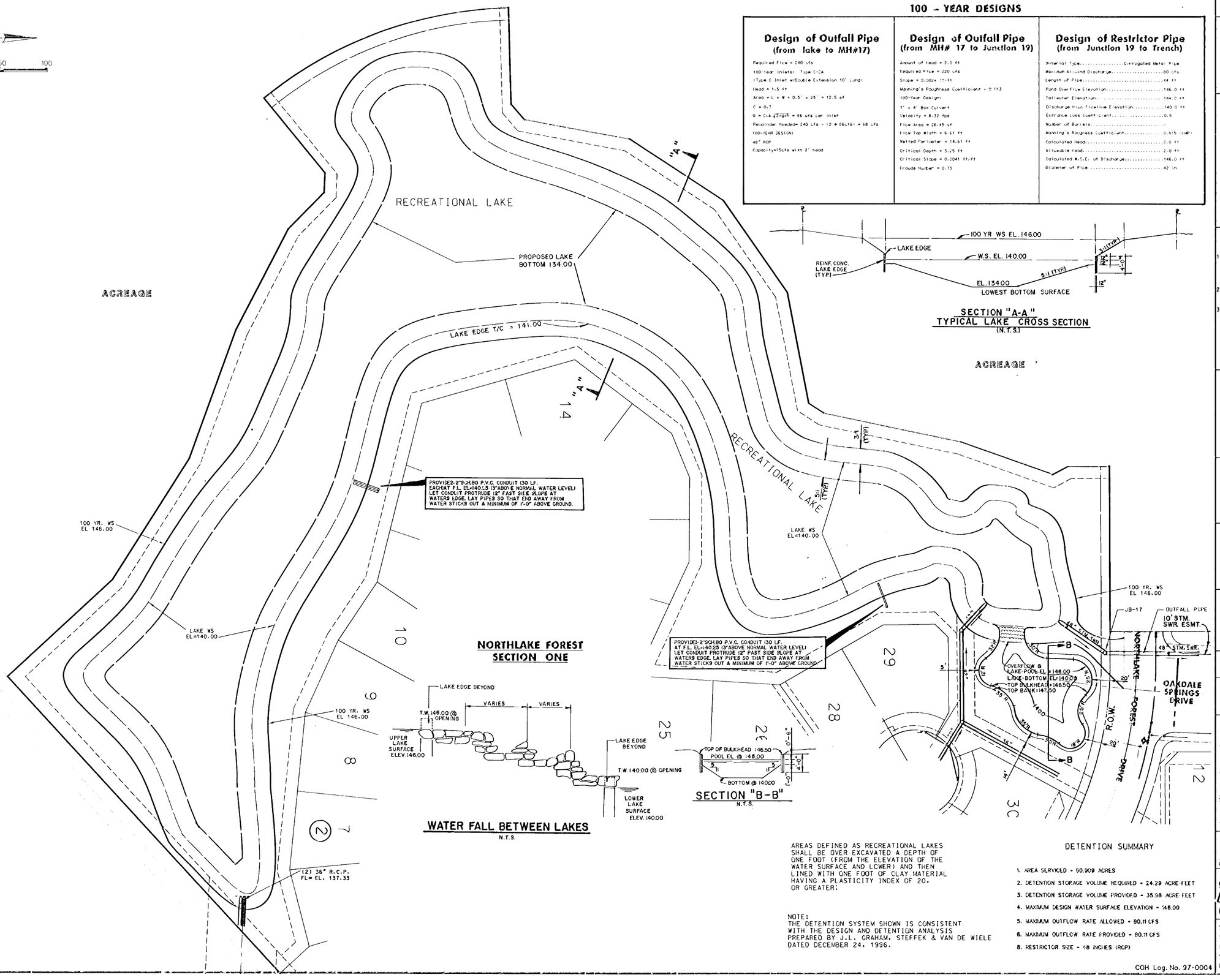
Required Flow = 240 cfs
100-Year Inlets: Type C-2A
(Type C Inlet w/Double Extension 10' Long)
Head = 1.5 ft
Area = L x W = 0.5' x 25' = 12.5 sf
C = 0.7
Q = CiA $\sqrt{2gH}$ = 86 cfs per Inlet
Recalculate Needed= 240 cfs ÷ 12 = 86cfs= 68 cfs
100-YEAR DESIGN:
48" RCP
Capacity=75cfs with 2' Head

Design of Outfall Pipe (from MH# 17 to Junction 19)

Amount of Head = 2.0 ft
Required Flow = 220 cfs
Slope = 0.002± ft/ft
Manning's Roughness Coefficient = 0.013
100-Year Design:
7' x 4' Box Culvert
Velocity = 8.32 fps
Flow Area = 26.45 sf
Flow Top Width = 6.61 ft
Wetted Perimeter = 14.61 ft
Critical Depth = 3.25 ft
Critical Slope = 0.0041 ft/ft
Froude Number = 0.73

Design of Restrictor Pipe (from Junction 19 to Trench)

Material Type.....Corrugated Metal Pipe
Maximum Allowed Discharge.....80 cfs
Length of Pipe.....44 ft
Pond Overflow Elevation.....146.0 ft
Tailwater Elevation.....144.0 ft
Discharge Pipe Flowline Elevation.....140.0 ft
Entrance Loss Coefficient.....0.5
Number of Barrels.....
Manning's Roughness Coefficient.....0.015 (CMP)
Calculated Head.....2.0 ft
Allowable Head.....2.0 ft
Calculated W.S.E. at Discharge.....146.0 ft
Diameter of Pipe.....42 in



SECTION "A-A"
TYPICAL LAKE CROSS SECTION
(N.T.S.)

NORTHLAKE FOREST SECTION ONE

WATER FALL BETWEEN LAKES
N.T.S.

SECTION "B-B"
N.T.S.

AREAS DEFINED AS RECREATIONAL LAKES SHALL BE OVER EXCAVATED A DEPTH OF ONE FOOT (FROM THE ELEVATION OF THE WATER SURFACE AND LOWER) AND THEN LINED WITH ONE FOOT OF CLAY MATERIAL HAVING A PLASTICITY INDEX OF 20, OR GREATER.

NOTE:
THE DETENTION SYSTEM SHOWN IS CONSISTENT WITH THE DESIGN AND DETENTION ANALYSIS PREPARED BY J.L. GRAHAM, STEFFEK & VAN DE WIELE DATED DECEMBER 24, 1996.

DETENTION SUMMARY

1. AREA SERVICED = 50.909 ACRES
2. DETENTION STORAGE VOLUME REQUIRED = 24.29 ACRE-FEET
3. DETENTION STORAGE VOLUME PROVIDED = 35.98 ACRE-FEET
4. MAXIMUM DESIGN WATER SURFACE ELEVATION = 146.00
5. MAXIMUM OUTFLOW RATE ALLOWED = 80.11 CFS
6. MAXIMUM OUTFLOW RATE PROVIDED = 80.11 CFS
8. RESTRICTOR SIZE = 48 INCHES (RCP)

COH Log. No. 97-0004

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION ONE DETENTION POND & SPILLWAY ALTERNATE "A"

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59' (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70'

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD 50' NORTH OF PIPELINE.
ELEVATION = 147.22'

NOTES

1. 100 Yr. Flood Plain Water Surface elev.=146.0 as per the Federal Emergency Management Agency Flood Insurance Rate Map for (City of Houston) (Harris County) 48201 C0410 Revised Nov. 6, 1996
2. THE DETENTION POND SHOWN HEREON IS A PRIVATE FACILITY AND WILL BE OPERATED AND MAINTAINED BY THE OWNER.
3. THE SPILLWAY SHALL BE CONSTRUCTED WITH 4" THICK CONCRETE AND 6x6xW2.9xW2.9 WELDED WIRE FABRIC OR EQUIVALENT REINFORCING.

STATE OF TEXAS
J.L. GRAHAM
66480
REGISTERED PROFESSIONAL ENGINEER
SEAL

INTERPOSE NO OBJECTION
FINAL APPROVAL BY OTHERS
HARRIS COUNTY FLOOD CONTROL DISTRICT
DATE
THE ABOVE SIGNATURE VALID FOR ONE (1) YEAR ONLY
FLOOD CONTROL

COUNTY ENGINEER

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-001-1-UTL | DWG. NO. P-600

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

SECTION APPROVALS

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & DRAINAGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

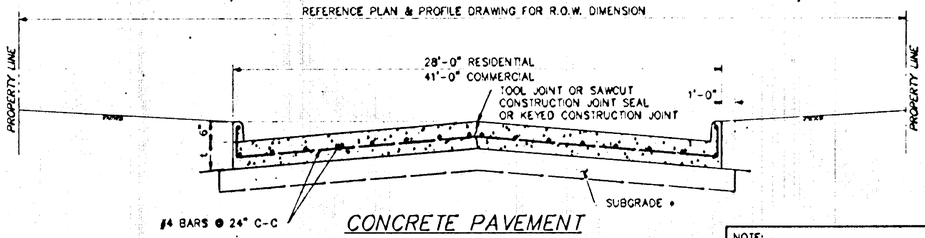
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT
ENGINEER — DATE
DIRECTOR OF PUBLIC WORKS AND ENGINEERING — DATE

SUBMITTED:
SCALE: H: 1"=50'
DATE:
SURVEY BY:
F B NO:

DESIGNED BY: JLG
DRAWN BY: RWLY,DD,SP
SHEET NO.38 OF 42 SHEETS
CITY DWG NO:

P-600

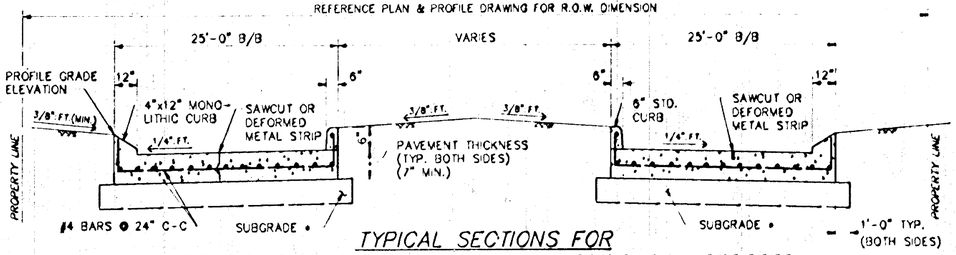


CONCRETE PAVEMENT CURB & GUTTER SECTION

PARBOLIC CROWN IS AN ACCEPTABLE OPTION

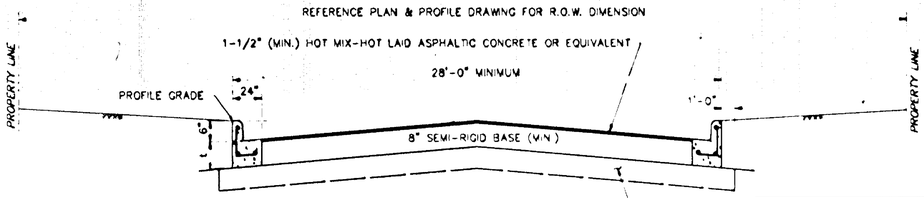
N.T.S.

NOTE: PAVEMENT SECTIONS TO BE LOCATED IN CENTER OF R-O-W



TYPICAL SECTIONS FOR COMBINATION CURB FOR DIVIDED RESIDENTIAL STREETS

N.T.S.

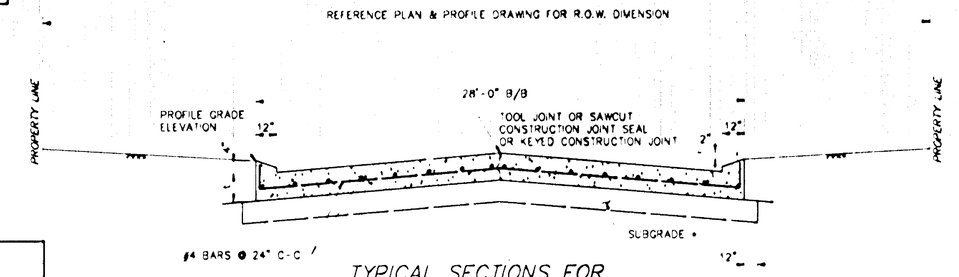


SEMI-RIGID BASE PAVEMENT CURB & GUTTER SECTION

N.T.S.

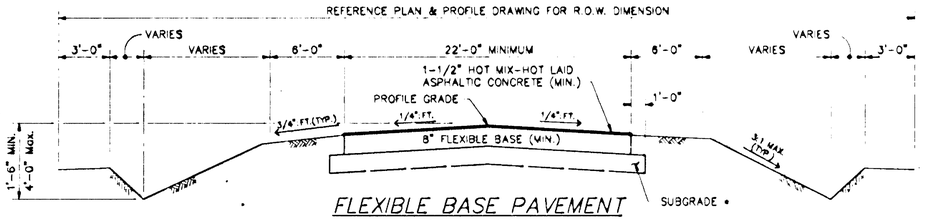
SUBGRADE

REFER TO RULES AND REGULATIONS FOR SUBDIVISIONS FOR TREATMENT AND COMPACTION



TYPICAL SECTIONS FOR 4"x12" MONOLITHIC CURB FOR RESIDENTIAL STREETS

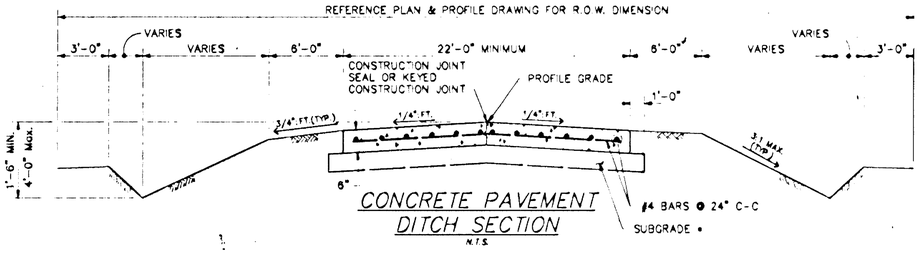
N.T.S.



FLEXIBLE BASE PAVEMENT DITCH SECTION

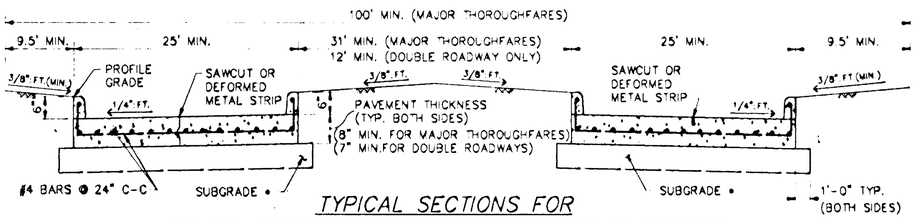
N.T.S.

t = THICKNESS OF CONCRETE PAVEMENT
REFER TO SUBDIVISION RULES AND REGULATIONS



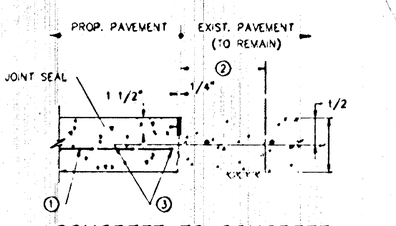
CONCRETE PAVEMENT DITCH SECTION

N.T.S.



TYPICAL SECTIONS FOR MAJOR THOROUGHFARES AND DOUBLE ROADWAYS

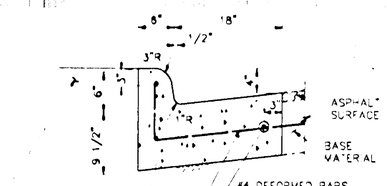
N.T.S.



CONCRETE TO CONCRETE STANDARD PAVEMENT TIE-IN

(SEE NOTES)

① Reinforcing centered in proposed pavement, 3" clear at edges.
② Saw-cut & remove 2' existing pavement or pavement with curb. Expose and clean existing reinforcing.
③ 24 bar diameter lap or weld, if directed.



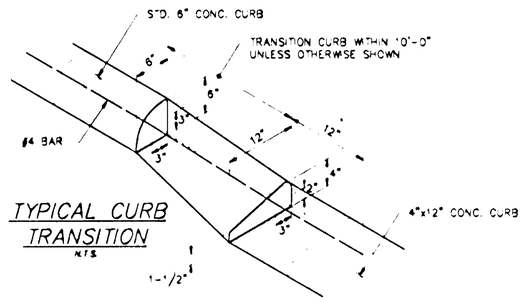
NOTE: SOIL SHALL BE COMPACTED IN ACCORDANCE WITH SPECIFICATIONS PRIOR TO FURTHER ROADWAY CONSTRUCTION.

MONOLITHIC CONCRETE CURB & GUTTER DETAIL

SCALE: 1"=1'-0"

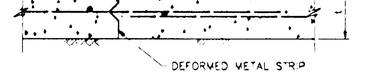
4"x12" MONOLITHIC AND TRANSITION CURB NOTES:

1. 6-inch concrete curb to be constructed on all esplanades, islands and non-residential streets. Residential streets may be constructed with either 6-inch concrete curb or 4-inch x 12-inch concrete curb as noted on plans.
2. All 4-inch x 12-inch concrete curbs to be poured monolithicly with proposed concrete pavement.
3. Transitions from 6-inch concrete curb to 4-inch x 12-inch concrete curb to be accomplished within 10 feet, unless otherwise shown. If this 10-foot transition curb is not poured monolithicly with the pavement, then reinforcing steel as shown above in typical detail 4-inch x 12-inch transition curb is to be installed.



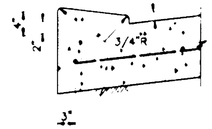
TYPICAL CURB TRANSITION

N.T.S.



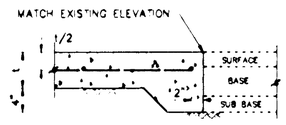
CONSTRUCTION JOINT DETAIL

SCALE: 1 1/2"=1'-0"



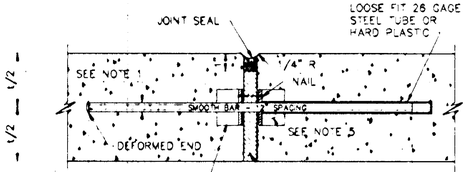
TYPICAL DETAIL 4"x12" MONOLITHIC CURB

SCALE: 1"=1'-0"



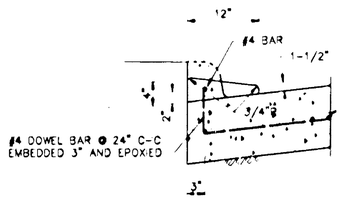
CONCRETE TO ASPHALT STANDARD PAVING HEADER

SCALE: 1"=1'-0"



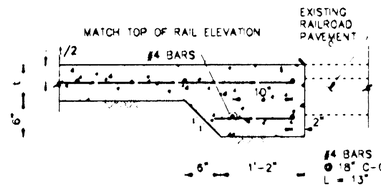
DOWEL TYPE EXPANSION JOINT DETAIL

SCALE: 3"=1'-0"



TYPICAL DETAIL 4"x12" TRANSITION CURB

SCALE: 1"=1'-0"



RAILROAD HEADER DETAIL

SCALE: 1"=1'-0"

NOTES:

1. Dowels for pavement expansion joints shall be 3/4" ø for 6" to less than 7" pavement thickness, 1" ø for 7" to less than 9" pavement thickness and 1 1/4" ø for 9" or greater pavement thickness.
2. Expansion joint shall be placed at the end of each curb return and at maximum 60' spacing (See plans).
3. All joint seal material shall be asphalt rubber in accordance with ASTM designation D3405.
4. If deformed metal strips are allowed, they shall be staked in place with #3 bars.
5. Pre-manufactured joint plate.

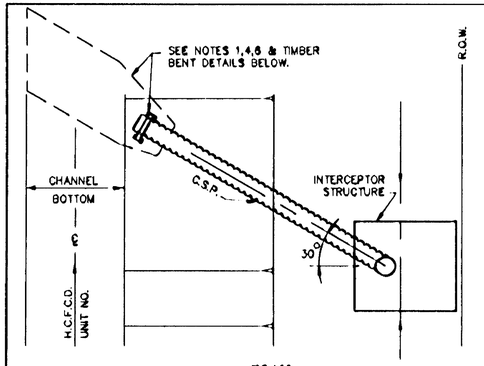
NO	REVISIONS	DATE	NAME

HARRIS COUNTY ENGINEERING DEPARTMENT

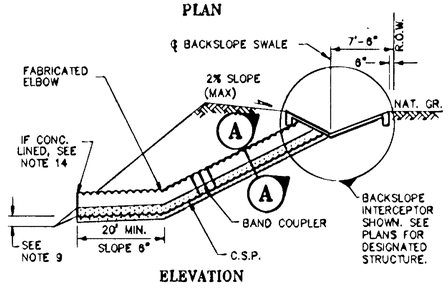
DRAWN BY: L.M.J.	SUBDIVISION STANDARD	JOB NO: 10902-001-1
CHK BY: S.	PAVEMENT DETAILS	FILE NAME: PAVING1
SCALE: AS NOTED		FILE NO:
DATE: 09/03/93	APPROVED BY: Jerry H. Anderson	SHT NO: S/D-1

SHT. 39 OF 42

P-600

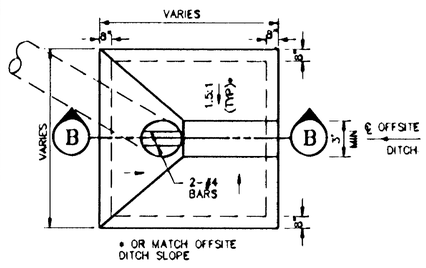


PLAN

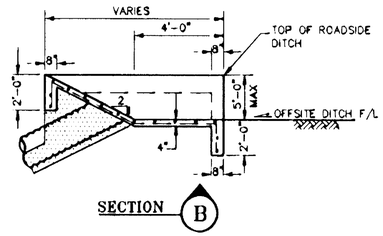


ELEVATION

TYPICAL INTERCEPTOR OUTFALL STRUCTURE LAYOUT

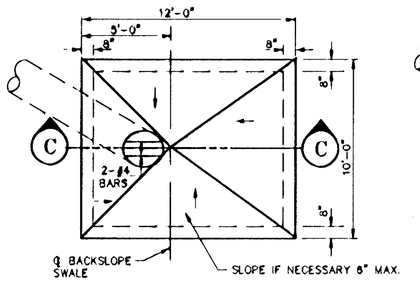


PLAN

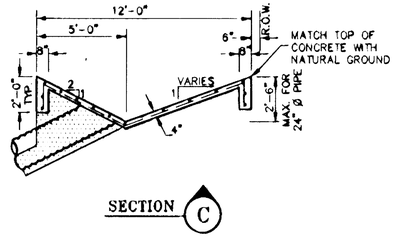


SECTION

TYPICAL OFFSITE DITCH INTERCEPTOR STRUCTURE
(42" MAX.)

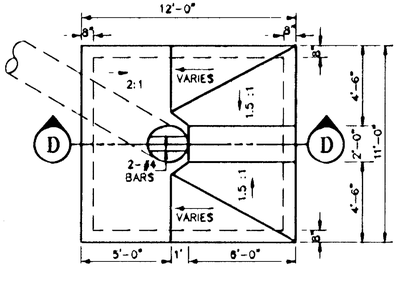


PLAN

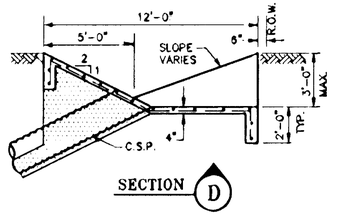


SECTION

TYPICAL BACKSLOPE INTERCEPTOR STRUCTURE
(24" & 30" DIA. C.S.P. ONLY)



PLAN



SECTION

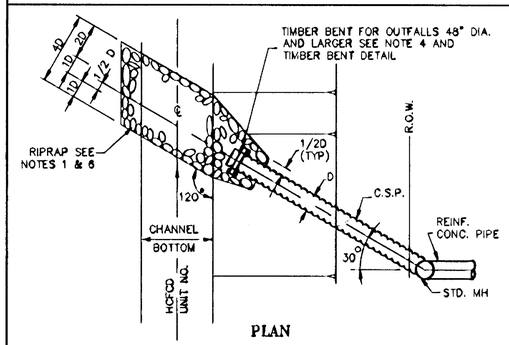
COMBINATION BACKSLOPE AND OFFSITE DITCH INTERCEPTOR
(42" MAX.)

GENERAL NOTES

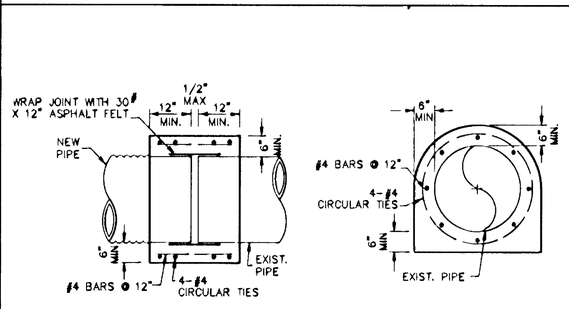
1. INTERCEPTOR STRUCTURE OUTFALLS ≥ 48" DIAMETER AND ALL STORM SEWER AND TREATMENT PLANT OUTFALLS SHALL BE INSTALLED WITH RIPRAP EROSION PROTECTION, DIMENSIONED AS SHOWN IN "TYPICAL STORM SEWER OUTFALL STRUCTURE LAYOUT."
2. ALL STORM SEWER AND INTERCEPTOR OUTFALL PIPES WITHIN THE HCFCD RIGHT-OF-WAY SHALL BE CORRUGATED STEEL PIPE (CSP) PER HCFCD SPECIFICATION NO. 02610-CORRUGATED STEEL PIPE.
3. CEMENT STABILIZED SAND SHALL BE PROVIDED AND PLACED IN ACCORDANCE WITH HCFCD SPECIFICATION NO. 02242-CEMENT STABILIZED SAND.
4. TIMBER BENTS SHALL BE IN ACCORDANCE WITH HCFCD SPECIFICATION NO.02365-TIMBER BENTS FOR OUTFALL PIPES.
5. ALL EXCAVATION, FILL AND BACKFILL FOR THE INTERCEPTOR STRUCTURES SHALL BE IN ACCORDANCE WITH HCFCD SPECIFICATION NO. 02221-STRUCTURAL EXCAVATION, FILL AND BACKFILL.
6. RIPRAP SHALL BE IN ACCORDANCE WITH HCFCD SPECIFICATION NO. 02273.
7. ALL CONCRETE SHALL HAVE A MINIMUM 3000 psi COMPRESSIVE STRENGTH AT 28 DAYS.
8. ALL INTERCEPTOR STRUCTURES SHALL HAVE:
   a. 2-FEET DEEP X 8-INCH WIDE TOE ALL AROUND THE STRUCTURE.
   b. STEEL REINFORCING- 4 BARS (GRADE 40) AT 12 INCHES C.C., EACH WAY.
9. THE FLOWLINE OF ALL OUTFALL PIPES SHALL BE 1 FOOT ABOVE THE DESIGN CHANNEL FLOWLINE, OR 1 FOOT ABOVE NORMAL WATER SURFACE ELEVATION.
10. SLOPE LAST SEGMENT OF OUTFALL PIPE 6 INCH IN 20 FEET.
11. VOIDS BEYOND THE LIMITS OF THE CONCRETE INTERCEPTOR PAD SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND OR SANDY CLAY MATERIAL COMPACTED TO 95% STANDARD PROCTOR DENSITY.
12. THE INTERCEPTOR STRUCTURES SHOWN CAN BE USED ON PIPE SIZES UP TO AND INCLUDING 42-INCH DIAMETER. LARGER PIPE WILL REQUIRE AN INDIVIDUALLY DESIGNED STRUCTURE.
13. OUTFALL PIPES LARGER THAN 72-INCH DIAMETER SHALL BE INDIVIDUALLY DESIGNED AND DETAILED ON THE PLANS.
14. SEE THE CONCRETE PAVING DETAIL SHEET FOR CSP OUTFALL DETAILS THROUGH CONCRETE PAVING.
15. RCP AND BOX CULVERT OUTFALLS ARE TO BE INDIVIDUALLY DESIGNED AND DETAILED ON THE PLANS.
16. OUTFALL DETAILS SHOWN ARE SUITABLE ON SLOPES UP TO AND INCLUDING 3:1. FLATTER SLOPES WILL REQUIRE AN INDIVIDUALLY DESIGNED STRUCTURE.

REV	DESCRIPTION	DATE	APPR

HARRIS COUNTY
FLOOD CONTROL DISTRICT
9900 NORTHWEST FREEWAY
HOUSTON, TEXAS 77092

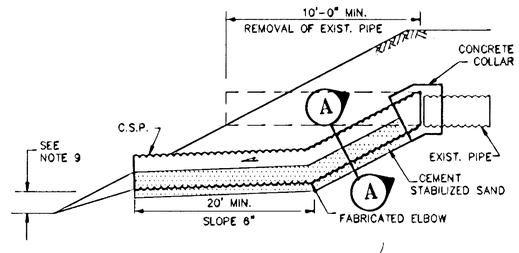


PLAN

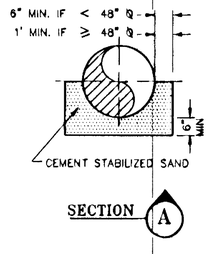


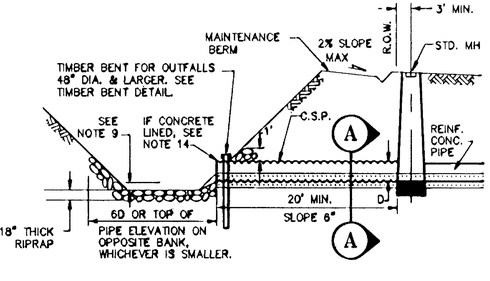
ELEVATION SECTION

TYPICAL CONCRETE COLLAR DETAIL



PIPE ADJUSTMENT DETAIL
24-INCH TO 42-INCH DIAMETER

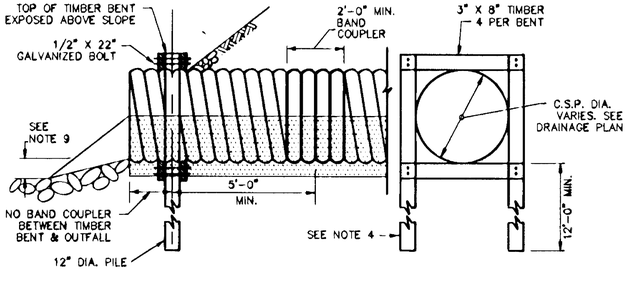




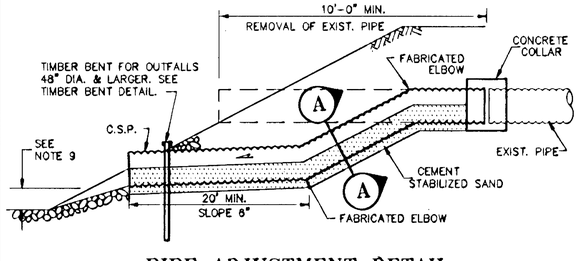
ELEVATION

TYPICAL STORM SEWER OUTFALL STRUCTURE LAYOUT

STANDARD\OUTFAL49



TIMBER BENT DETAIL
FOR 48" C.S.P. AND LARGER OUTFALLS



PIPE ADJUSTMENT DETAIL
48-INCH AND LARGER DIAMETER

THIS DETAIL SHEET HAS BEEN PREPARED FOR USE ON HCFCD PROJECTS OR PROJECTS TO BE MAINTAINED BY THE HCFCD WHEN COMPLETED BY OTHERS. THE ENGINEER SHOULD CAREFULLY REVIEW THESE DETAILS TO DETERMINE THEIR APPLICABILITY TO A PARTICULAR PROJECT. IF REVISIONS ARE NECESSARY, THEY SHALL BE CLEARLY DELINEATED AND NOTED IN THE REVISION BLOCK IN ACCORDANCE WITH RULE §131.138 OF THE TEXAS STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS. AN ENGINEER WHO INCORPORATES THE DETAILS ON THIS SHEET INTO HIS WORK MUST SEAL THIS SHEET AND BECOME RESPONSIBLE FOR ITS USE IN THE END PRODUCT.

HCFCD OUTFALL AND INTERCEPTOR STRUCTURE DETAILS

DATE: 8 - 14 - 91

SHEET NUMBER

SHT 40 OF 42

P-600

Subpart P—Excavations, Trenching, and Shoring

§1926.650 General protection requirements.

(a) Walkways, runways, and sidewalks shall be kept clear of excavated material or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty five (125) pounds per square foot.

(b) If planks are used for raised walkways, runways, or sidewalks, they shall be laid parallel to the length of the walk and fastened together against displacement.

(c) Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.

(d) Raised walkways, runways, and sidewalks shall be provided with plank steps on strong stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.

(e) All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet, and other parts of the body as set forth in Subpart E of this part.

(f) Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made of reflectorized or high visibility material.

(g) Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in Subpart D of this part.

(h) No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid any spillage employees shall be required to stand away from any vehicle being loaded.

(i) Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until the necessary precautions have been taken to safeguard the employees.

§1926.651 Specific excavation requirements.

(a) Prior to opening an excavation, effort shall be made to determine whether underground installations (i.e., sewer, telephone, water, fuel, electric lines, etc.) will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

(b) Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.

(c) The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.

(d) Excavations shall be inspected by a competent person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.

(e) The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

(f) Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When light sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties, and bracing shall be provided to allow for any necessary temporary removal of individual supports.

(g) All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or presplitting.

(h) The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.

(i)(1) Employees entering which employees may be required to enter, excavated or other material shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.

(2) As an alternative to (i)(1), the clearance prescribed in paragraph (i)(1) of this section, the employer may use effective barriers or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.

(j) Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

(k) Support systems shall be planned and designed by a qualified person when excavation is in excess of 20 feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.

(l) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.

(m) Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation or a fill, particularly when the separation is less than the depth of the excavation. Particular attention also shall be paid to joints and seams of material comprising a face and the slope of such seams and joints.

(n) Except in hard rock excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the wall and safety of employees involved in excavation work or in the vicinity thereof.

(o) If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing, or underpinning shall be inspected daily or more often as conditions warrant, by a competent person while the protection is effectively maintained.

(p) Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.

(q) If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on or near above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.

(r) Blasting and the use of explosives shall be performed in accordance with Subpart U of this part.

(s) When mobile equipment is utilized or allowed adjacent to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.

(t) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

(u) If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.

(v) In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in Subparts D and E of this part, shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc., shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.

(w) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

(x) Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.

(y) All ladders used on excavation operations shall be in accordance with the requirements of Subpart L of this part.

§1926.652 Specific trenching requirements

(a) Banks more than 5 feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table P-1 as a guide in sloping of banks. Trenches less than 5 feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.

(b) Sides of trenches in unstable or soft material, 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Tables P-1, P-2 (following paragraph (g) of this section).

(c) Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length. In lieu of shoring, the sides of the trench above the 5 foot level may be sloped to preclude collapse, but shall not be steeper than a 1 foot rise to each 1 foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4 foot minimum shall be provided at the toe of the sloped portion.

(d) Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

(e) Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.

(f) Employees entering bell bottom pier holes shall be protected by the installation of a removable type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.

(g)(1) Minimum requirements for trench timbering shall be in accordance with Table P-2.

(2) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:

$$S = \frac{13 - 20L}{\text{Maximum ratio } L/D} \cdot D$$

Where
- L = Length, unsupported, in inches
- D = Least side of the timber in inches
- S = Allowable stress in pounds per square inch of cross section

(h) When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet of lateral travel.

(i) Bracing or shoring of trenches shall be carried along with the excavation.

(j) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.

(k) Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the shoring or sloping required for the trench.

(l) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, lines shall be used to pull out the jacks or braces from above after employees have cleared the trench.

§1926.653 Definitions applicable to this subpart.

(a) "Acceptable engineering requirements or practices" – Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.

(b) "Angle of repose" – The greatest angle above the horizontal plane at which a material will lie without sliding.

(c) "Bank" – A mass of soil rising above a digging level.

(d) "Bell bottom excavation" – A part of a shaft or footing excavation, usually near the bottom and bell-shaped, i.e., an enlargement of the cross section above.

(e) "Braces (trench)" – The horizontal members of the shoring system whose ends bear against the uprights or stringers.

(f) "Excavation" – Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth to width relationship, an excavation may become a trench.

(g) "Faces" – See paragraph (k) of this section.

(h) "Hard compact soil" – All earth materials not classified as running or unstable.

(i) "Kickouts" – Accidental release or failure of a shore or brace.

(j) "Sheet pile" – A pile or sheeting that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.

(k) "Sides", "Walls", or "Faces" – The vertical or inclined earth surfaces formed as a result of excavation work.

(l) "Slope" – The angle with the horizontal at which a particular earth material will stand indefinitely without movement.

(m) "Stringers" (walers) – The horizontal members of a shoring system whose sides bear against the uprights or earth.

(n) "Trench" – A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.

(o) "Trench jack" – Screw or hydraulic type jacks used as cross bracing in a trench shoring system.

(p) "Trench shield" – A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

(q) "Unstable soil" – Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

(r) "Uprights" – The vertical members of a shoring system.

(s) "Wales" – See paragraph (m) of this section.

(t) "Walls" – See paragraph (k) of this section.

ONE EXAMPLE OF SEVERAL TYPES OF SHEETING

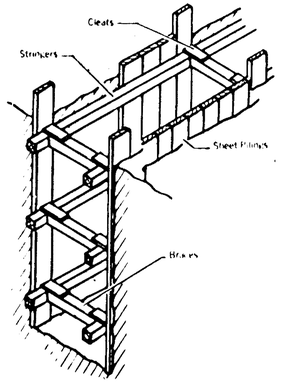


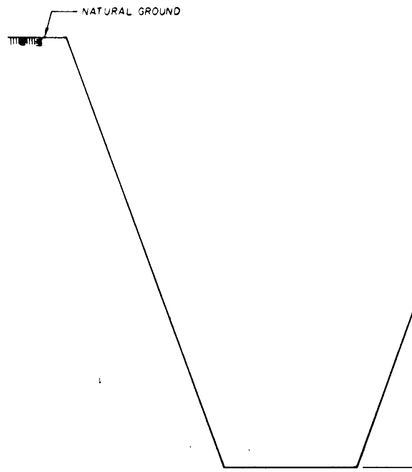
TABLE P-2—TRENCH SHORING—MINIMUM REQUIREMENTS

Depth of trench	Kind or condition of earth	Size and spacing of members										
		Uprights		Stringers		Cross braces—Width of trench				Maximum spacing		
		Minimum dimension	Maximum spacing	Minimum dimension	Maximum spacing	1 to 3 feet	3 to 6 feet	6 to 9 feet	9 to 12 feet	12 to 15 feet	Vertical	Horizontal
Feet		Inches	Feet	Inches	Feet	Inches	Inches	Inches	Inches	Inches	Feet	Feet
5 to 10	Hard, compact	3 x 4 or 2 x 6	6			2 x 6	4 x 4	4 x 6	6 x 6	6 x 6	4	6
	Likely to crack	3 x 4 or 2 x 6	3	4 x 6	4	2 x 6	4 x 4	4 x 6	6 x 6	6 x 6	4	6
	Soft, sandy, or silted	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 6	6 x 6	4	6
	Hydrostatic pressure	3 x 4 or 2 x 6	Close sheeting	6 x 6	4	4 x 4	4 x 6	6 x 6	6 x 6	6 x 6	4	6
10 to 15	Hard	3 x 4 or 2 x 6	4	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 6	6 x 6	4	6
	Likely to crack	3 x 4 or 2 x 6	2	4 x 6	4	4 x 4	4 x 6	6 x 6	6 x 6	6 x 6		6
	Soft, sandy, or silted	3 x 4 or 2 x 6	Close sheeting	4 x 6	4	4 x 6	6 x 6	6 x 6	6 x 6	6 x 10	4	6
	Hydrostatic pressure	3 x 6	Close sheeting	6 x 10	4	4 x 6	6 x 6	6 x 6	6 x 6	6 x 10	4	6
15 to 20	All kinds of conditions	3 x 6	Close sheeting	4 x 12	4	4 x 12	6 x 6	6 x 6	8 x 10	10 x 10	4	6
Over 20	All kinds of conditions	3 x 6	Close sheeting	6 x 6	4	4 x 12	8 x 8	8 x 10	10 x 10	10 x 12	4	6

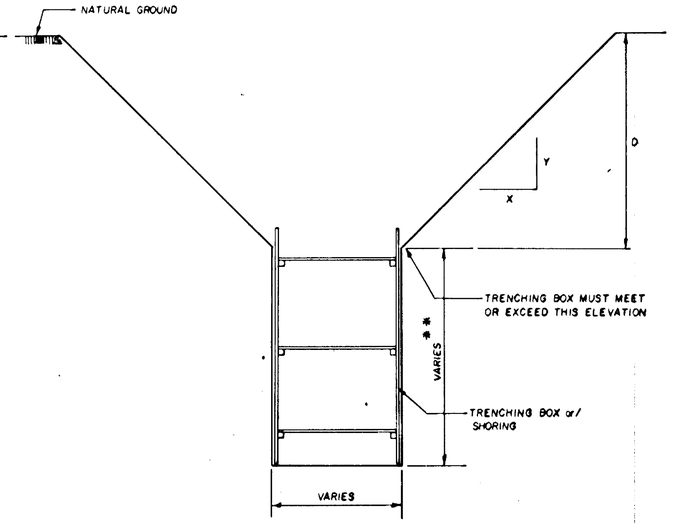
Trench jacks may be used in lieu of, or in combination with, cross braces.
Shoring is not required in solid rock, hard shale, or hard clay.
Where desirable, steel sheet piling and bracing of equal strength may be substituted for wood.

D	X	Y
0' – 5'	0	1'
5' – 8'	1'	1'
8' – 10'	2'	1'
10' – Greater	*	*

* * Shoring or Trenching Box is Required



DETAIL "A"



DETAIL "B"

BENCH MARK

NOTES

1. Contractor must submit, in writing, his proposal for conformance with OSHA Trenching Safety Requirements.
2. Conformance with the OSHA Trenching Safety Requirements is mandatory and will be strictly enforced.
3. Soils Report available at the office of the Engineer.

FLOOD CONTROL

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS

APPROVALS

Water Design	Paving Dept.
Water Quality	Storm Sewers
Wastewater Operations	Wastewater Collection
OTHER DEPT'S.	
Traffic & Transportation Dept.	City Planning Dept.
Asst. Director of Public Works	Director of Public Works

COUNTY ENGINEER

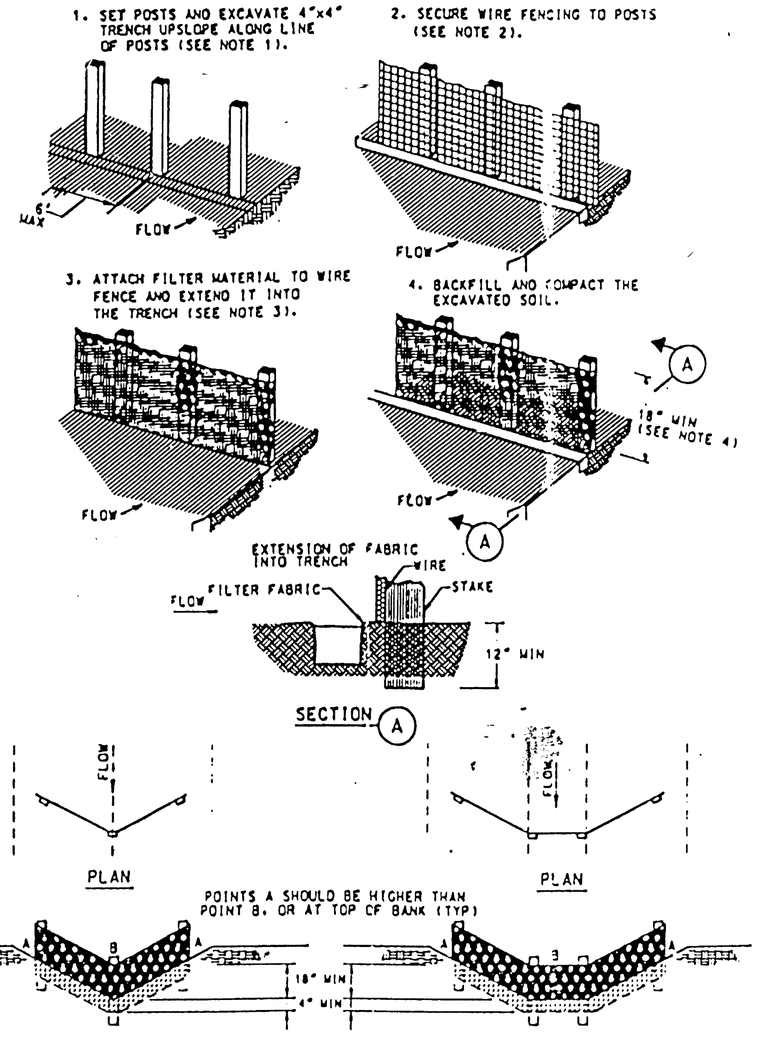
Steffek & Van De Wiele, Inc.
CONSULTING ENGINEERS

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

TRENCHING SAFETY REQUIREMENTS

DRAWN: L.D.W.
CHECKED: T.H.H.
DATE:
SCALE: HORIZ: VERT: N.T.S.
JOB NO. 10992-001-1
DWG. NO. SD-000
SHEET 41 OF 42 SHEETS

P-600

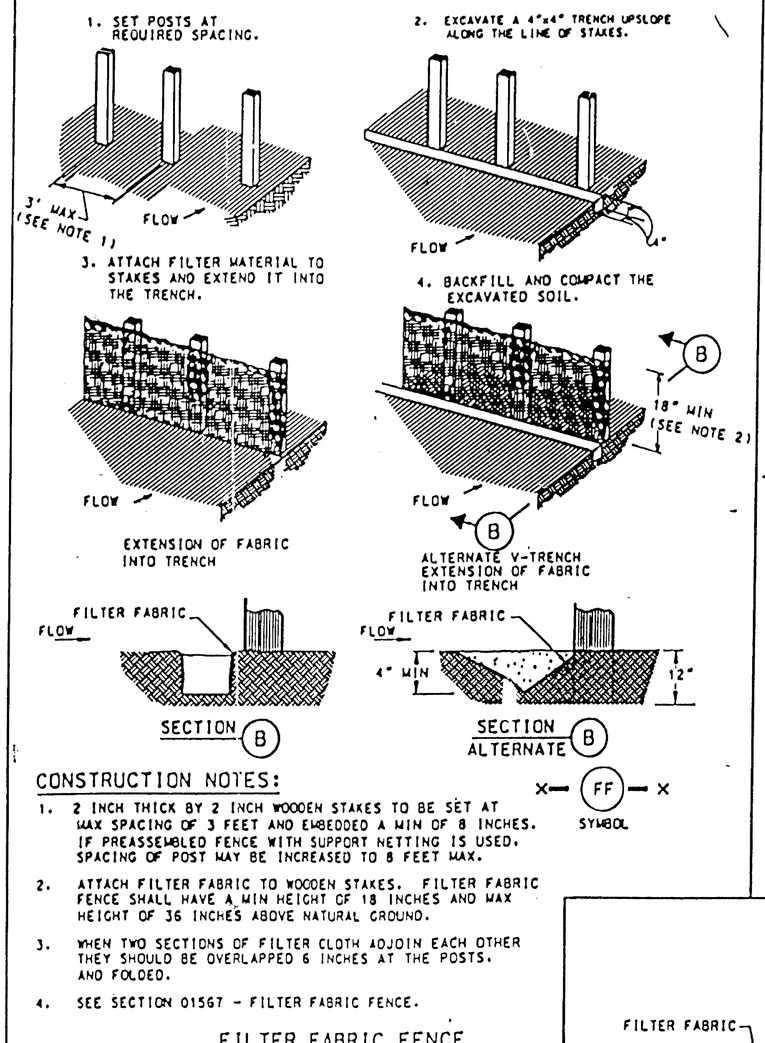


CONSTRUCTION NOTES:

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 FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH STAPLES.
3. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE, 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 SECTION 01568 - REINFORCED FILTER FABRIC BARRIER.

×—(RFB)—×
SYMBOL

REINFORCED FILTER FABRIC BARRIER

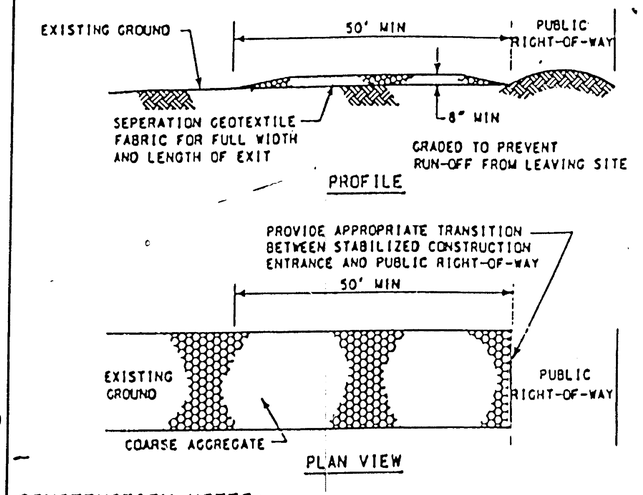


CONSTRUCTION NOTES:

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 FENCE WITH SUPPORT NETTING IS USED, SPACING OF POST MAY BE INCREASED TO 8 FEET MAX.
2. ATTACH FILTER FABRIC TO WOODEN STAKES. FILTER FABRIC FENCE 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 SECTION 01567 - FILTER FABRIC FENCE.

×—(FF)—×
SYMBOL

FILTER FABRIC FENCE

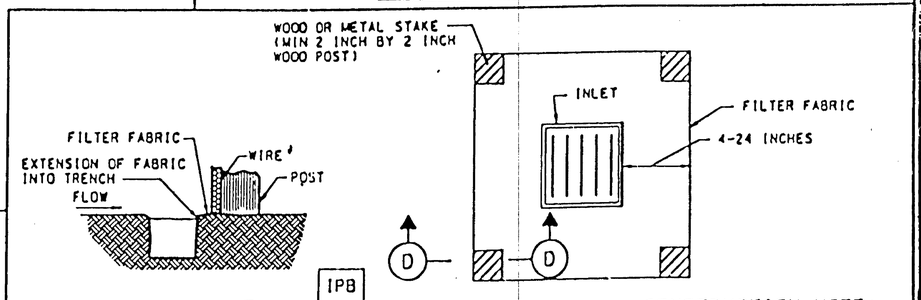


CONSTRUCTION NOTES:

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 EXIT, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMODATE A TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR THE TRUCK WASHING AREA.
6. SEE SECTION 01569 - STABILIZED CONSTRUCTION EXIT.
7. STABILIZED CONSTRUCTION EXIT SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.

(SC)
SYMBOL

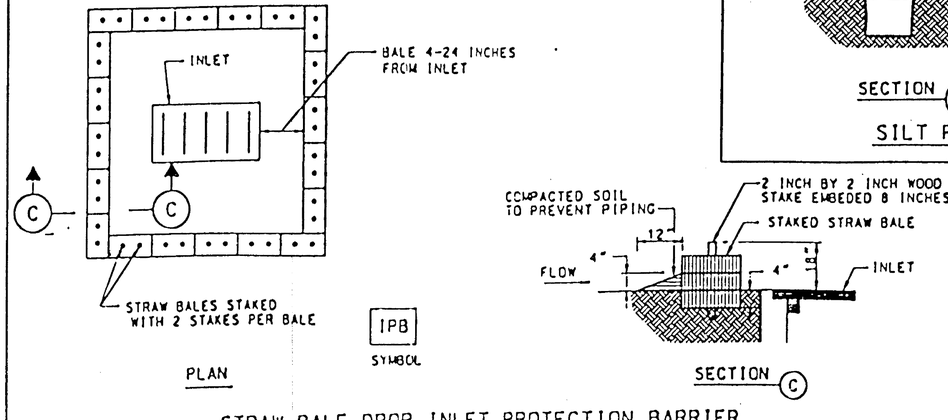
STABILIZED CONSTRUCTION EXIT



CONSTRUCTION NOTE:

1. SEE CONSTRUCTION NOTES FOR RFB.

SILT FENCE INLET PROTECTION BARRIER



STRAW BALE DROP INLET PROTECTION BARRIER

M. Lacy 5/6/98

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

STORM WATER POLLUTION PREVENTION PLAN DETAILS

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER 6/4/98	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE:	DWG NO: 01565-01C

SHT. 42 OF 42 P-600

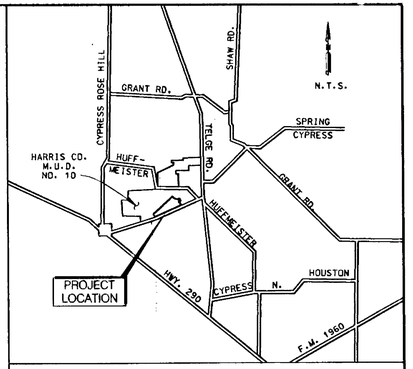
NORTHLAKE FOREST - SECTION THREE

NORTHWEST HARRIS COUNTY
MUNICIPAL UTILITY DISTRICT NO. 10

WITHIN HARRIS COUNTY, TEXAS

CONSTRUCTION PLANS
FOR

WATER DISTRIBUTION, SANITARY SEWER, PAVING AND DRAINAGE IMPROVEMENTS



VICINITY MAP

KEY MAP NO. 327-Y & 367-C

INDEX OF DRAWINGS

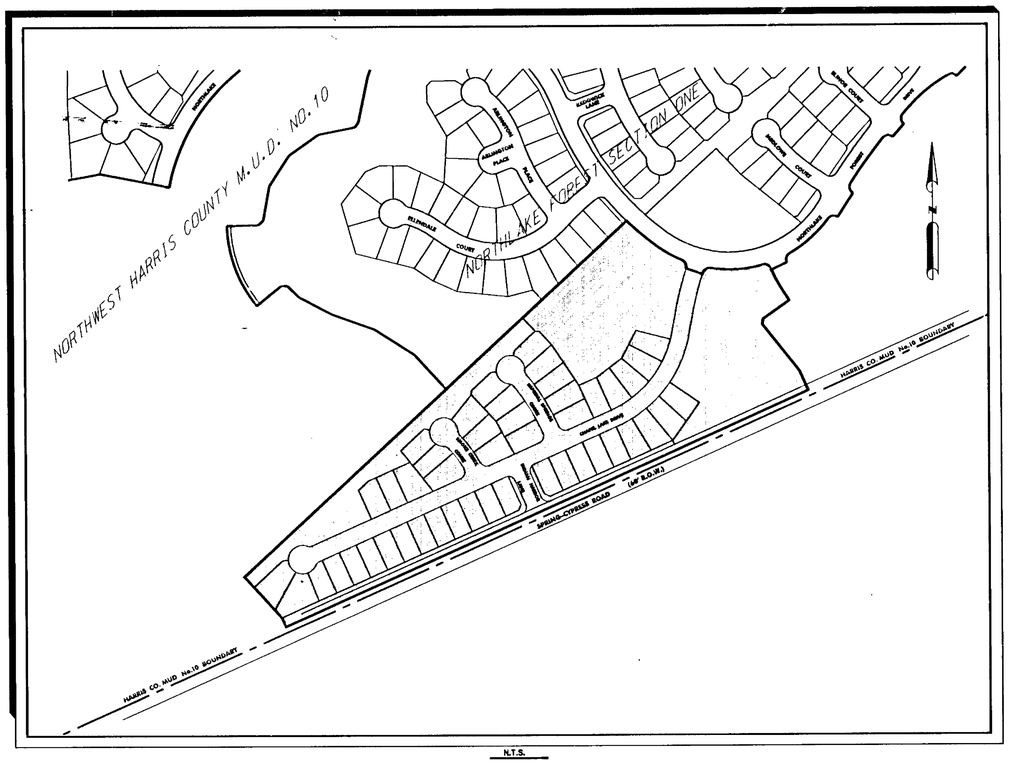
SHEET NO.	DESCRIPTION
1.	COVER SHEET
2.	GENERAL NOTES
3.	DRAINAGE AREA, PONDING, AND SHEET FLOW MAP
4.	PAVING AND DRAINAGE LAYOUT
5.	SANITARY SEWER AND WATER LAYOUT
6.	STORM WATER RUNOFF POLLUTION PREVENTION PLAN
7.	TRAFFIC CONTROL PLAN
8.	DETENTION POND "A" PLAN
9.	DETENTION POND "B" PLAN

PLAN & PROFILES

10.	STA. 0+00 TO STA. 5+20	CHAPEL LAKE DRIVE
11.	STA. 5+20 TO STA.10+20	CHAPEL LAKE DRIVE
12.	STA.10+20 TO STA.14+60	CHAPEL LAKE DRIVE
13.	STA.14+60 TO STA.18+40	CHAPEL LAKE DRIVE
14.	STA.18+40 TO STA.19+11	CHAPEL LAKE DRIVE
15.	STA. 1+00 TO STA. 4+00	INDIAN HARBOR LANE
16.	STA. 0+00 TO STA. 3+08.40	SMOKE CREEK COURT
17.	STA. 0+00 TO STA. 4+07.97	HICKORY SPRINGS COURT

DETAILS

18.	TRENCHING SAFETY REQUIREMENTS
19.	HARRIS COUNTY SUBDIVISION STANDARD PAVEMENT DETAILS
20.	STORM SEWER DETAILS
21.	SANITARY SEWER DETAILS
22.	WATER LINE DETAILS
23.	STORM WATER RUNOFF POLLUTION PREVENTION PLAN DETAILS
24.	BARRICADE STANDARD DETAILS
25.	STANDARD WHEELCHAIR RAMP DETAILS



N.T.S.

PRIVATE UTILITY LINES SHOWN

HOUSTON LIGHTING & POWER
CROSSING UNDERGROUND DUCT LINES. UNLESS NOTED VALID AT TIME OF REVIEW ONLY

SOUTHWESTERN BELL TELEPHONE CO.

ENTEX, INCORPORATED

APPROVED
CITY OF HOUSTON

CITY ENGINEER
RICHARD C. SCOTT, P.E. — DATE 6/12/98

DIRECTOR OF PUBLIC WORKS AND ENGINEERING
JERRY KING P.E. — DATE 6/12/98

PRIOR TO THE CONSTRUCTION OF SUCH FACILITIES WITHIN THE DISTRICT, THE DISTRICT OR ITS ENGINEER WILL GIVE WRITTEN NOTICE BY REGISTERED OR CERTIFIED MAIL TO THE DIRECTOR OF PUBLIC WORKS AND ENGINEERING, STATING THE DATE SUCH CONSTRUCTION WILL BE COMMENCED.

"CONTRACTOR SHALL NOTIFY THE CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING, ENGINEERING CONSTRUCTION AND REAL ESTATE GROUP (TELEPHONE NO.754-0700) 48 HOURS BEFORE STARTING WORK ON THIS PROJECT".

APPROVED:

TERRY A. ANDERSON, P.E. — DATE:
HARRIS COUNTY ENGINEER

SIGNATURE IS VOID IF CONSTRUCTION HAS NOT COMMENCED WITHIN ONE (1) YEAR OF SIGNATURE DATE.

I J. A. VAN DE WIELE, A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THESE PLANS WERE PREPARED UNDER MY SUPERVISION TO MEET OR EXCEED THE SPECIFICATIONS AND REQUIREMENTS OF HARRIS COUNTY, TEXAS.

4/9/98
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER

Steffek & Van De Wiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

JOB NO. 10902-003-1 — MARCH, 1998

CPC FORM 101 FILE NO. 12848
C.O.H. LOG NO. 98-0083

CITY DWG, NO.:
SHEET 1 OF 25 SHEETS
P-644

NORTHLAKE FOREST SECTION THREE - PAVING & UTILITIES

GENERAL CONSTRUCTION NOTES:

1. ALIGNMENT, CENTERLINE CURVE DATA AND STATIONING TO BE VERIFIED FROM APPROVED SUBDIVISION PLAT OR APPROVED PLAT FOR OFFSITE EASEMENTS.

2. CONTRACTOR SHALL SEND WRITTEN NOTIFICATION TO HARRIS COUNTY ENGINEERING DEPARTMENT FORTY-EIGHT (48) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AND NOTIFY THEM TWENTY-FOUR (24) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713-755-8210).

3. CONTRACTOR SHALL NOTIFY THE FOLLOWING AGENCIES 48 HOURS PRIOR TO BEGINNING CONSTRUCTION:

   A) UTILITY LOCATION AND COORDINATING COMMITTEE AT 713-223-4567

   B) ENTEX AT 713-654-5166

   C) HOUSTON LIGHTING AND POWER COMPANY AT 713-659-6457

   D) TEXAS ONE CALL SYSTEM AT 800-245-4545

   E) HARRIS COUNTY FLOOD CONTROL DISTRICT AT 713-684-4050

4. CONTRACTOR SHALL OBTAIN ALL DEVELOPMENT, RIGHT-OF-WAY AND CONSTRUCTION PERMITS REQUIRED BY THE REGULATIONS OF HARRIS COUNTY, TEXAS AT HIS EXPENSE PRIOR TO COMMENCEMENT OF WORK. THE ENGINEER WILL ASSIST THE CONTRACTOR IN COMPLETING THE PERMIT APPLICATION.

5. CONTRACTOR SHALL GIVE NOTICE TO ALL AUTHORIZED INSPECTORS, SUPERINTENDENTS, OR PERSONS IN CHARGE OF PRIVATE AND PUBLIC UTILITIES OR RAILROADS AFFECTED BY HIS OPERATIONS PRIOR TO COMMENCEMENT OF WORK. REQUIRED PERMITS THAT CAN BE ISSUED TO CONTRACTOR WILL BE OBTAINED AT HIS EXPENSE.

6. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF EXISTING FACILITIES PRIOR TO CONSTRUCTION OF PROPOSED FACILITIES. NO SEPARATE PAY. ANY DAMAGE TO EXISTING FACILITIES INCURRED AS A RESULT OF CONSTRUCTION OPERATIONS WILL BE REPAIRED TO THE OWNING AUTHORITY'S STANDARDS BY THE CONTRACTOR AT HIS OWN EXPENSE.

7. CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF JOB, SHALL BE AS GOOD OR BETTER THAN THE CONDITION PRIOR TO STARTING WORK.

8. EXISTING PAVEMENTS, CURBS, SIDEWALKS, AND DRIVEWAYS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO CITY OF HOUSTON DESIGN AND CONSTRUCTION STANDARDS AS CURRENTLY AMENDED AT CONTRACTOR'S EXPENSE.

9. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING THE MUD AND/OR DIRT DEPOSITED ON EXISTING PAVEMENT DUE TO HIS CONSTRUCTION ACTIVITY ON A DAILY BASIS. (NO SEPARATE PAY)

10. PROPOSED PAVING AND BARRICADES AS SHOWN IN THE WATER, SEWER AND DRAINAGE PLANS ARE FOR INFORMATION ONLY AND ARE NOT INCLUDED IN THE WATER, SEWER AND DRAINAGE CONTRACT.

11. SEWER MATERIALS, CONSTRUCTION AND TESTING SHALL BE IN COMPLIANCE WITH THE CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATIONS (SEPTEMBER 1996) INCLUDING ALL REVISIONS AND AMENDMENTS THERETO. CONTRACTOR SHALL PROVIDE ALL NECESSARY TEST EQUIPMENT AT NO SEPARATE PAY.

12. CONTRACTOR SHALL REMOVE EXISTING PLUGS AND CONNECT TO EXISTING UTILITY LINES AS INDICATED ON PLANS. NO SEPARATE PAY.

13. MANHOLE RIM ELEVATIONS SHALL BE TWO (2) INCHES ABOVE A STRAIGHT LINE FROM TOP OF CURB TO FINISHED GRADE ELEVATION AT RIGHT-OF-WAY LINE.

14. NO MANHOLES SHALL BE LOCATED WITHIN PAVING LIMITS.

15. WHEN TRENCH CONDITIONS REQUIRE THE USE OF WELL POINTS, THIS SHALL BE REQUESTED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. MEASUREMENT AND PAYMENT OF THESE ITEMS SHALL BE IN ACCORDANCE WITH SPECIAL PROVISION NO. 1 TO SPECIFICATIONS FOR SEWER CONSTRUCTION.

16. ALL AREAS AFFECTED BY CONTRACTOR'S OPERATIONS, INCLUDING BUT NOT LIMITED TO ACCESS ROADS, AREAS OF MATERIAL AND EQUIPMENT STORAGE, AND ALL CONSTRUCTION AREAS, SHALL BE STRIPPED OF ALL VEGETATION PRIOR TO COMMENCEMENT OF WORK. STRIPPINGS SHALL BE DISPOSED OF OFFSITE BY THE CONTRACTOR. NO SEPARATE PAY.

17. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE OWNING AUTHORITY.

18. APPROVAL ONLY FOR UTILITIES WITHIN PUBLIC R.O.W.

19. FINAL ACCEPTANCE OF THE UTILITIES WILL NOT BE GIVEN TO THE CONTRACTOR UNTIL THEY ARE INSPECTED AND APPROVED BY THE TEXAS NATURAL RESOURCE CONSERVATION COMMISSION.

20. ALL TRENCH BACKFILL FOR UTILITIES SHALL BE COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY PER ASTM D-698. MOISTURE CONTENT SHALL BE WITHIN 2% OF OPTIMUM. ALL TRENCH BACKFILL SHALL BE CONSIDERED INCIDENTAL TO UTILITY CONSTRUCTION.

21 GUIDELINES SET FORTH IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" SHALL BE OBSERVED.

REVISED: 2/14/97

WATER LINE CONSTRUCTION NOTES:

1. WATER MAINS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING "STANDARD SPECIFICATIONS AND STANDARD CONSTRUCTION DETAILS FOR WASTE WATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE AND PAVING" (NOVEMBER 1997).

2. ALL WATER MAINS FOUR (4) INCHES THRU 12 INCHES IN DIAMETER, IF NOT SPECIFIED OTHERWISE, SHALL BE AWWA C-900 PVC PIPE, CLASS 150, DR18, WITH RUBBER GASKETED BELL AND SPIGOT PUSH ON JOINTS.

3. ALL VALVES SHALL BE GATE VALVES UNLESS OTHERWISE NOTED AND SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF AWWA C-500.

4. ALL WATER LINES SHALL BE ENCASED IN BANK SAND, AND BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAIL NO. 02511-01. COST OF BANK SAND TO BE INCLUDED IN UNIT COST FOR WATERLINE AND SHALL NOT BE PAID FOR DIRECTLY.

5. WHEN WATER LINES AND SANITARY SEWER LINES ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO EACH OTHER THAN NINE FEET (9') IN ALL DIRECTIONS AND PARALLEL LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHERE THE NINE FOOT (9') SEPARATION DISTANCE CANNOT BE ACHIEVED, THE GUIDELINES SET FORTH IN THE CITY OF HOUSTON DESIGN MANUAL (SEPTEMBER 1996) CHAPTER 7, 1.04.C AS CURRENTLY AMENDED SHALL GOVERN.

6. ALL WATER LINE TRENCHES LOCATED UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1½ SACK CEMENT/CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)

7. WATER LINE SHALL BE CONSTRUCTED SUCH THAT ALL CROSSES AND TEES WILL NOT BE LOCATED UNDER PROPOSED OR FUTURE PAVING.

8. WHERE A WATER LINE OR LEAD CROSSES OR COMES WITHIN 9 FEET OF AN EXISTING SANITARY SEWER OR SANITARY SEWER LEAD AND THAT SANITARY SEWER IS FOUND TO BE LEAKING, REPLACE A 20 FOOT SECTION OF THE SEWER WITH C900 OR 18 PVC OR DUCTILE IRON PIPE CENTERED ON THE CLOSEST POINT.

9. ALL STATIONS ARE CENTERLINE OF THE STREET RIGHT-OF-WAY UNLESS OTHERWISE NOTED.

10. ALL FIRE HYDRANTS SHALL BE LOCATED AS SHOWN ON THE PLANS AND SET THREE FEET (3') BEHIND BACK OF CURB (EXCEPT WITHIN ESPLANADES WHERE FIRE HYDRANTS SHALL BE SEVEN FEET (7') BEHIND BACK OF CURB) AND WITH STREAMER NOZZLE 22 INCHES ABOVE FINISHED GRADE UNLESS OTHERWISE NOTED ON PLANS.

11. UTILITY CONTRACTOR TO TURN FIRE HYDRANTS AND MAKE ALL FINAL ADJUSTMENTS AFTER COMPLETION OF PAVING. (NO SEPARATE PAY)

12. SANITARY PRECAUTIONS MUST BE TAKEN DURING WATERLINE CONSTRUCTION, AS CALLED FOR BY AWWA STANDARDS AND CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02514.

13. NEW MAINS SHALL BE THOROUGHLY DISINFECTED IN ACCORDANCE WITH AWWA SPECIFICATIONS C-651 AND THEN FLUSHED AND SAMPLED BEFORE BEING PLACED IN SERVICE. SAMPLES SHALL BE COLLECTED FOR BACTERIOLOGICAL ANALYSIS TO CHECK THE EFFICIENCY OF THE DISINFECTING PROCEDURE, WHICH SHALL BE REPEATED IF CONTAMINATION PERSISTS. A MINIMUM ONE SAMPLE FOR EACH 1,000 FEET OF COMPLETED WATER MAIN WILL BE REQUIRED. WATER SAMPLES MUST MEET TEXAS STATE DEPARTMENT OF HEALTH AND CITY OF HOUSTON REQUIREMENTS PRIOR TO PLACING THE LINES INTO SERVICE.

14. ALL WATER LINES TO BE HYDROSTATICALLY TESTED BY CONTRACTOR AT 125 PSI IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02515 AS CURRENTLY AMENDED.

NOTE: FORMAL "NOTIFICATION APPROVED BY COMMISSIONERS COURT REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES WITHIN HARRIS COUNTY RIGHT-OF-WAY. CONTACT HARRIS COUNTY PERMIT DIVISION (713-956-3000)

REVISED: 3/18/98

UTILITY NOTES:

HOUSTON LIGHTING & POWER COMPANY (HL&P)

OVERHEAD LINES MAY EXIST ON THE PROPERTY. WE HAVE NOT ATTEMPTED TO MARK THOSE LINES SINCE THEY ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO ANY BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE, FORBIDS ALL ACTIVITIES IN WHICH PERSONS OR THINGS MAY COME WITHIN SIX(6) FEET OF LIVE OVERHEAD LINES. PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS, ARE LEGALLY RESPONSIBLE FOR SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR MOVED CALL HL&P AT (713) 207-7777.

SOUTHWESTERN BELL TELEPHONE COMPANY (SWBT)

THE LOCATIONS OF SWBT UTILITIES 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 HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

ENTEX

LOCATION OF ENTEX MAIN LINES (TO INCLUDE UNIT GAS TRANSMISSION, AND/OR INDUSTRIAL GAS SUPPLY CORPORATION WHERE APPLICABLE) ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 713/223-4567 OR 1-800-245-4545 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK AND AGREE TO BE FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

REVISED 5/17/95

SANITARY SEWER CONSTRUCTION NOTES:

1. ALL SANITARY SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON DESIGN MANUAL (SEPTEMBER 1996) AND STANDARD CONSTRUCTION DETAILS (NOVEMBER 1997) AS CURRENTLY AMENDED.

2. UNLESS OTHERWISE NOTED, ALL GRAVITY FLOW SANITARY SEWER PIPE AND FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION D-3040 AND ASTM D-3212 RESPECTIVELY. PVC PIPE SHALL BE SDR 26.

3. ALL SANITARY SEWER SHALL BE INSTALLED, BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02317-02, AND 02317-08 FOR STABLE TRENCHES. BACKFILL SHALL BE CONSIDERED AS SUBSIDIARY TO THE PAY ITEM FOR SANITARY SEWER PIPE AND SHALL NOT BE PAID FOR DIRECTLY.

4. ALL SANITARY SEWER MANHOLE CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02082-01, 02082-02, AND 02082-02N.

5. ALL SANITARY SEWER MANHOLE RIMS SHALL BE SET TWO (2) INCHES ABOVE THE SURROUNDING LEVELS OF FINISHED GRADE, BACKFILLED AND SLOPED FOR SURFACE WATER DRAINAGE AWAY FROM MANHOLE RIMS.

6. WHEN WATER LINES AND SANITARY SEWER LINES ARE INSTALLED, THEY SHALL BE INSTALLED NO CLOSER TO EACH OTHER THAN NINE FEET (9') IN ALL DIRECTIONS AND PARALLEL LINES MUST BE INSTALLED IN SEPARATE TRENCHES. WHERE THE NINE FOOT (9') SEPARATION DISTANCE CANNOT BE ACHIEVED, THE GUIDELINES SET FORTH IN THE CITY OF HOUSTON DESIGN MANUAL (SEPTEMBER 1996) CHAPTER 7, 1.04.C AS CURRENTLY AMENDED SHALL GOVERN.

7. SANITARY SEWER LINE TRENCHES LOCATED UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1½ SACK CEMENT/CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)

8. SANITARY SEWER LINES CROSSING WATER LINES MUST HAVE A FULL LENGTH JOINT (20' NOMINAL) CENTERED AT THE CROSSING WITH A MINIMUM SEPARATION DISTANCE OF SIX INCHES FOR WATERLINE OVER SANITARY AND TWO FEET FOR SANITARY OVER WATERLINE.

9. ALL GRAVITY SANITARY SEWER LINES SHALL BE AIR TESTED ACCORDING TO CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02533. ALL SANITARY SEWER MANHOLES SHALL BE TESTED FOR LEAKAGE PER TNRCC CHAPTER 317.2 (C)(5)(H), BY EITHER VACUUM TESTING, OR HYDROSTATIC EXFILTRATION TESTING.

10. ALL SANITARY SEWERS SHALL BE TESTED FOR DEFLECTION IN ACCORDANCE WITH ASTM 3034D AND CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATION NO. 02533.

11. NO CONNECTIONS SHALL BE MADE TO EXISTING SANITARY SEWER LINES UNTIL ALL PROPOSED SEWER LINES HAVE BEEN THOROUGHLY CLEANED, TESTED AND ACCEPTED BY THE ENGINEER.

12. STACKS SHALL BE SHOWN ON THE PLANS. EXACT LOCATION OF STACKS SHALL BE SUPPLIED TO THE ENGINEER AND THE CITY OF HOUSTON UPON COMPLETION OF CONSTRUCTION.

13. THE "Y" FITTING ON THE SANITARY SEWER LEAD SHALL BE INSIDE OF STREET RIGHT-OF-WAY OR IN AN EASEMENT.

14. IF THE SANITARY LEADS HAVE LESS THAN THREE (3) FEET OF TOP COVER USE DUCTILE IRON PIPE FOR SANITARY SEWER LEADS.

15. DUCTILE IRON PIPE SHALL HAVE 80 MILS OF POLYETHYLENE WRAP AND SHALL BE LINED WITH 40-50 MILS OF POLYETHYLENE LINING TO COVER ALL SURFACES EXPOSED TO SANITARY SEWAGE. USE "POLYLINE" BY US PIPE OR "POLYBOND" BY AMERICAN C.I.P.

16. CONTRACTOR SHALL OBTAIN (AND USE) A COPY OF DESIGN MANUAL, STD. SPEC. & STD. DETAILS. OBTAIN FROM CITY OF HOUSTON 1801 MAIN FILE ROOM.

NOTE: FORMAL "NOTIFICATION APPROVED BY COMMISSIONERS COURT REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES WITHIN HARRIS COUNTY RIGHT-OF-WAY. CONTACT HARRIS COUNTY PERMIT DIVISION (713-956-3000)

REVISED: 3/18/98

STORM SEWER CONSTRUCTION NOTES:

1. STORM SEWERS SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON 1996 DESIGN MANUAL (SEPTEMBER 1996) AND STANDARD CONSTRUCTION DETAILS (JULY 1, 1997) AS CURRENTLY AMENDED.

2. CONTRACTOR SHALL NOTIFY FORT BEND COUNTY ENGINEERING DEPARTMENT 48 HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT TELEPHONE NUMBER 281/342-3039.

3. REINFORCED CONCRETE PIPE (C-76, CLASS III) WITH RUBBER GASKET JOINTS (ASTM C-443), SHALL BE INSTALLED, BEDDED AND BACKFILLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO. 02317-04, 02317-05 AND 02317-09 AS APPLICABLE.

4. ALL STORM SEWER MANHOLES SHALL BE CITY OF HOUSTON TYPE "C" AND CONSTRUCTED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAILS NO.02081-03, 02081-04, AND 02081-05 UNLESS OTHERWISE NOTED.

5. ALL STORM SEWER INLETS SHALL BE CITY OF HOUSTON TYPE "B-B" AND CONSTRUCTED IN ACCORDANCE WITH CITY OF HOUSTON STANDARD CONSTRUCTION DETAIL NO.02632-04 UNLESS OTHERWISE NOTED.

6. ALL PROPOSED PIPE STUB OUTS FROM MANHOLES AND INLETS ARE TO BE PLUGGED WITH EIGHT INCH (8") BRICK WALLS UNLESS OTHERWISE NOTED.

7. ALL STORM SEWERS UNDER OR WITHIN ONE FOOT (1') OF PROPOSED OR FUTURE PAVEMENT SHALL BE BACKFILLED WITH CEMENT STABILIZED SAND (1½ SACK CEMENT/ CUBIC YARD) TO WITHIN ONE FOOT (1') OF SUBGRADE. NO SEPARATE PAY. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)

   ALTERNATIVE TO CEMENT STABILIZED SAND BACKFILL FOR PIPES 54-INCH AND LARGER, FROM ONE FOOT (1') ABOVE THE TOP OF THE PIPE TO THE BOTTOM OF THE SUBGRADE. CONTRACTOR MAY BACKFILL WITH SUITABLE MATERIAL, PROVIDED THE BACKFILL MATERIAL IS PLACED IN 6-INCH LIFTS AND MECHANICALLY COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D-698. TESTS SHALL BE TAKEN AT 100-FOOT INTERVALS ON EACH LIFT. BEDDING AND BACKFILL TO 1-FOOT ABOVE THE TOP OF PIPE SHALL BE CEMENT STABILIZED SAND. (LAB DENSITY TEST REPORTS ARE REQUIRED PRIOR TO PLACEMENT OF PAVEMENT.)

8. ALL STORM SEWERS CONSTRUCTED INSIDE LOT EASEMENTS SHALL BE R.C.P. (C-76, CLASS III). MINIMUM TWENTY FOOT (20') WIDE EASEMENTS SHALL BE PROVIDED.

9. ALL CONSTRUCTION STORM RUNOFF SHALL COMPLY WITH THE FINAL DRAFT OF THE STORMWATER MANAGEMENT HANDBOOK FOR CONSTRUCTION ACTIVITIES AS PREPARED BY HARRIS COUNTY/H.C.F.C.D., AND THE CITY OF HOUSTON; ALL IN COMPLIANCE WITH THE NATIONAL POLLUTANT ELIMINATION SYSTEM (NPDES) REQUIREMENTS.

10. UTILITY CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING STAGE II INLETS AFTER COMPLETION OF PAVING. (NO SEPARATE PAY)

11. ALL DRIVEWAYS WILL BE LOCATED TO AVOID EXISTING CURB INLET STRUCTURES.

REVISED: 3/18/98

PAVING CONSTRUCTION NOTES:

1. PAVING SHALL BE IN ACCORDANCE WITH HARRIS COUNTY RULES, REGULATIONS AND REQUIREMENTS" RELATING TO THE APPROVAL AND ACCEPTANCE OF IMPROVEMENTS IN SUBDIVISIONS OR RE-SUBDIVISIONS AND/OR AMENDMENTS OF SAME.

2. CONTRACTOR SHALL SEND WRITTEN NOTIFICATION TO HARRIS COUNTY ENGINEERING DEPARTMENT FORTY-EIGHT (48) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AND NOTIFY THEM TWENTY-FOUR (24) HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713-755-8210).

3. DOUBLE REFLECTORIZED BLUE TRAFFIC MARKERS SHALL BE PLACED 6-INCHES OFFSET OF THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS BY PAVING CONTRACTOR. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED AT EACH STREET.

4. STREET NAME SIGNS (FOR ALL STREETS) SHALL BE LOCATED ATOP EACH STOP SIGN AT ALL INTERSECTIONS.

5. ALL TEMPORARY AND PERMANENT SIGNAGE MUST COMPLY WITH THE MOST CURRENT EDITION OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AS CURRENTLY AMENDED.

6. CONTINUOUS LONGITUDINAL REINFORCING BARS SHALL BE USED IN CURBS.

7. REINFORCEMENT STEEL FOR PAVEMENT SHALL BE SUPPORTED WITH PLASTIC CHAIRS AT 24-INCH MAXIMUM SPACING.

8. THE 6" SUBGRADE IS TO BE SCARIFIED, LIME STABILIZED (AMOUNT TO BE DETERMINED BY TEST LAB) AND COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM D-698. MOISTURE CONTENT SHALL BE WITHIN 2% OPTIMUM.

9. AREAS WITHIN THE R.O.W. TO BE FILLED SHALL BE SCARIFIED AND COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY PER ASTM D-698 TO A DEPTH OF 8-INCHES PRIOR TO FILL PLACEMENT. FILL MATERIAL SHALL CONSIST OF CLEAN EARTH, SAND, OR COMBINATION AND BE FREE OF TRASH, VEGETATION, AND LARGE STONE. FILL MATERIAL SHALL BE PLACED IN 8-INCH LIFTS AND COMPACTED TO AT LEAST 95% OF MAXIMUM DENSITY.

10. NECESSARY TESTING OF THE SUBGRADE AND CONCRETE PAVEMENT TO PROVE THAT THESE ITEMS MEET REQUIREMENTS SHALL BE DONE BY A COMMERCIAL TESTING LABORATORY APPROVED BY THE ENGINEER.

REVISED: 2/14/97

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL RD 7, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION - 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION - 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION - 147.22

NOTES

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4/15/98
JOHN A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

GENERAL NOTES

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER 6/19/98

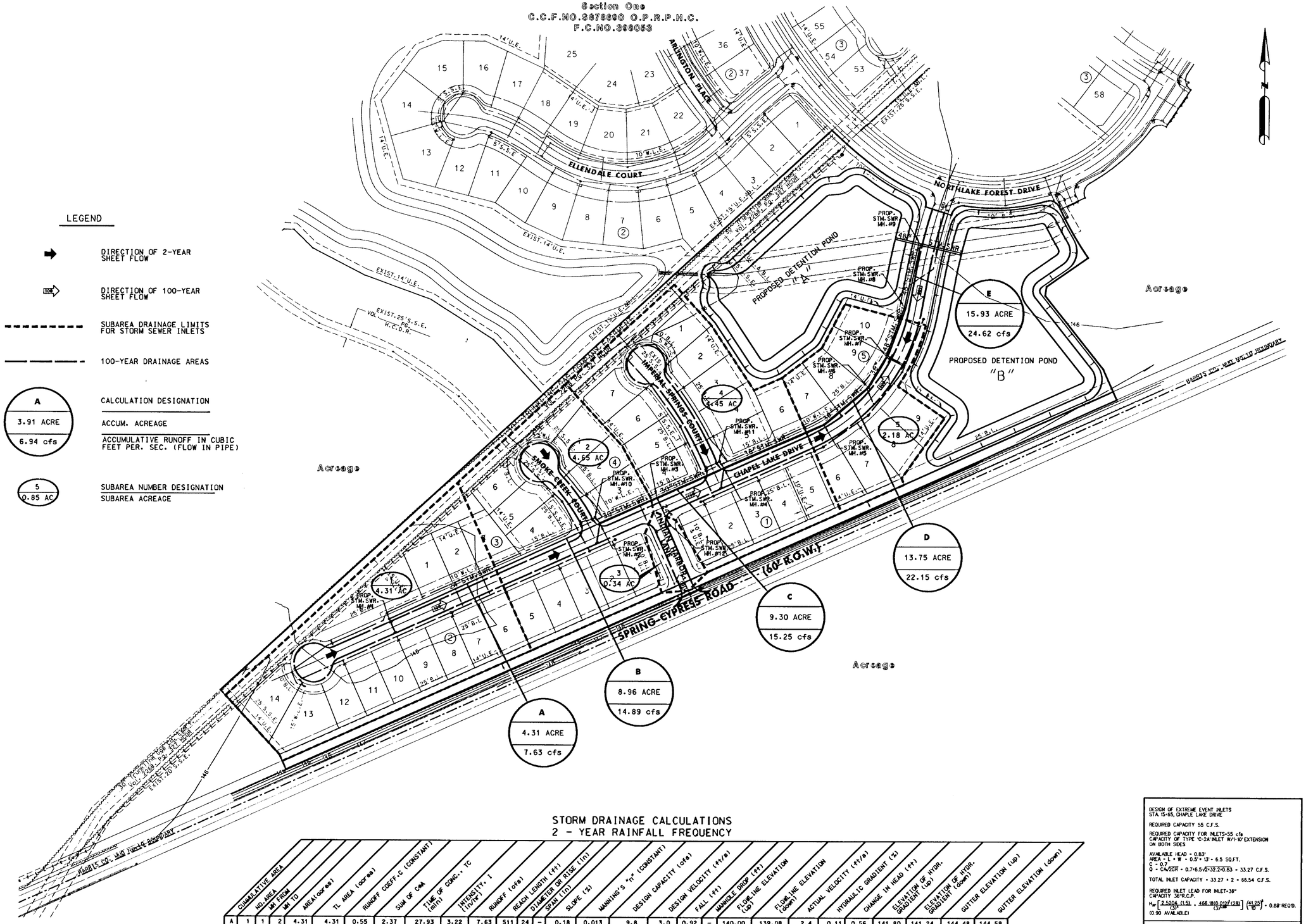
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: N/A
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 2 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

Northlake Forest
Section One
C.C.F.NO.8878690 O.P.R.P.H.C.
F.C.NO.388053



LEGEND

- DIRECTION OF 2-YEAR SHEET FLOW
- DIRECTION OF 100-YEAR SHEET FLOW
- SUBAREA DRAINAGE LIMITS FOR STORM SEWER INLETS
- 100-YEAR DRAINAGE AREAS
- A / 3.91 ACRE / 6.94 cfs — CALCULATION DESIGNATION; ACCUM. ACREAGE; ACCUMULATIVE RUNOFF IN CUBIC FEET PER. SEC. (FLOW IN PIPE)
- 5 / 0.85 AC — SUBAREA NUMBER DESIGNATION; SUBAREA ACREAGE

STORM DRAINAGE CALCULATIONS
2 - YEAR RAINFALL FREQUENCY

	CUMULATIVE AREA	NO. AREA MH FROM	NO. AREA MH TO	AREA (acres)	TL AREA (acres)	RUNOFF COEFF. C (CONSTANT)	SUM OF CxA	TIME OF CONC., TC (min)	INTENSITY, I (IN/HR)	RUNOFF (cfs)	REACH LENGTH (ft)	DIAMETER OR RISE (in)	SPAN (in)	SLOPE (%)	MANNING'S "n" (CONSTANT)	DESIGN CAPACITY (cfs)	DESIGN VELOCITY (ft/s)	FALL (ft)	MANHOLE DROP (ft)	FLOWLINE ELEVATION (UP)	FLOWLINE ELEVATION (down)	ACTUAL VELOCITY (ft/s)	HYDRAULIC GRADIENT (%)	CHANGE IN HEAD (ft)	ELEVATION OF HYDR. GRADIENT (UP)	ELEVATION OF HYDR. GRADIENT (down)	GUTTER ELEVATION (up)	GUTTER ELEVATION (down)
A	1	1	2	4.31	4.31	0.55	2.37	27.93	3.22	7.63	511	24	–	0.18	0.013	9.8	3.0	0.92	–	140.00	139.08	2.4	0.11	0.56	141.80	141.24	144.48	144.59
								3.55																				
B	2	2	3	4.65	8.96	0.55	4.93	31.48	3.02	14.89	139	30	–	0.13	0.013	15.3	3.0	0.18	0.50	138.58	138.40	3.0	0.13	0.18	141.24	141.06	144.59	145.36
								0.77																				
C	3	3	4	0.34	9.30	0.55	5.12	32.25	2.98	15.25	162	30	–	0.13	0.013	15.3	3.0	0.21	–	138.40	138.18	3.0	0.13	0.21	141.06	140.85	145.36	144.57
								0.50																				
D	4	4	7	4.45	13.75	0.55	7.56	33.15	2.93	22.15	448	36	–	0.10	0.013	22.0	3.0	0.45	0.50	137.68	137.23	3.0	0.10	0.45	140.85	141.40	144.57	144.58
								2.49																				
E	5	7	9	2.18	15.93	0.55	8.76	35.64	2.81	24.62	258	48	–	0.16	0.013	59.5	4.6	0.41	0.50	136.73	136.32	2.0	0.03	0.08	140.40	140.32	144.58	145.80

DESIGN OF EXTREME EVENT INLETS
STA. 15-65, CHAPLE LAKE DRIVE

REQUIRED CAPACITY 55 C.F.S.

REQUIRED CAPACITY FOR INLETS=55 cfs
CAPACITY OF TYPE 'C-2A' INLET W/1-10' EXTENSION ON BOTH SIDES

AVAILABLE HEAD = 0.83'
AREA = L * W - 0.5 * 13' - 6.5 SQ.FT.
C = 0.7
Q = CA√2GH = 0.7*6.5√2*32.2*0.83 = 33.27 C.F.S.

TOTAL INLET CAPACITY = 33.27 * 2 = 66.54 C.F.S.

REQUIRED INLET LEAD FOR INLET-36"
CAPACITY 36"R.C.P.
$H_w = \left[\frac{2.5204\ (1.5)}{(3)^{1.5}} + \frac{466.1810.012^2(28)}{(3)^{2.286}}\right]\left(\frac{41.25}{10}\right)^2 = 0.89'$ REQ'D.
(0.90 AVAILABLE)

DESIGN OF EXTREME EVENT OUTFALL PIPE (48")
REQUIRED CAPACITY 82.5 C.F.S.
MH 7 TO OUTFALL

AVAILABLE HEAD = .83

$H_w = \left[\frac{2.5204\ (1.5)}{(4)^{1.5}} + \frac{466.1810.012^2(258)}{(4)^{2.286}}\right]\left(\frac{55'}{10}\right)^2 = 0.75'$

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

1. THIS BASIN DESIGN IS BASED ON THE REPORT TITLED "NORTHLAKE FOREST, SECTION ONE WITHIN NORTHWEST HARRIS COUNTY M.U.D. No. 10" DATED 12/1996, AND WAS ACKNOWLEDGED BY HARRIS COUNTY FLOOD CONTROL DISTRICT BY SIGNITURE DATED _____
2. THE DETENTION POND SHOWN HEREON IS A PRIVATE FACILITY AND WILL BE OPERATED AND MAINTAINED BY THE OWNER.
3. 100-YEAR FLOOD PLAIN WATER SURFACE EL=144.00 AS PER THE FEDERAL EMERGENCY FLOOD INSURANCE RATE MAP FOR HARRIS COUNTY 48201C0-410J REVISED NOVEMBER 6, 1996

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated — Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER
NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION THREE

DRAINAGE AREA, PONDING, AND SHEET FLOW MAP

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

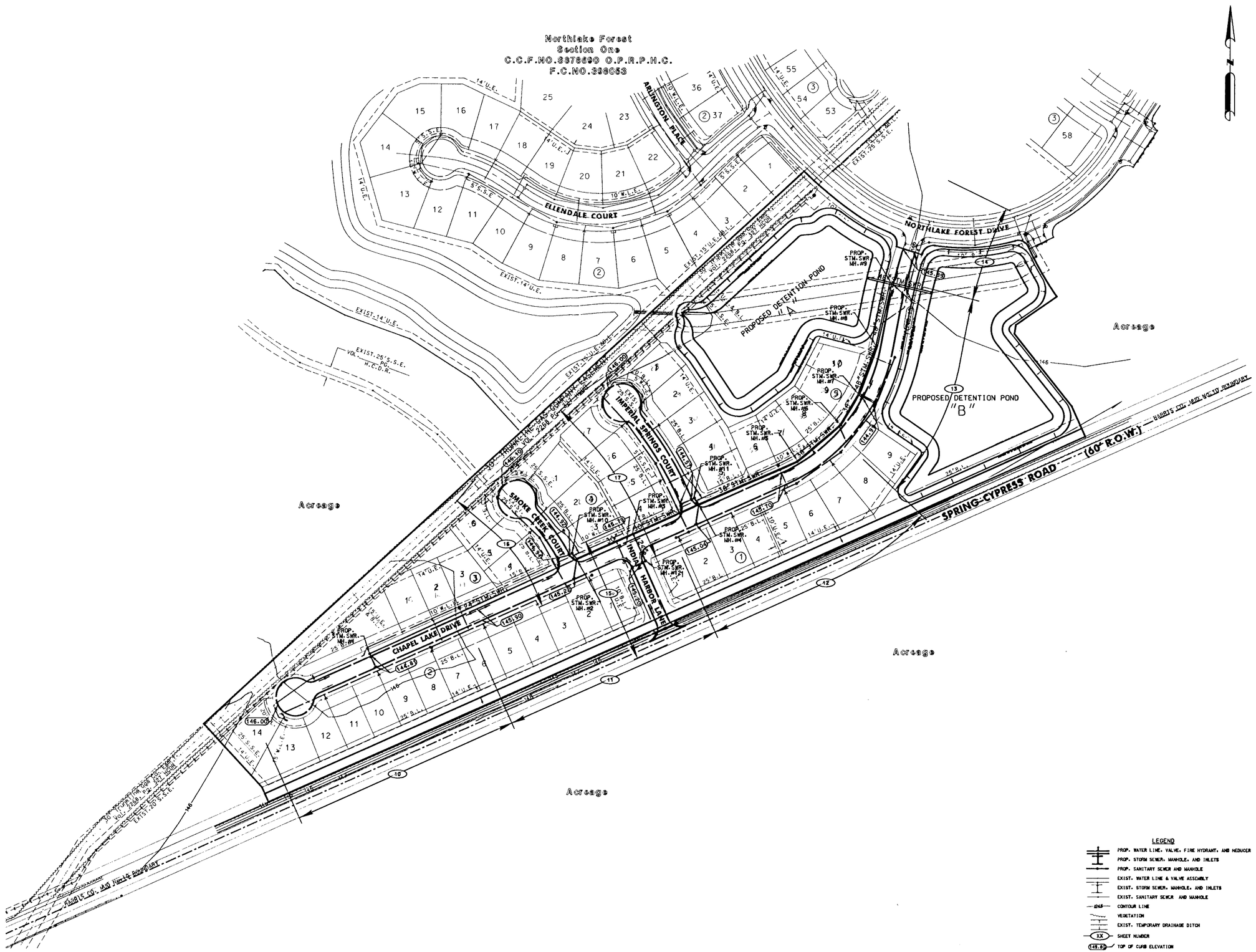
WATER ENGINEERING — 6-11-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — 6/9/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — 6/1/98
CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER 6/12/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=100'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 3 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

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RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

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2. THE DETENTION POND SHOWN HEREON IS A PRIVATE FACILITY AND WILL BE OPERATED AND MAINTAINED BY THE OWNER.
3. 100-YEAR FLOOD PLAIN WATER SURFACE EL=144.00 AS PER THE FEDERAL EMERGENCY FLOOD INSURANCE RATE MAP FOR HARRIS COUNTY 48201C0-410J REVISED NOVEMBER 6, 1996

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

EXITEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
J.A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: _____
ASSISTANT COUNTY ENGINEER

DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PAVING AND DRAINAGE LAYOUT

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

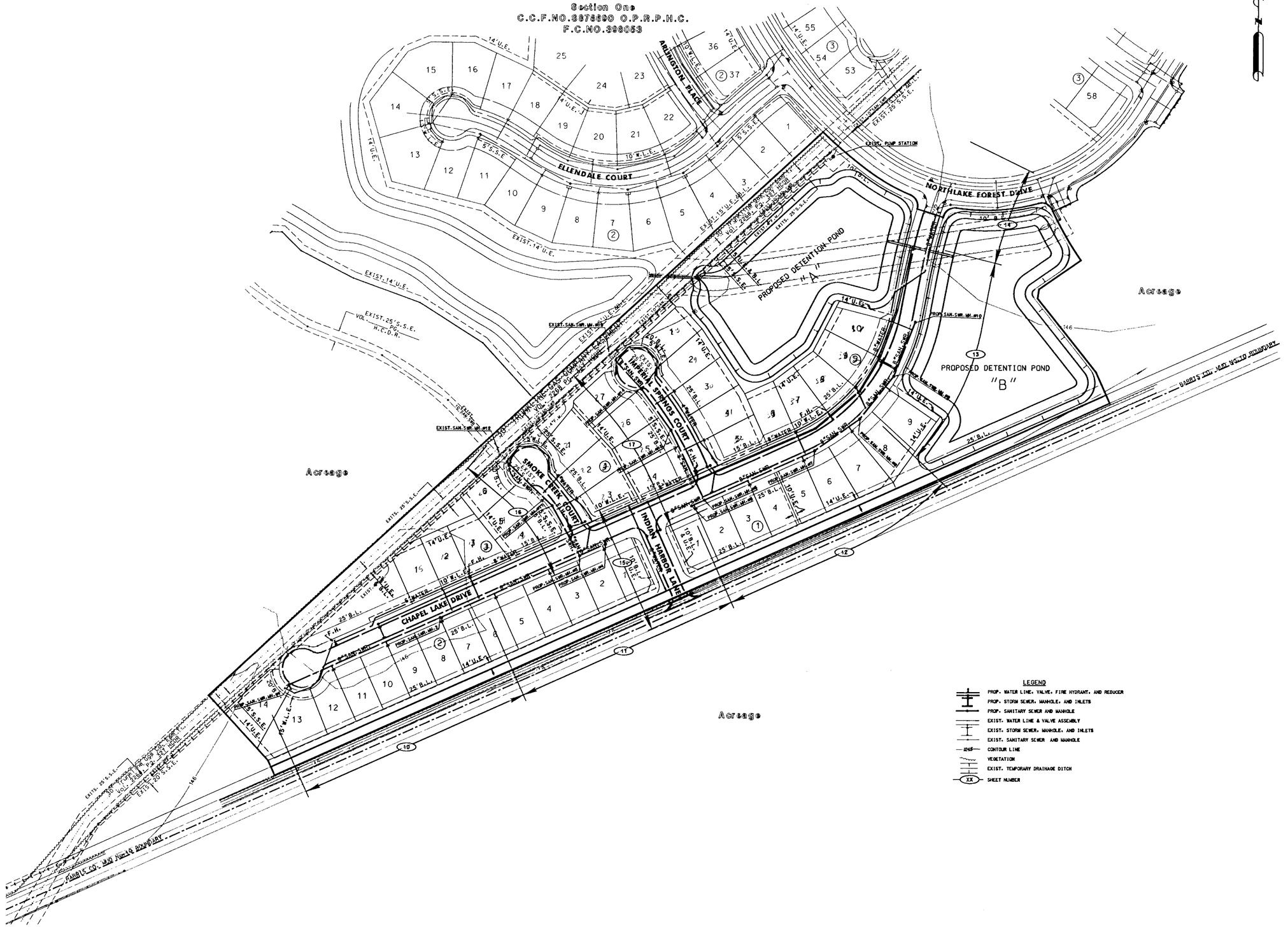
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY:	APPROVED BY:
CITY ENGINEER 6/19/98	DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/24/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=100'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 4 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644

Northlake Forest
Section One
C.C.F.NO.S878890 O.P.R.P.H.C.
F.C.NO.398053



LEGEND

- PROP. WATER LINE, VALVE, FIRE HYDRANT, AND REDUCER
- PROP. STORM SEWER, MANHOLE, AND INLETS
- PROP. SANITARY SEWER AND MANHOLE
- EXIST. WATER LINE & VALVE ASSEMBLY
- EXIST. STORM SEWER, MANHOLE, AND INLETS
- EXIST. SANITARY SEWER AND MANHOLE
- 0245 CONTOUR LINE
- VEGETATION
- EXIST. TEMPORARY DRAINAGE DITCH
- XX SHEET NUMBER

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/9/98
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

SANITARY SEWER AND WATER LAYOUT

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98	CONSTRUCTION

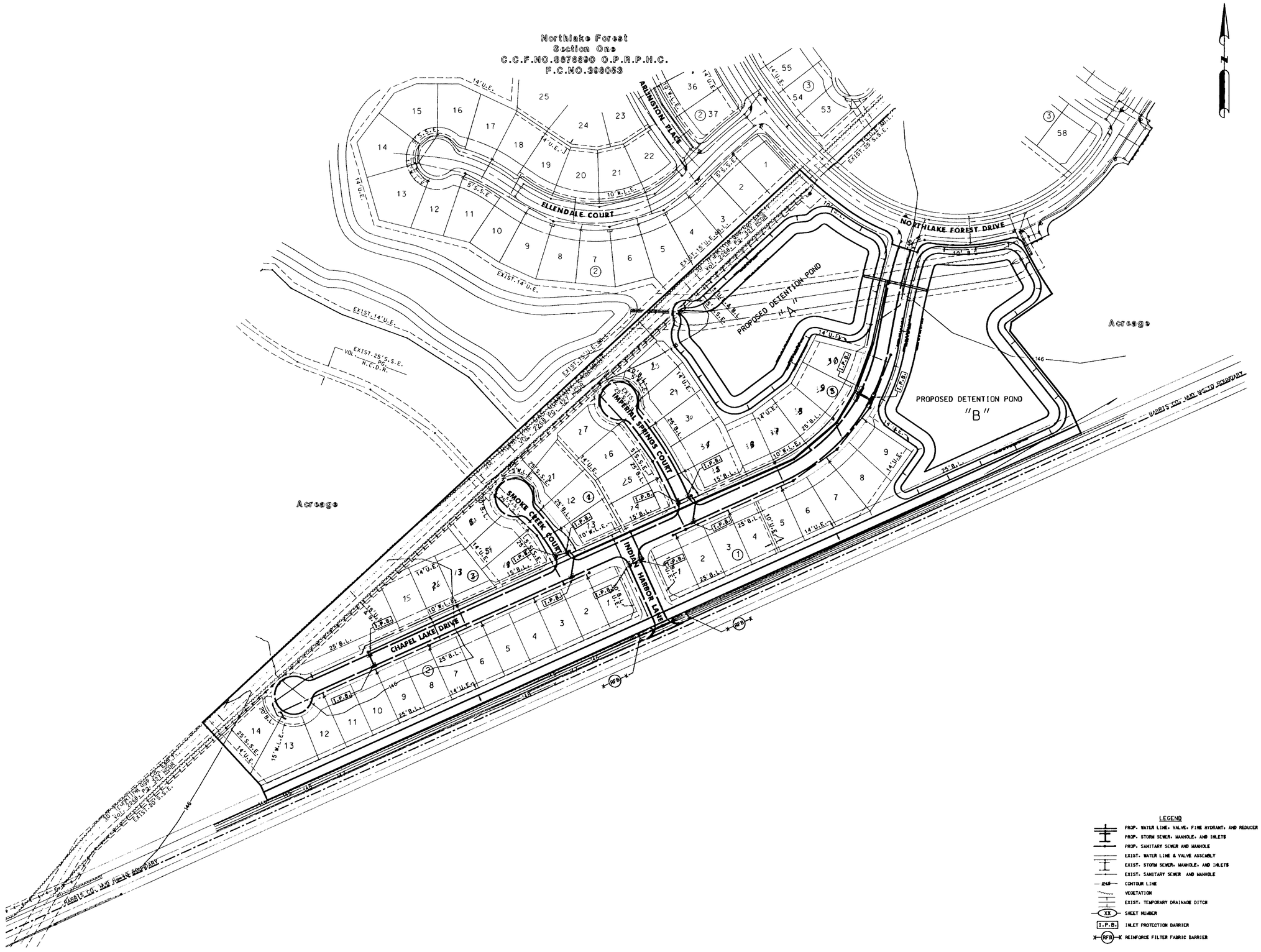
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

APPROVED BY:	APPROVED BY:
CITY ENGINEER 6/18/98	DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=100'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 05 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644

Northlake Forest
Section One
C.C.F.NO.8878890 O.P.R.P.H.C.
F.C.NO.386053



LEGEND

- PROP. WATER LINE, VALVE, FIRE HYDRANT, AND REDUCER
- PROP. STORM SEWER, MANHOLE, AND INLETS
- PROP. SANITARY SEWER AND MANHOLE
- EXIST. WATER LINE & VALVE ASSEMBLY
- EXIST. STORM SEWER, MANHOLE, AND INLETS
- EXIST. SANITARY SEWER AND MANHOLE
- 1245 CONTOUR LINE
- VEGETATION
- EXIST. TEMPORARY DRAINAGE DITCH
- XX SHEET NUMBER
- I.P.B. INLET PROTECTION BARRIER
- R.F.B. REINFORCE FILTER FABRIC BARRIER

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/13/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST
SECTION THREE

STORM WATER RUNOFF POLLUTION PREVENTION PLAN

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6-1-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/5/98
CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

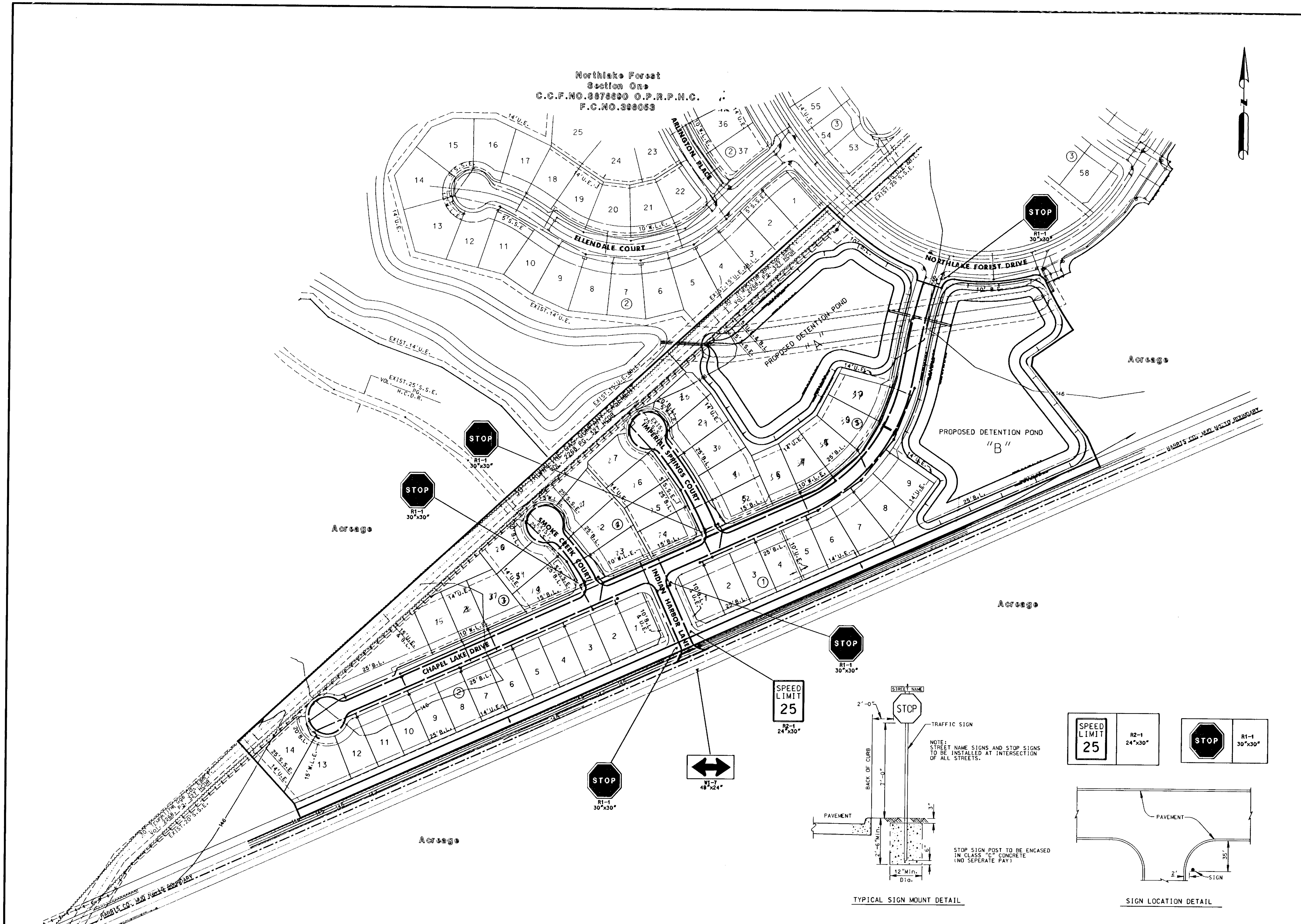
APPROVED BY:
CITY ENGINEER 6/8/98

APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/24/98

SUBMITTED: JAV
SCALE: 1"=100'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 6 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644



NOTE:
TRAFFIC SIGNAGE SHALL CONFORM TO THE STANDARD OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

TRAFFIC SIGNAGE DETAIL

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

TRAFFIC CONTROL PLAN

CITY OF HOUSTON

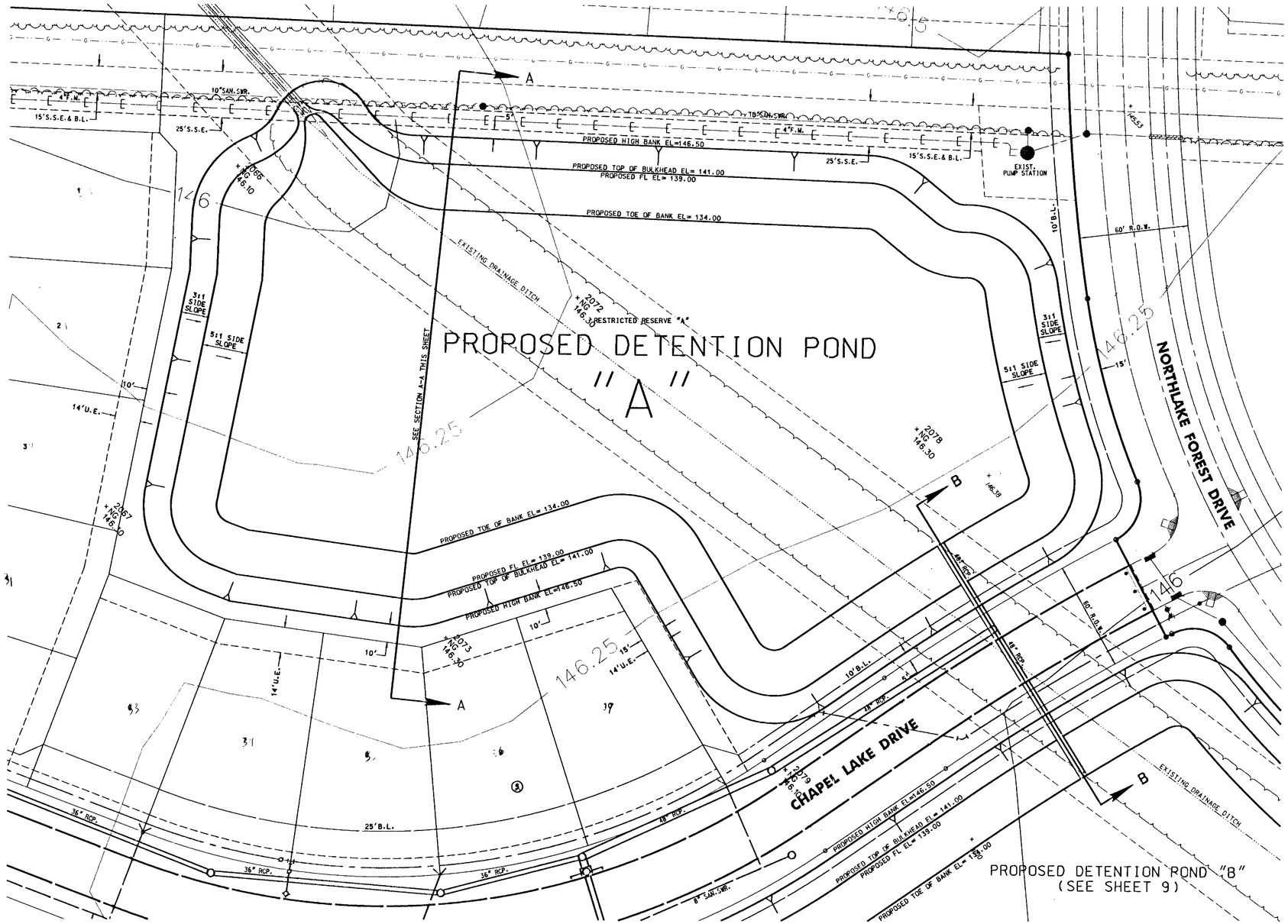
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING	TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98	STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98	CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT	SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/24/98
SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=100'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 7 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644



ULTIMATE DETENTION VOLUME REQUIRED = 72.77 AC./FT.

NORTHLAKE FOREST SECTION ONE VOLUME REQUIRED	= 24.289 AC./FT.
NORTHLAKE FOREST SECTION TWO VOLUME REQUIRED	= 9.918 AC./FT.
NORTHLAKE FOREST SECTION THREE VOLUME REQUIRED	= 9.928 AC./FT.
REMAINING ACREAGE REQUIRED VOLUME	= 28.632 AC./FT.
TOTAL	= 72.767 AC./FT.

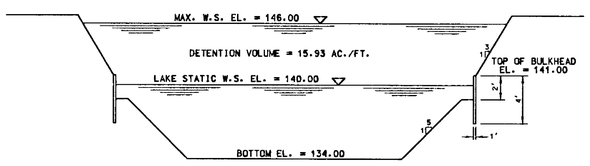
PROPOSED DETENTION POND VOLUME

POND 1 (EXISTING) (TO SERVE SECTIONS 1 & 2)	= 38.16 AC./FT.
POND A (PROPOSED) (TO SERVE SECTION 3)	= 15.93 AC./FT.
POND B (PROPOSED) (TO SERVE REMAINING DEVELOPMENT)	= 18.91 AC./FT.
TOTAL PROPOSED AND EXISTING DETENTION	= 73.00 AC./FT.

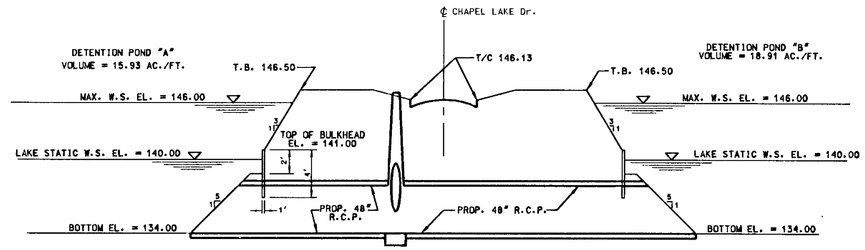
ALLOWABLE DISCHARGE FOR 180.023 AC.
UNDEVELOPED Q 100 YR. = 240 C.F.S.
DEVELOPED Q 100 YR. = 560 C.F.S.

OUTFALL SIZE FOR 240 C.F.S. UNDEVELOPED RATE
2' AVAILABLE HEAD

INTERPOSE NO OBJECTION
FINAL APPROVAL BY OTHERS
Harris County Flood Control District
5/12/98
Date
THE ABOVE SIGNATURE VALID FOR ONE (1) YEAR ONLY.



TYPICAL LAKE CROSS SECTION
SECTION A-A
(N.T.S.)



TYPICAL LAKE CROSS SECTION
SECTION B-B
(N.T.S.)

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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ELEVATION = 147.22

NOTES

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3. 100-YEAR FLOOD PLAIN WATER SURFACE EL=144.00 AS PER THE FEDERAL EMERGENCY FLOOD INSURANCE RATE MAP FOR HARRIS COUNTY 48201C0-410J REVISED NOVEMBER 6, 1998

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/9/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: _____ ASSISTANT COUNTY ENGINEER
6/16/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PROPOSED DETENTION POND "A"

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6-11-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98
CONSTRUCTION

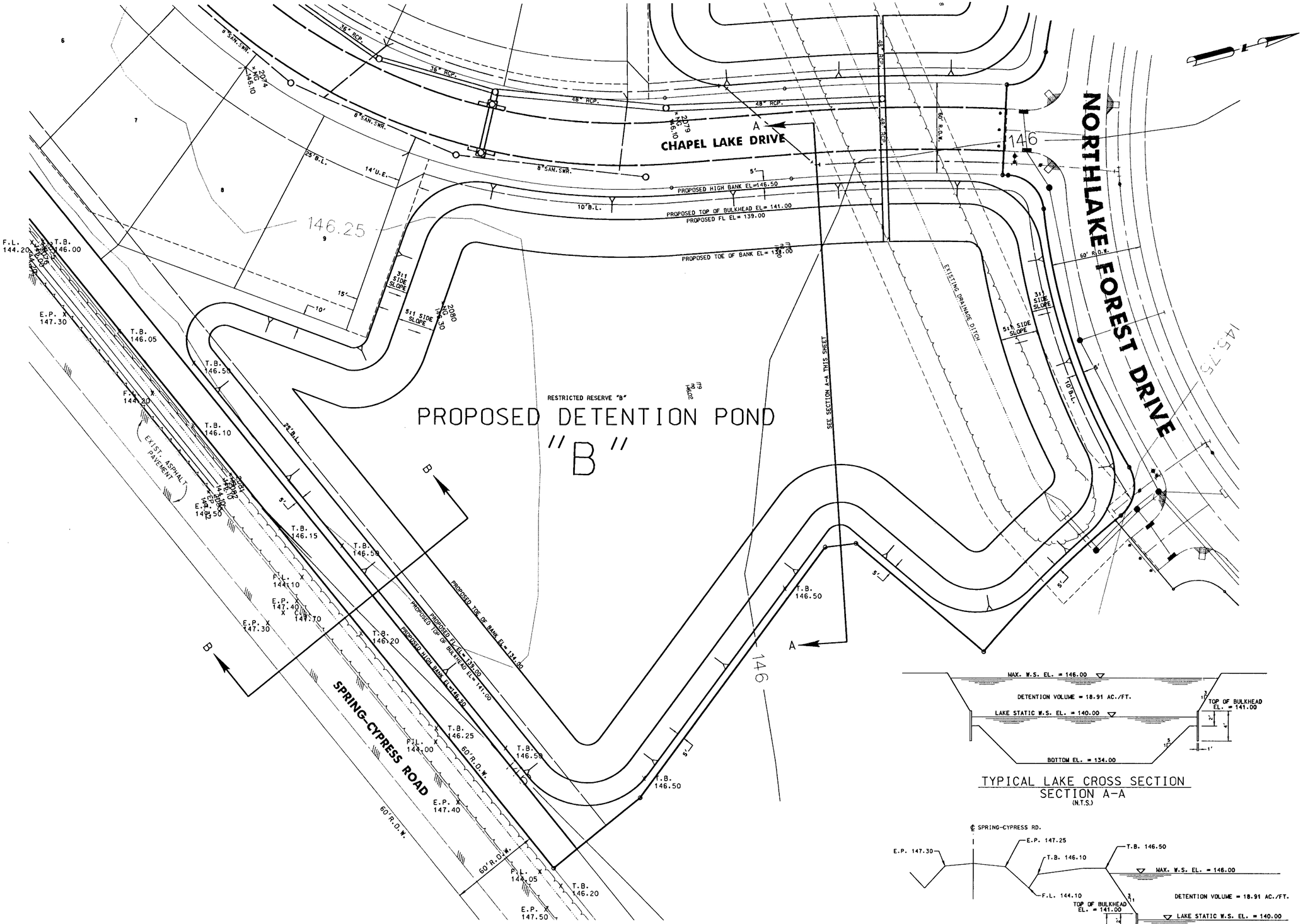
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

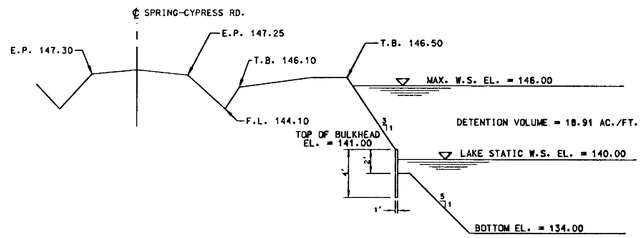
APPROVED BY: _____ CITY ENGINEER 6/12/98

APPROVED BY: _____ DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=30'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 8 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644



TYPICAL LAKE CROSS SECTION
SECTION A-A
(N.T.S.)



TYPICAL CROSS SECTION B-B
(N.T.S.)

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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3. 100-YEAR FLOOD PLAIN WATER SURFACE EL=144.00 AS PER THE FEDERAL EMERGENCY FLOOD INSURANCE RATE MAP FOR HARRIS COUNTY 4820ICO-410J REVISED NOVEMBER 6, 1996

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
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Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: _____ ASSISTANT COUNTY ENGINEER
DATE 6/24/98

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PROPOSED DETENTION POND "B"

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 4/10/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 4/1/98 — CONSTRUCTION

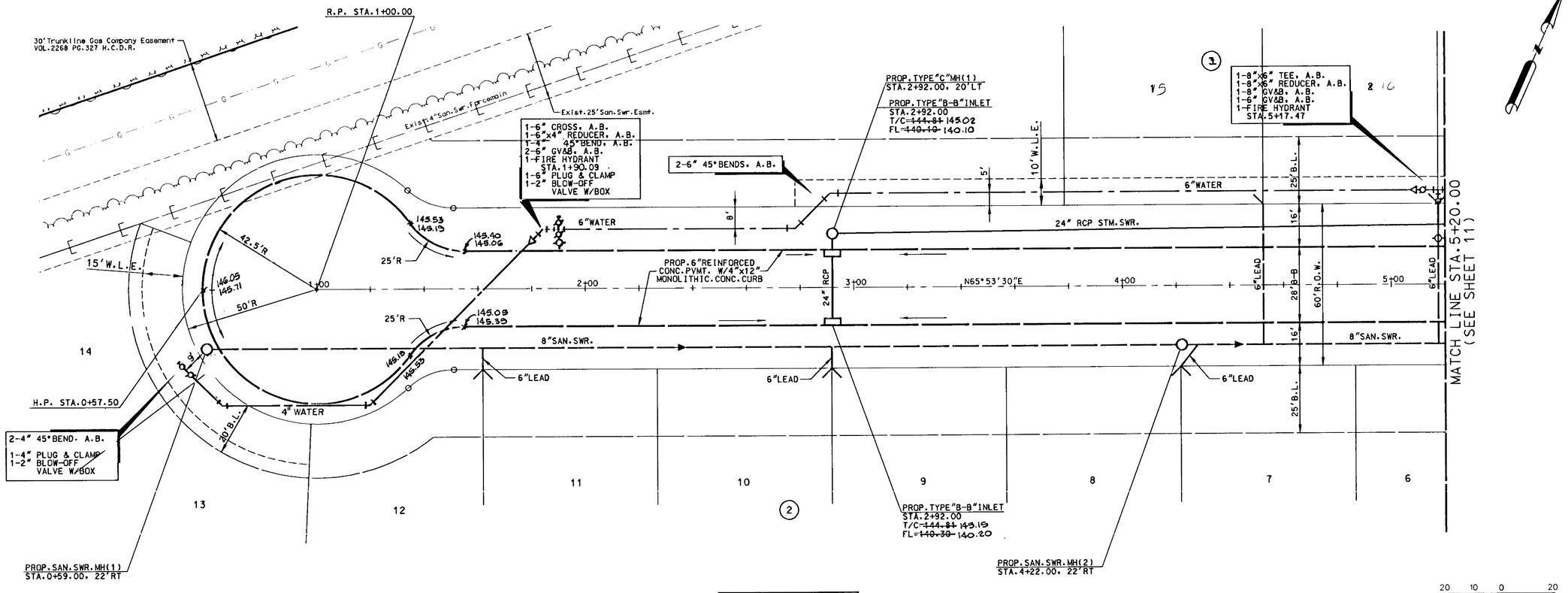
OTHER DEPARTMENT

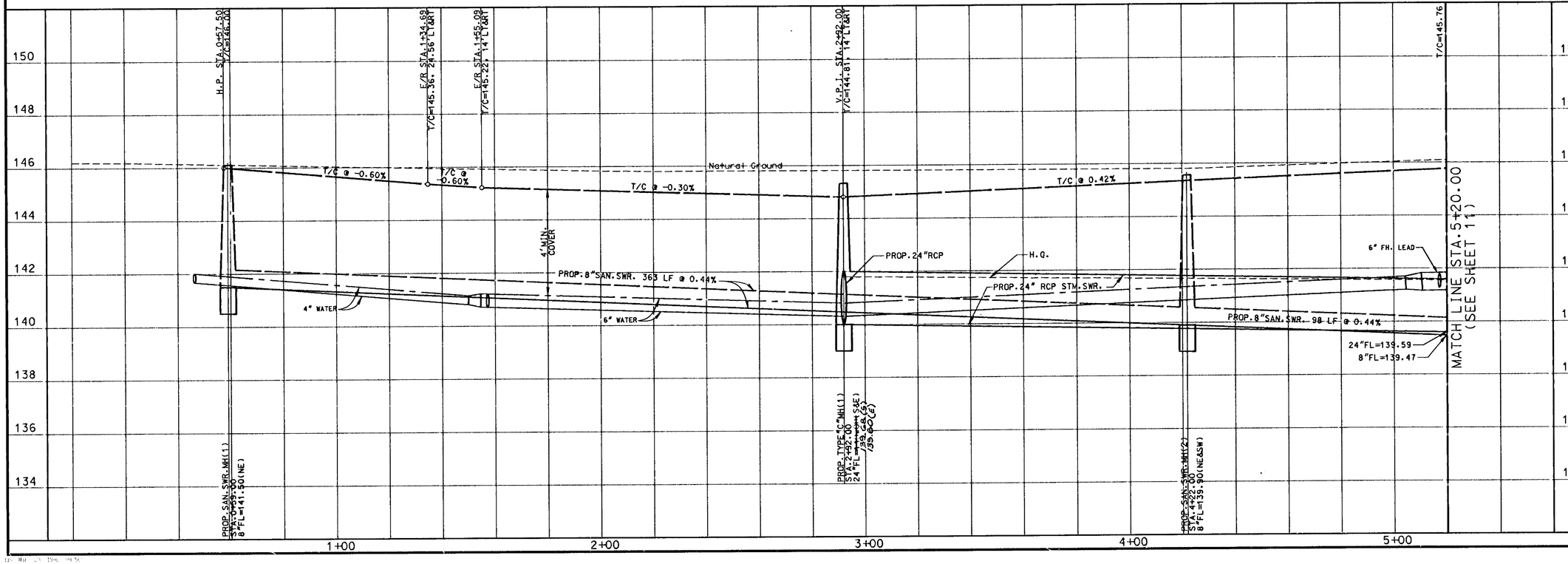
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY: _____ CITY ENGINEER 6/15/98

APPROVED BY: _____ DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: 1"=30'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 9 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644





BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
NR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/3/98
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: _____ ASSISTANT COUNTY ENGINEER
6/16/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE CHAPEL LAKE DRIVE STA.1+00 to STA.5+20

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6-4-98 — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/4/98 — CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

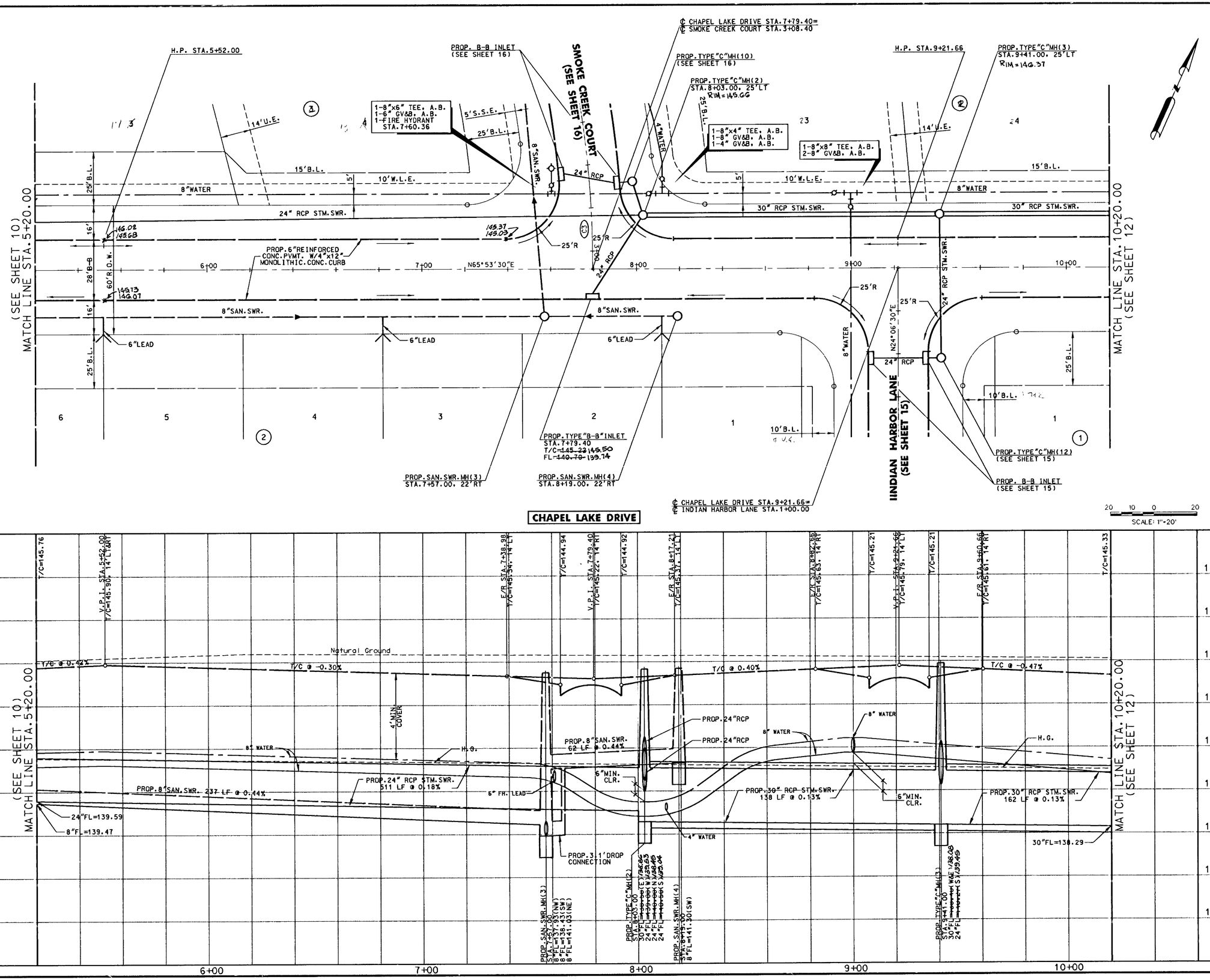
APPROVED BY: CITY ENGINEER 6/18/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F.B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 10 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

01



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: Archie Thomas
ASSISTANT COUNTY ENGINEER
6/6/98
DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION THREE

PLAN & PROFILE
CHAPEL LAKE DRIVE
STA.5+20 to STA.10+20

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

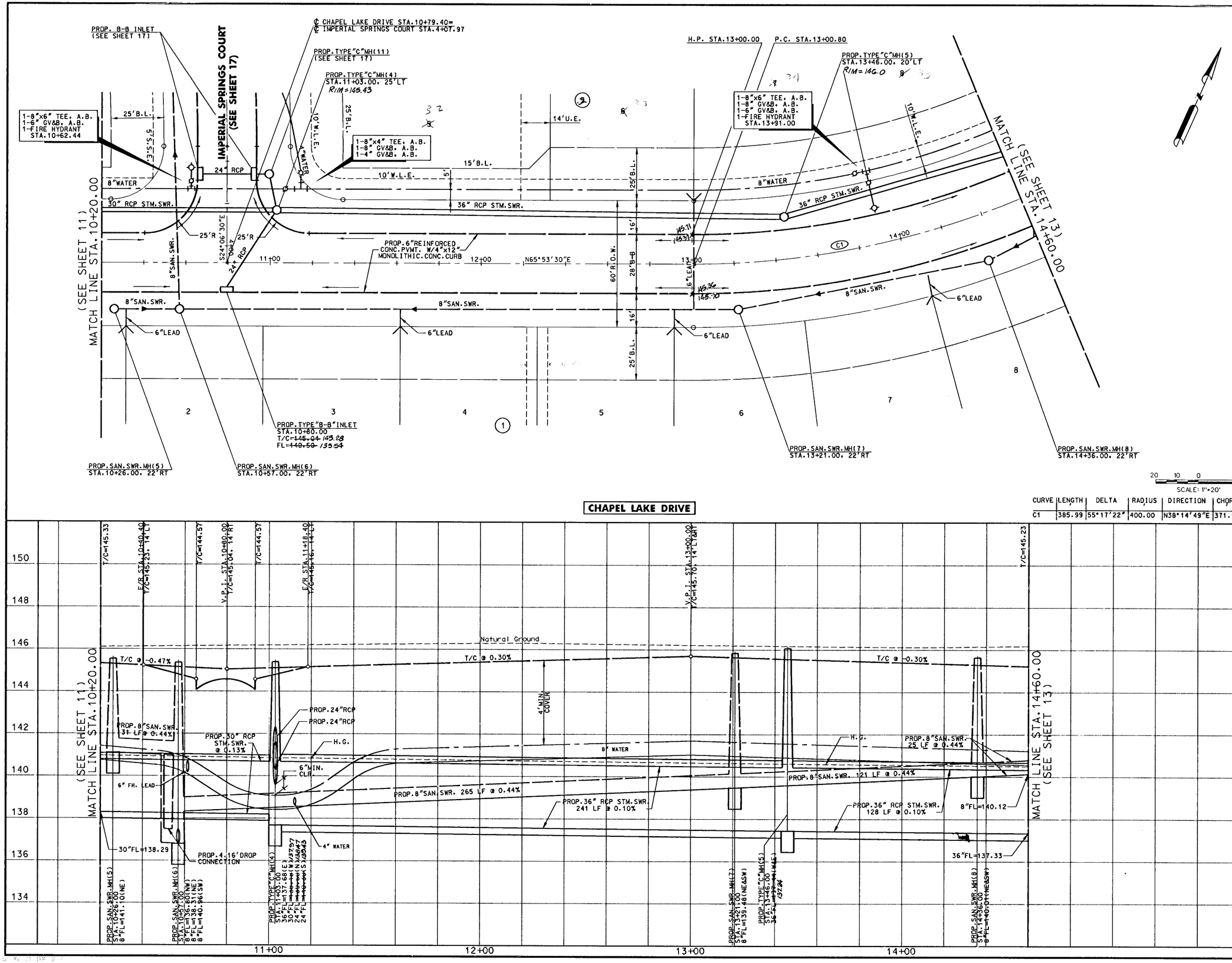
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER 6/12/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 11 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FEMSKE ROAD.
ELEVATION - 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION - 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION - 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & Van De Wiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: ASSISTANT COUNTY ENGINEER 6/16/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE CHAPEL LAKE DRIVE STA.10+20 to STA.14+60

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6/1/98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98
CONSTRUCTION

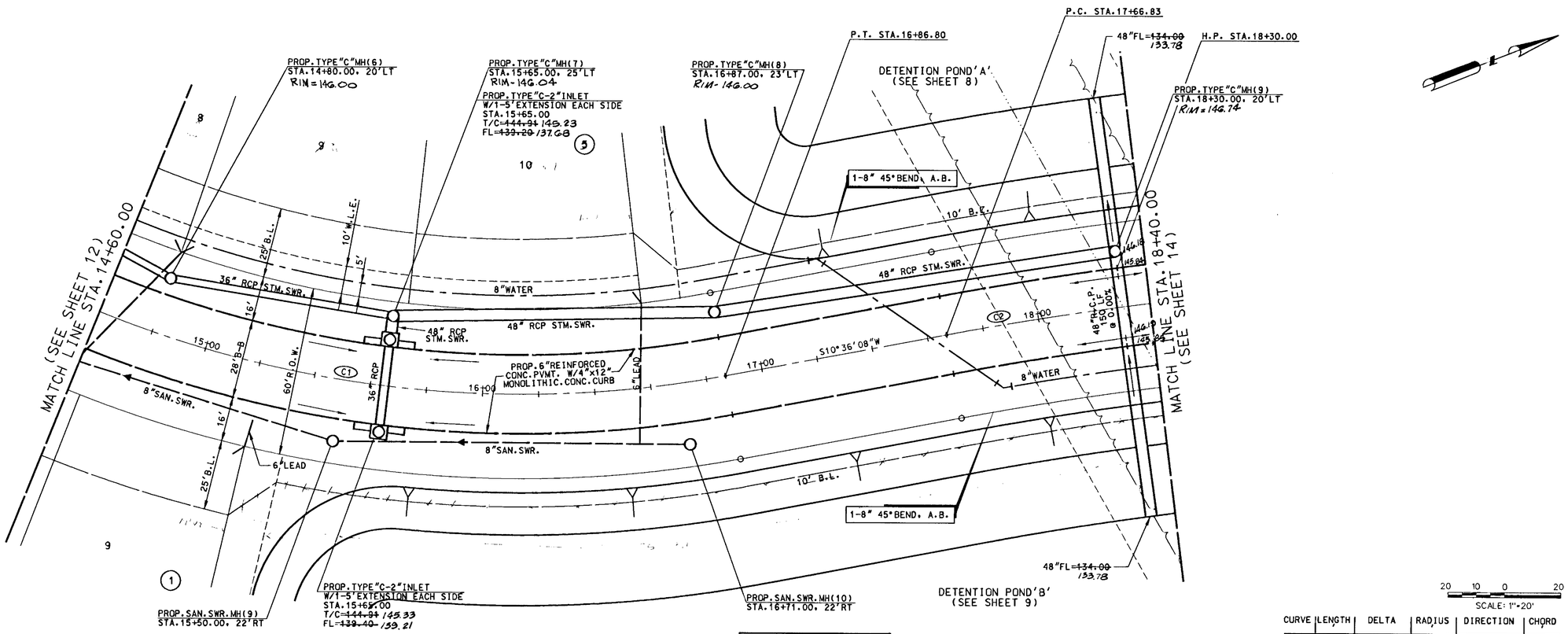
OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER 6/26/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/24/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:
DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 12 OF 25 SHEETS
CITY DWG NO:

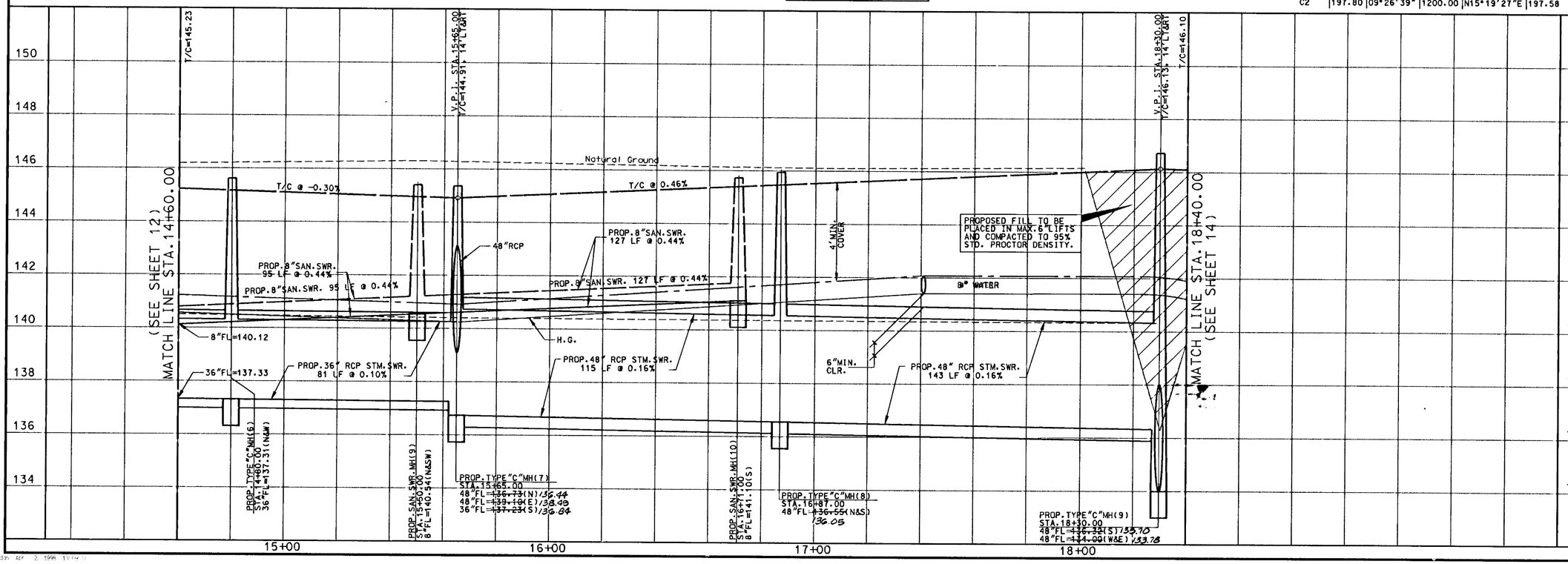
JOB NO. 10902-003-1
DWG. NO. P-644



CHAPEL LAKE DRIVE

CURVE	LENGTH	DELTA	RADIUS	DIRECTION	CHORD
C1	385.99	55°17'22"	400.00	N38°14'49"E	371.19
C2	197.80	09°26'39"	1200.00	N15°19'27"E	197.58

SCALE: 1"=20'



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-5778
713/782-0042

4/9/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: _____ ASSISTANT COUNTY ENGINEER
6/9/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE CHAPEL LAKE DRIVE STA.14+60 to STA.18+40

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

6/11/98 — WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING
STREET & BRIDGE ENGINEERING
6/1/98 — STORM SEWER ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT

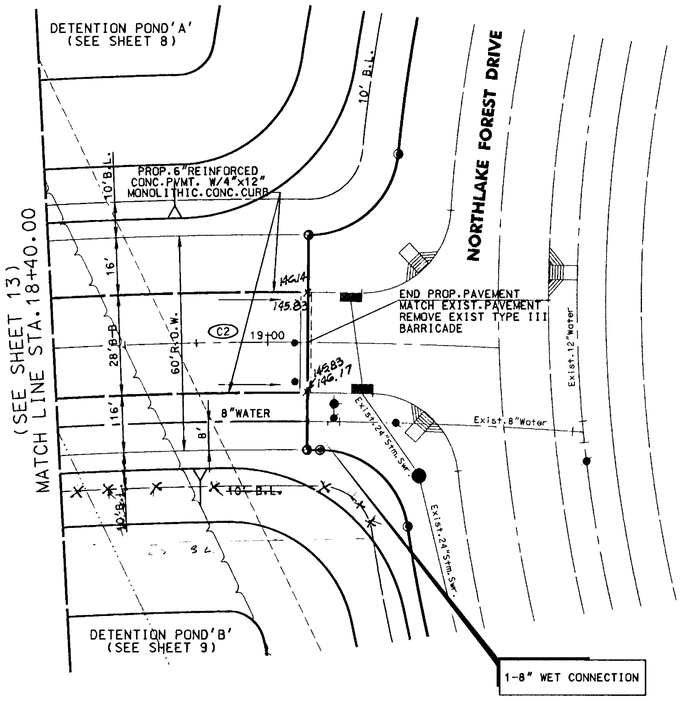
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY: _____ CITY ENGINEER 6/19/98

APPROVED BY: _____ DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: H: 1"=20' / V: 1"=2'	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 13 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644

13

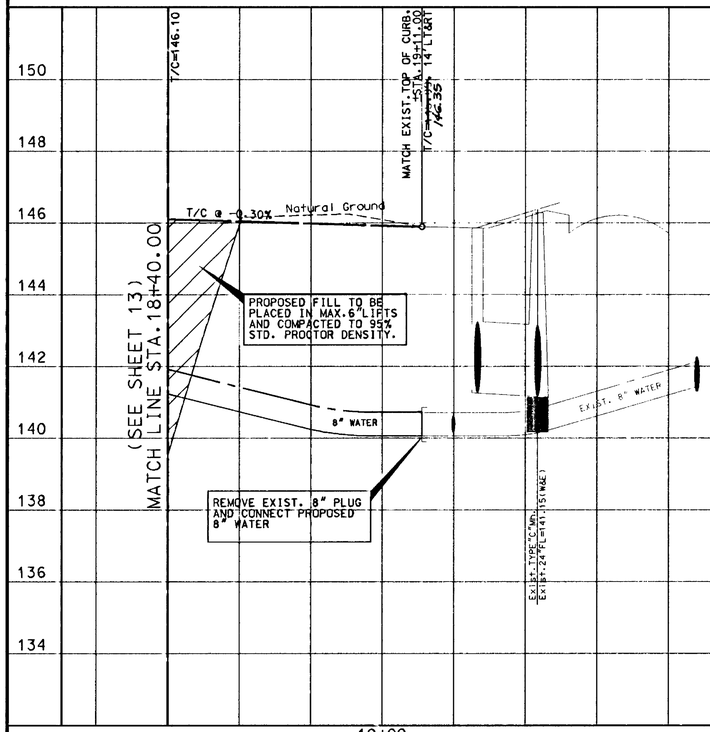


Northlake Forest
Section One
C.C.F.NO.8878830 O.P.R.P.H.C.
F.C.NO.388053

20 10 0 20
SCALE: 1"=20'

CHAPEL LAKE DRIVE

CURVE	LENGTH	DELTA	RADIUS	DIRECTION	CHORD
C2	197.80	09°26'39"	1200.00	N15°19'27"E	197.58



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (197.3 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/9/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: ASSISTANT COUNTY ENGINEER
6/16/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE
CHAPEL LAKE DRIVE
STA. 18+40 to STA. 19+11

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6-4-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 4-1-98
CONSTRUCTION

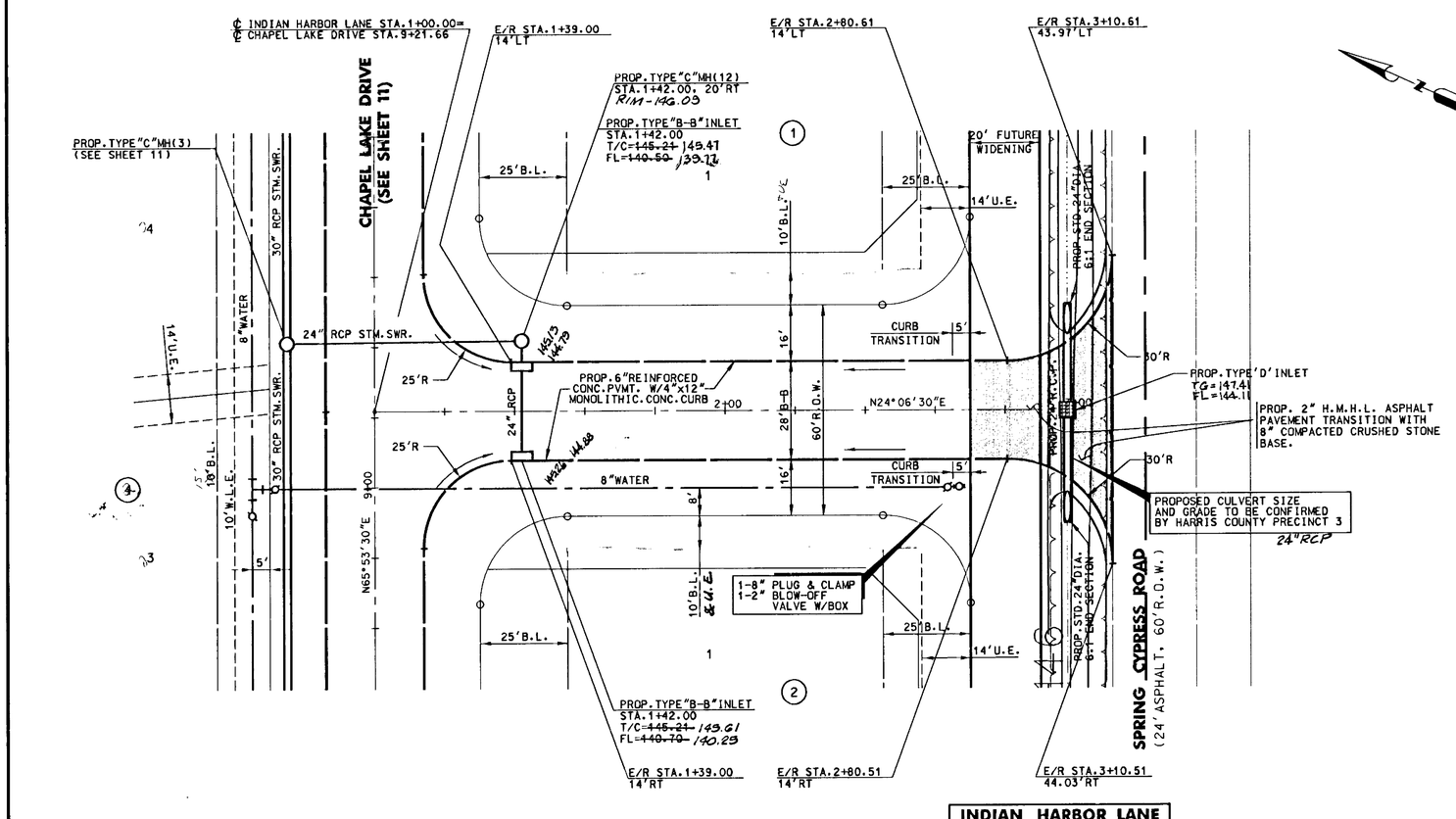
OTHER DEPARTMENT
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

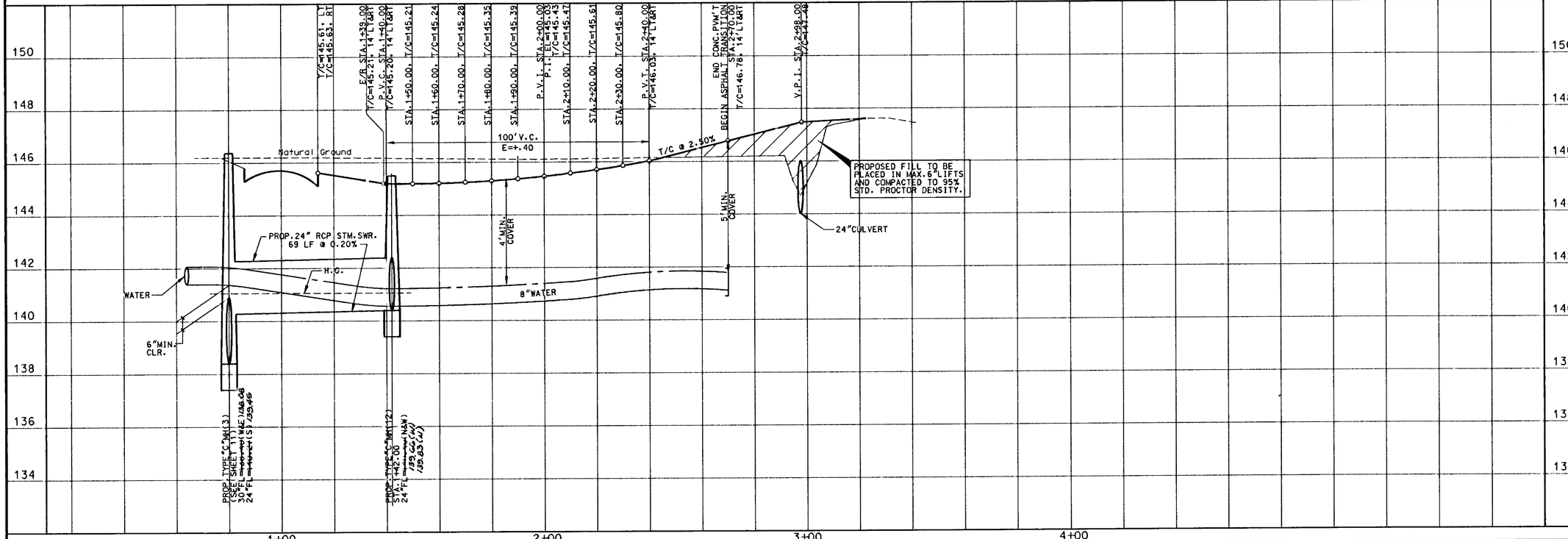
APPROVED BY: CITY ENGINEER 6/17/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/11/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 14 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644





BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-5778
713/782-0042

4/8/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: Cachie Thomas
ASSISTANT COUNTY ENGINEER
6/9/98
DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY
M.U.D. 10

NORTHLAKE FOREST
SECTION THREE

PLAN & PROFILE
INDIAN HARBOR LANE
STA.1+00 to STA.4+00

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 4/1/98 — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/10/98

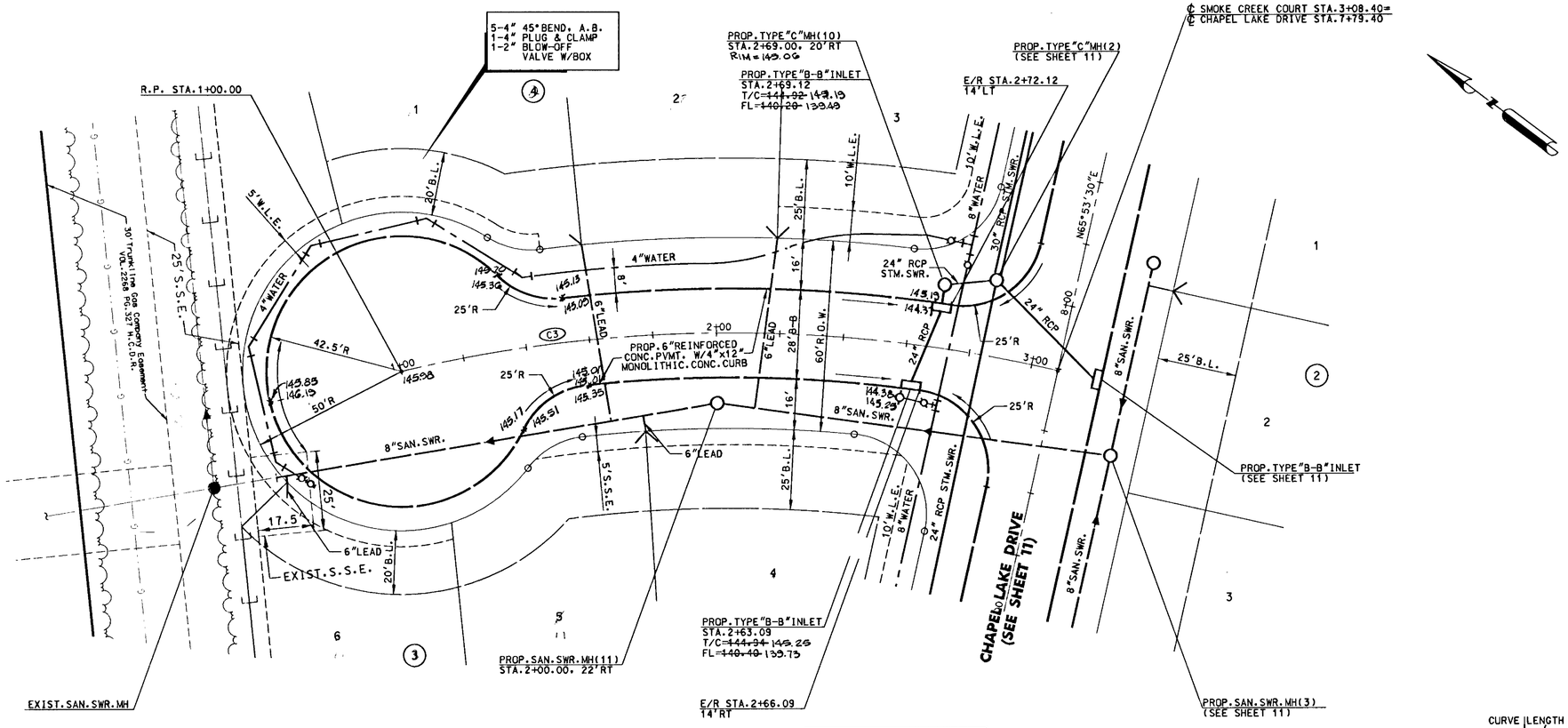
APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/11/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 15 OF 25 SHEETS
CITY DWG NO:

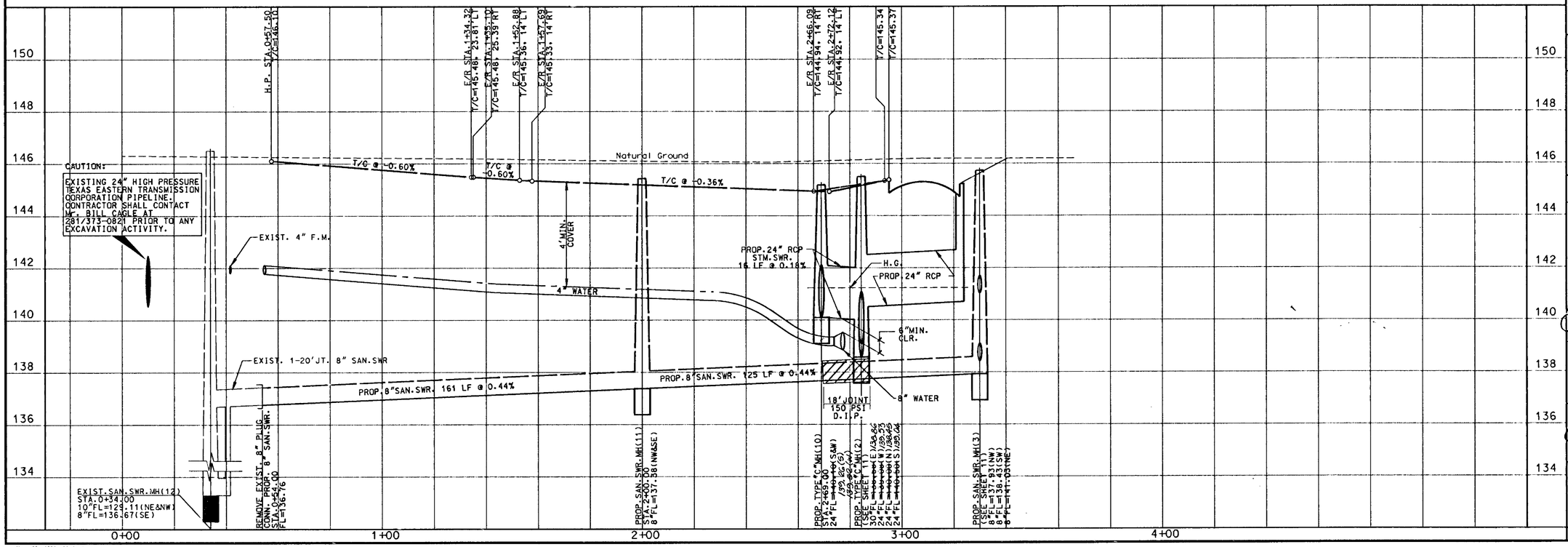
JOB NO. 10902-003-1

DWG. NO. P-644



CURVE	LENGTH	DELTA	RADIUS	DIRECTION	CHORD
C3	208.40	26°32'04"	450.00	N36°47'19"W	206.54

SMOKE CREEK COURT



BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/19/98
STATE OF TEXAS
J. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: Cecile Thomas
ASSISTANT COUNTY ENGINEER
6/16/98
DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE
SMOKE CREEK COURT
STA.1+00 to STA.3+08.40

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98 — CONSTRUCTION

OTHER DEPARTMENT

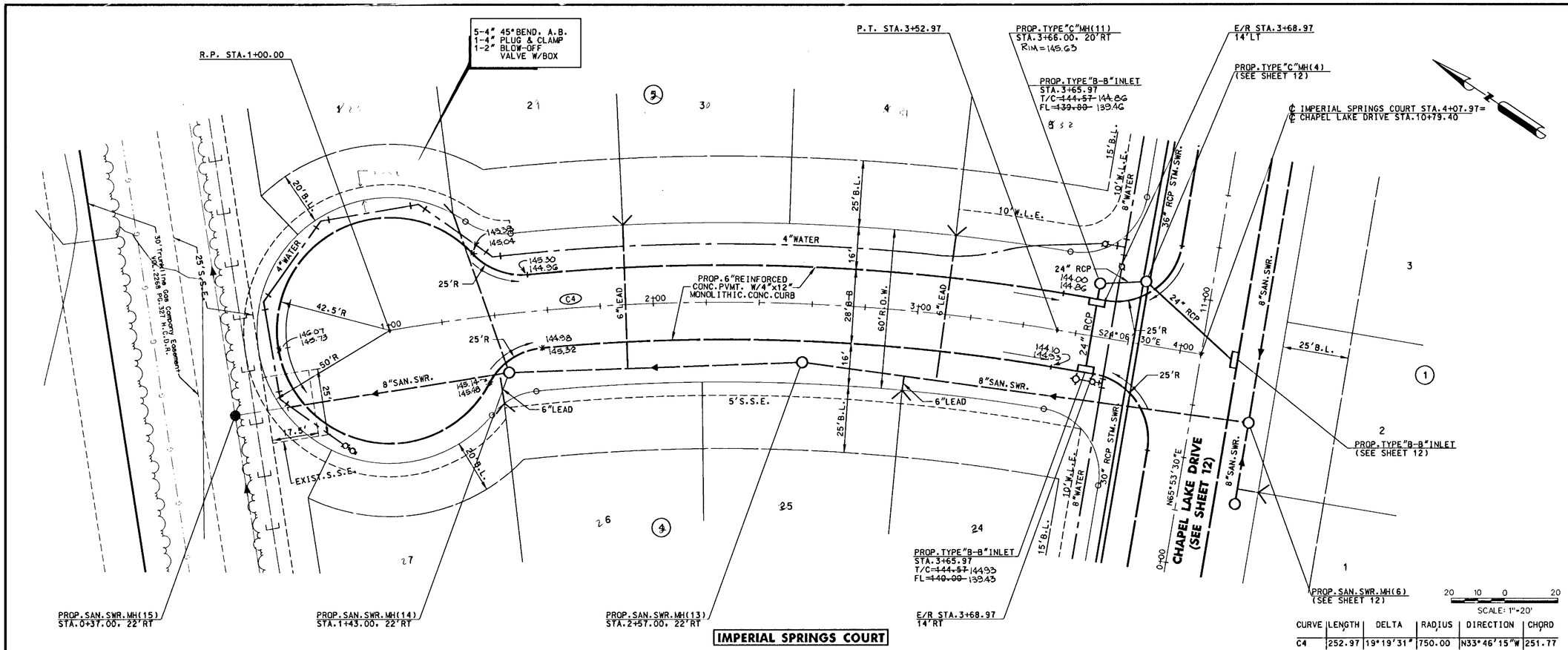
PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

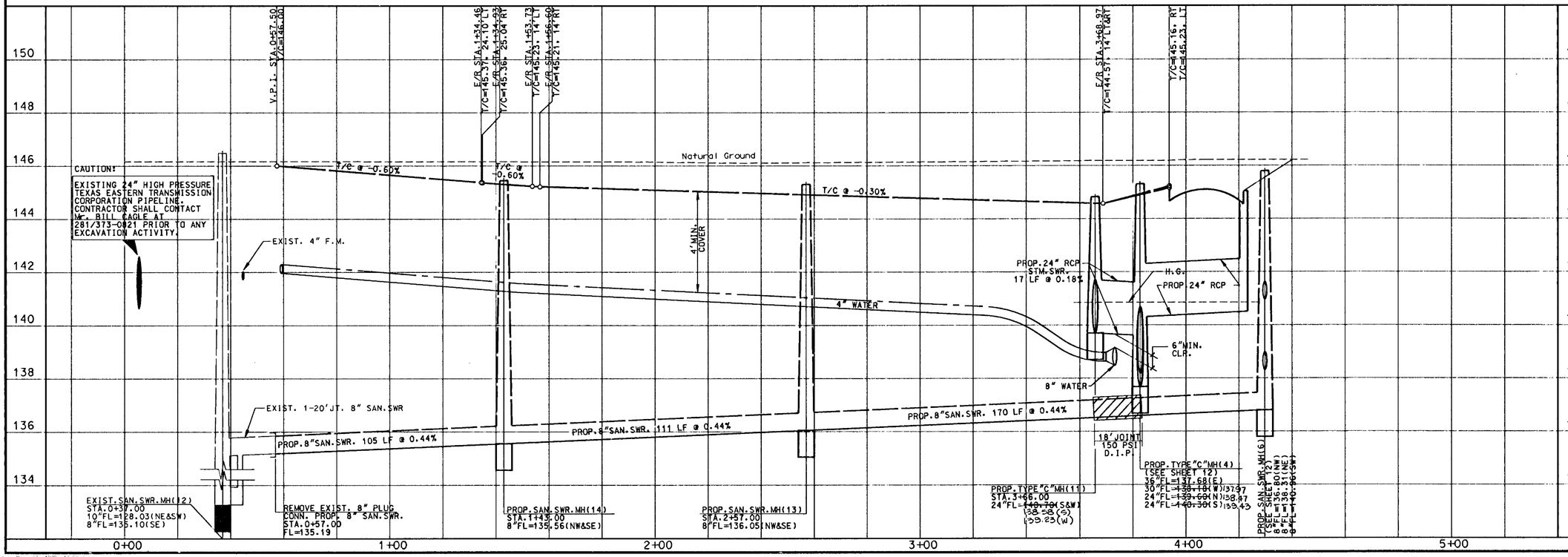
APPROVED BY: CITY ENGINEER 6/16/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 16 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644





BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

PRIVATE UTILITY LINES SHOWN

SOUTHWESTERN BELL TELEPHONE CO.
VALID FOR ONE YEAR

ENTEX, INC.

HOUSTON LIGHTING & POWER CO.
APPROVAL FOR CROSSING UNDERGROUND DUCTLINES UNLESS NOTED.
VALID AT TIME OF REVIEW ONLY.

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
(713)782-0042

4/8/98
STATE OF TEXAS
J.A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

APPROVED: ASSISTANT COUNTY ENGINEER
4/16/98 DATE

APPROVAL IMPLIED FOR PAVING AND DRAINAGE FACILITIES WITHIN HARRIS COUNTY R.O.W. AND/OR JURISDICTION. ALL OTHER IMPROVEMENTS IN H.C.R.O.W. AND/OR JURISDICTION ARE APPROVED AS TO LOCATION ONLY.

THE ABOVE AUTHORIZATION IS VALID FOR ONE YEAR ONLY
COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

PLAN & PROFILE
IMPERIAL SPRINGS COURT
STA.0+00 to STA.4+07.97

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING
CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER 6/18/98
APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: H: 1"=20' / V: 1"=2'
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:
DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 17 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

Subpart P - Excavations, Trenching, and Shoring

§ 1926.650 General protection requirements.

(a) Walkways, runways, and sidewalks shall be kept clear of excavated materials or other obstructions and no sidewalks shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (125) pounds per square foot.
(b) If planks are used for raised walkways, runways, or sidewalks, they shall be laid parallel to the length of the walk and fastened together against displacement.
(c) Planks shall be uniform in thickness and all exposed ends shall be provided with beveled cleats to prevent tripping.
(d) Raised walkways, runways, and sidewalks shall be provided with plank steps on strong stringers. Ramps, used in lieu of steps, shall be provided with cleats to insure a safe walking surface.
(e) All employees shall be protected with personal protective equipment for the protection of the head, eyes, respiratory organs, hands, feet, and other parts of the body as set forth in Subpart E of this part.
(f) Employees exposed to vehicular traffic shall be provided with and shall be instructed to wear warning vests marked with or made of reflectorized or high visibility material.
(g)Employees subjected to hazardous dusts, gases, fumes, mists, or atmospheres deficient in oxygen, shall be protected with approved respiratory protection as set forth in Subpart D of this part.
(h) No person shall be permitted under loads handled by power shovels, derricks, or hoists. To avoid spillage employees shall be required to stand away from any vehicle being loaded.
(i) Daily inspections of excavations shall be made by a competent person. If evidence of possible cave-ins or slides is apparent, all work in the excavation shall cease until necessary precautions have been taken to safeguard the employees.

§ 1926.651 Specific excavation requirements.

(a) Prior to opening an excavation, efforts shall be made to determine whether underground installations i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.
(b) Trees, boulders, and other surface encumbrances, located so as to create a hazard to employees involved in the excavation work in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
(c) The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means.
(d) Excavations shall be inspected by a competent person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins shall be increased if necessary.
(e) The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: Depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored materials; and vibration from equipment, blasting, traffic, or other sources.
(f) Supporting systems, i.e., piling, cribbing, shoring, etc., shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining system, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed unless provision is made by weep holes or drains or other means. Additional stringers, ties and bracing shall be provided to allow for any necessary temporary removal of individual supports.
(g) All slopes and inclines subjected to at least the angle of repose except for areas where solid rock allows for line drilling and presplitting.
(h) The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders, and areas where erosion, deep frost action, and slide planes appear.
(i)(1) In excavations which employees may be required to enter, excavation or other material shall be effectively stored and retained at least 2 feet or more from the edge of the excavation.
(2) As an alternative to the clearance prescribed in paragraph (i)(1) of this section, the employer may use effective barrels or other effective retaining devices in lieu thereof in order to prevent excavated or other materials from falling into the excavation.
(j) Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, barricading, rock bolting, wire meshing, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.
(k) Support systems shall be planned and designed by a qualified person when excavation is in excess of 20 feet in depth, adjacent to structures or improvements, or subject to vibration or ground water.
(l) Materials used for sheeting, sheet piling, cribbing, bracing, shoring, and underpinning shall be in good serviceable condition, and timbers shall be sound, free from large or loose knots, and of proper dimensions.
(m) Special precautions shall be taken in sloping or shoring the sides of excavations adjacent to a previously backfilling excavation or a fill, particularly when the separation is less that the depth of the excavation. Particular attention also shall be paid to joint and seams of material comprising a face and the slope of such seams and joints.
(n) Except in hard rock, excavations below the level of the base of footing of any foundation or retaining wall shall not be permitted, unless the wall is underpinned and all other precautions taken to insure the stability of the adjacent walls for the protection of employees involved in excavation work or in the vicinity thereof.
(o) If the stability of adjoining buildings or walls is endangered by excavations, shoring, bracing, or underpinning shall be provided as necessary to insure their safety. Such shoring, bracing, or underpinning shall be inspected daily or more often, as conditions warrant, by a competent person and the protection effectively maintained.
(p) Diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water shall not be allowed to accumulate in an excavation.
(q) If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored, and braced as necessary to resist the extra pressure due to such superimposed loads.
(r) Blasting and the use of explosives shall be performed in accordance with Subpart U of this part.
(s) When mobile equipment is utilized or allowed adjacent to excavation, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.
(t) Adequate barrier physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.
(u) If possible, dust conditions shall be kept to a minimum by the use of water, salt, calcium chloride, oil, or other means.
(v) In locations where oxygen deficiency or gaseous conditions are possible, air in the excavation shall be tested. Controls, as set forth in Subparts D and E of this part, shall be established to assure acceptable atmospheric conditions. When flammable gases are present, adequate ventilation shall be provided or sources of ignition shall be eliminated. Attended emergency rescue equipment, such as breathing apparatus, a safety harness and line, basket stretcher, etc., shall be readily available where adverse atmospheric conditions may exist or develop in an excavation.
(w) Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
(x) Where ramps are used for employees or equipment, they shall be designed and constructed by qualified persons in accordance with accepted engineering requirements.
(y) All ladders used on excavation operation shall be in accordance with the requirements of Subpart L of this part.

§ 1926.652 Specific trenching requirements

(a) Banks more than 5 feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table P-1 as a guide in sloping of banks. Trenches less than 5 feet in depth shall also be effectively protected when examination of the ground indicated hazardous ground movement may be expected.
(b) Sides of trenches in unstable or soft material, 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Tables P-1, P-2 (following paragraph (g) of this section).
(c) Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length. In lieu of shoring, the sides of the trench above the 5 foot level may be sloped to preclude collapse, but shall not be steeper than a 1 foot rise to each 1/2 foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4 foot minimum shall be provided at the toe of the sloped portion.
(d) Materials used for sheeting, sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
(e) Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.
(f) Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.
(g)(1) Minimum requirements for trench timbering shall be in accordance with Table P-2.
(2) Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formulas

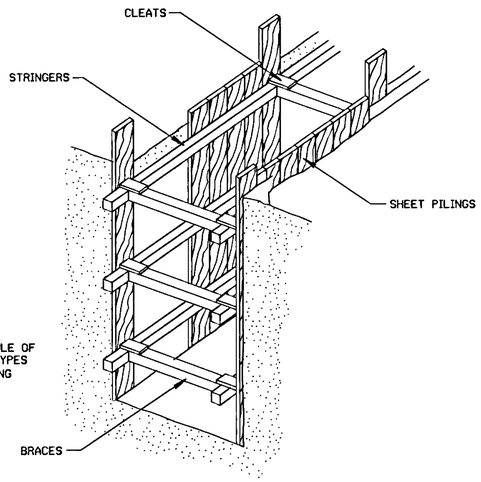
$$S = 13 - 20L/D$$
Maximum ratio L/D = 50

Where
L = Length, unsupported, in inches
D = Least side of the timber in inches
S = Allowable stress in pounds per square inch of cross-section

(h) When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps, shall be provided and located so as to require no more than 25 feet of lateral travel.
(i) Bracing or shoring of trenches shall be carried along with the excavation.
(j) Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling , or kickouts.
(k) Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench.
(l) Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soils, ropes shall be used to pull of the jacks or braces from above after employees have cleared the trench.

§ 1926.653 Definitions applicable to this subpart.

(a) "Accepted engineering requirements for practices" -- Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.
(b) "Angle of repose" -- The greatest angle above the horizontal plane at which a material will lie without sliding.
(c) "Bank" -- A mass of soil rising above a digging level.
(d) "Belled excavation" -- A part of a shaft or footing excavation, usually near the bottom and bell-shaped i.e., an enlargement of the cross section above.
(e) "Braces (trench)" -- The horizontal members of the shoring system whose ends bear against the uprights or stringers.
(f) "Excavation" -- Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
(g) "Faces" -- See paragraph (b) of this section.
(h) "Hard compact soil" -- All earth materials not classified as running or unstable.
(i) "Kickouts" -- Accidental release or failure of a shore or brace.
(j) "Sheet pile" -- A pile, or sheeting that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
(k) "Sides", "Walls", or "Faces" -- The vertical or included earth surface formed as a result of excavation work.
(l) "Slope" -- The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
(m) "Stringers (wales)" -- The horizontal members of a shoring system whose sides bear against the uprights or earth.
(n) "Trench" -- A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
(o) "Trench jack" -- Screw or hydraulic type jack used as cross bracing in a trench shoring system.
(p) "Trench shield" -- A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.
(q) "Unstable soil" -- Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.
(r) "Uprights" -- The vertical members of a shoring system.
(s) "Wales" -- See paragraph (m) of this section.
(t) "Walls" -- See paragraph (k) of this section.



ONE EXAMPLE OF SEVERAL TYPES OF SHEETING

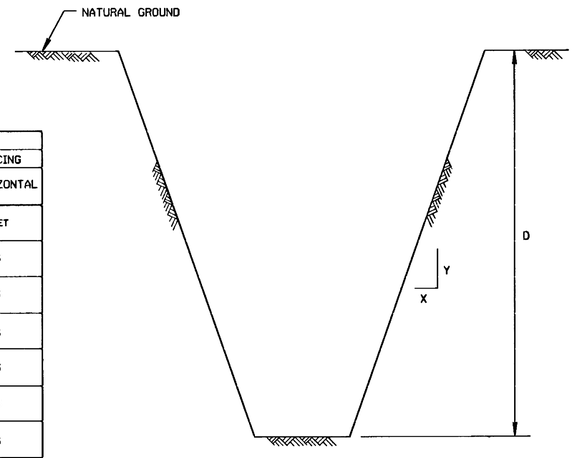
D	X	Y
0' - 5'	0	1'
5' - 8'	1'	1'
8' - 10'	2'	1'
10'-GREATER	•	•

•• SHORING OR TRENCHING BOX IS REQUIRED

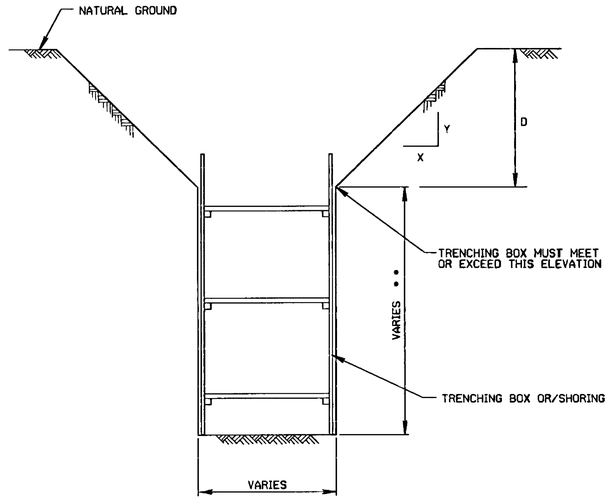
TABLE P-2 TRENCH SHORING-MINIMUM REQUIREMENTS

DEPTH OF TRENCH	KIND OF CONDITION OF EARTH	SIZE AND SPACING OF MEMBERS										
		UPRIGHTS		STRINGERS		CROSS BRACE / WIDTH OF TRENCH					MAXIMUM SPACING	
		MINIMUM DIMENSION	MAXIMUM SPACING	MINIMUM DIMENSION	MAXIMUM SPACING	UP TO 3 FEET	3 TO 6 FEET	6 TO 9 FEET	9 TO 12 FEET	12 TO 15 FEET	VERTICAL	HORIZONTAL
FEET		INCHES	FEET	INCHES	FEET	INCHES	INCHES	INCHES	INCHES	INCHES	FEET	FEET
5 TO 10	HARD, COMPACT	3x4 OR 2x6	6			2x6	4x4	4x6	6x6	6x8	4	6
	LIKELY TO CRACK	3x4 OR 2x6	3	4x6	4	2x6	4x4	4x6	6x6	6x8	4	6
	SOFT, SANDY OR FILLED	3x4 OR 2x6	CLOSE SHEETING	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	HYDROSTATIC PRESSURE	3x4 OR 2x6	CLOSE SHEETING	6x8	4	4x4	4x6	6x6	6x8	8x8	4	6
10 TO 15	HARD	3x4 OR 2x6	4	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	LIKELY TO CRACK	3x4 OR 2x6	2	4x6	4	4x4	4x6	6x6	6x8	8x8	4	6
	SOFT, SANDY OR FILLED	3x4 OR 2x6	CLOSE SHEETING	4x6	4	4x6	6x6	6x8	8x8	8x10	4	6
	HYDROSTATIC PRESSURE	3x6	CLOSE SHEETING	8x10	4	4x6	6x6	6x8	8x8	8x10	4	6
15 TO 20	ALL KINDS OR CONDITIONS	3x6	CLOSE SHEETING	4x12	4	4x12	6x8	8x8	8x10	10x10	4	6
OVER 20	ALL KINDS OR CONDITIONS	6x8	CLOSE SHEETING	3x6	4	4x12	8x8	8x10	10x10	10x12	4	6

TRENCH PACKS MAY BE USED IN LIEU OF OR IN COMBINATION WITH CROSS BRACES.
SHORING IS NOT REQUIRED IN SOLID ROCK, HARD SHALE OR HARD SLAG.
WHERE DESIRABLE, STEEL SHEET PILING AND BRACING OF EQUAL STRENGTH MAY BE SUBSTITUTED FOR WOOD.



DETAIL "A"



DETAIL "B"

BENCH MARK

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RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
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NOTES

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/15/98
STATE OF TEXAS
A. A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

TRENCHING SAFETY REQUIREMENTS

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98 — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/17/98

APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV
SCALE: N.T.S.
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 18 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

8/

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REFERENCE PLAN & PROFILE DRAWING FOR R.O.W. DIMENSION
PROPERTY LINE
28'-0" RESIDENTIAL
41'-0" COMMERCIAL
TOOL JOINT OR SAWCUT CONSTRUCTION JOINT SEAL OR KEYED CONSTRUCTION JOINT
1'-0"
#4 BARS @ 24" C-C
SUBGRADE •
CONCRETE PAVEMENT CURB & GUTTER SECTION
PARBOLIC CROWN IS AN ACCEPTABLE OPTION
N.T.S.
NOTE: PAVEMENT SECTIONS TO BE LOCATED IN CENTER OF R-O-W
1-1/2" (MIN.) HOT MIX-HOT LAID ASPHALTIC CONCRETE OR EQUIVALENT
28'-0" MINIMUM
PROFILE GRADE
24"
8" SEMI-RIGID BASE (MIN.)
SEMI-RIGID BASE PAVEMENT CURB & GUTTER SECTION
SUBGRADE • REFER TO RULES AND REGULATIONS FOR SUBDIVISIONS FOR TREATMENT AND COMPACTION
VARIES
3'-0"
6'-0"
22'-0" MINIMUM
1-1/2" HOT MIX-HOT LAID ASPHALTIC CONCRETE (MIN.)
3/4":FT.(TYP.)
1/4":FT.
8" FLEXIBLE BASE (MIN.)
3:1 MAX. (TYP.)
1'-6" MIN. 4'-0" MAX.
FLEXIBLE BASE PAVEMENT DITCH SECTION
t = THICKNESS OF CONCRETE PAVEMENT REFER TO SUBDIVISION RULES AND REGULATIONS
CONSTRUCTION JOINT SEAL OR KEYED CONSTRUCTION JOINT
CONCRETE PAVEMENT DITCH SECTION
100' MIN. (MAJOR THOROUGHFARES)
9.5' MIN.
25' MIN.
31' MIN. (MAJOR THOROUGHFARES)
12' MIN. (DOUBLE ROADWAY ONLY)
3/8":FT.(MIN.)
3/8":FT.
SAWCUT OR DEFORMED METAL STRIP
PAVEMENT THICKNESS (TYP. BOTH SIDES) (8" MIN. FOR MAJOR THOROUGHFARES) (7" MIN. FOR DOUBLE ROADWAYS)
1'-0" TYP. (BOTH SIDES)
TYPICAL SECTIONS FOR MAJOR THOROUGHFARES AND DOUBLE ROADWAYS
25'-0" B/B
PROFILE GRADE ELEVATION
4"x12" MONOLITHIC CURB
6" STD. CURB
SAWCUT OR DEFORMED METAL STRIP
PAVEMENT THICKNESS (TYP. BOTH SIDES) (7" MIN.)
TYPICAL SECTIONS FOR COMBINATION CURB FOR DIVIDED RESIDENTIAL STREETS
28'-0" B/B
TOOL JOINT OR SAWCUT CONSTRUCTION JOINT SEAL OR KEYED CONSTRUCTION JOINT
TYPICAL SECTIONS FOR 4"x12" MONOLITHIC CURB FOR RESIDENTIAL STREETS
STD. 6" CONC. CURB
TRANSITION CURB WITHIN 10'-0" UNLESS OTHERWISE SHOWN
#4 BAR
4"x12" CONC. CURB
TYPICAL CURB TRANSITION
TYPICAL DETAIL 4"x12" MONOLITHIC CURB
SCALE: 1"=1'-0"
#4 DOWEL BAR @ 24" C-C EMBEDDED 3" AND EPOXIED
TYPICAL DETAIL 4"x12" TRANSITION CURB
MATCH EXISTING ELEVATION
SURFACE
BASE
SUB BASE
CONCRETE TO ASPHALT STANDARD PAVING HEADER
MATCH TOP OF RAIL ELEVATION
EXISTING RAILROAD PAVEMENT
#4 BARS @ 18" C-C, L = 13"
RAILROAD HEADER DETAIL
PROP. PAVEMENT
EXIST. PAVEMENT (TO REMAIN)
JOINT SEAL
CONCRETE TO CONCRETE STANDARD PAVEMENT TIE-IN
(SEE NOTES)
① Reinforcing centered in proposed pavement, 3" clear at edges.
② Saw-cut & remove 2' existing pavement or pavement with curb. Expose and clean existing reinforcing.
③ 24 bar diameter lap or weld, if directed.
ASPHALT SURFACE
BASE MATERIAL
#4 DEFORMED BARS 10" LAPS
#4 DEFORMED BARS 4'-6" LONG, SPACED 5' C-C TO EXTEND 21" INTO BASE
NOTE: SOIL SHALL BE COMPACTED IN ACCORDANCE WITH SPECIFICATIONS PRIOR TO FURTHER ROADWAY CONSTRUCTION.
MONOLITHIC CONCRETE CURB & GUTTER DETAIL
DEFORMED METAL STRIP
CONSTRUCTION JOINT DETAIL
SCALE: 1 1/2"=1'-0"
LOOSE FIT 26 GAGE STEEL TUBE OR HARD PLASTIC
SEE NOTE 1
NAIL
SMOOTH BAR
DEFORMED END
SEE NOTE 5
EXPANSION JOINT PLATE
3/4" REDWOOD EXPANSION JOINT
DOWEL TYPE EXPANSION JOINT DETAIL
SCALE: 3"=1'-0"

4"x12" MONOLITHIC AND TRANSITION CURB NOTES:

1. 6-inch concrete curb to be constructed on all esplanades, islands and non-residential streets. Residential streets may be constructed with either 6-inch concrete curb or 4-inch x 12-inch concrete curb as noted on plans.
2. All 4-inch x 12-inch concrete curbs to be poured monolithicly with proposed concrete pavement.
3. Transitions from 6-inch concrete curb to 4-inch x 12-inch concrete curb to be accomplished within 10 feet, unless otherwise shown. If this 10-foot transition curb is not poured monolithicly with the pavement, then reinforcing steel as shown above in typical detail 4-inch x 12-inch transition curb is to be installed.

NOTES:

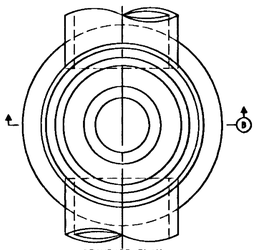
1. Dowels for pavement expansion joints shall be 3/4" ø for 6" to less than 7" pavement thickness, 1" ø for 7" to less than 9" pavement thickness and 1 1/4" ø for 9" or greater pavement thickness.
2. Expansion joint shall be placed at the end of each curb return and at maximum 80' spacing (See plans).
3. All joint seal material shall be asphalt rubber in accordance with ASTM designation D3405.
4. If deformed metal strips are allowed, they shall be staked in place with #3 bars.
5. Pre-manufactured joint plate.

NO	REVISIONS	DATE	NAME

HARRIS COUNTY ENGINEERING DEPARTMENT

DRAWN BY: L.M.J.
SHEET DESCRIPTION: SUBDIVISION STANDARD PAVEMENT DETAILS
FILE NAME: PAVING1
SCALE: AS NOTED
DATE: 09/03/93
SHEET NO: S/D-1

SHT. 19 of 25



STANDARD PLAN
COVER NOT SHOWN

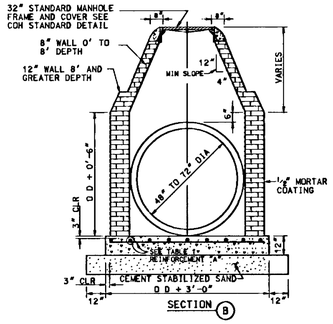


TABLE 1

DATA FOR VARIOUS PIPE DIAMETERS

PIPE DIA (INCHES)	MIN DEPTH	REINFORCEMENT ("A")	REINFORCEMENT ("B")
48"	8'-0"	# 5 @ 12 E W	2 - # 6
54"	9'-4"	# 5 @ 10 E W	2 - # 6
60"	10'-7"	# 5 @ 8 E W	2 - # 7
66"	11'-10"	# 5 @ 7 E W	2 - # 7
72"	13'-2"	# 5 @ 6 E W	2 - # 7

STORM SEWER MANHOLE TYPE "C" FOR 48" TO 72" DIA RCP

(NOT TO SCALE)
DWG.NO.02081-04

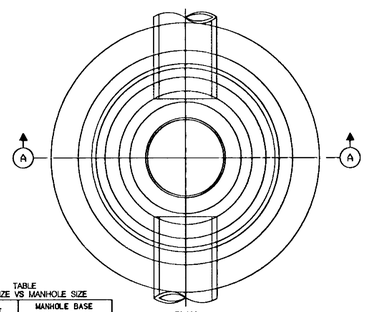
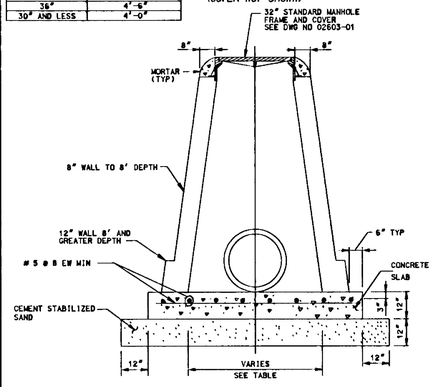


TABLE
SEWER SIZE VS MANHOLE SIZE

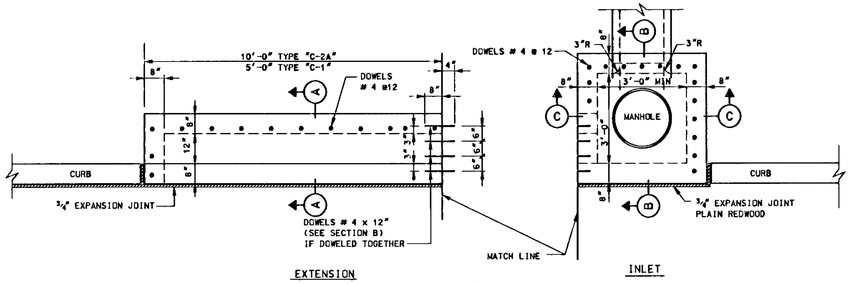
SEWER SIZE	MANHOLE BASE DIAMETER
42"	5'-0"
36"	4'-6"
30" AND LESS	4'-0"

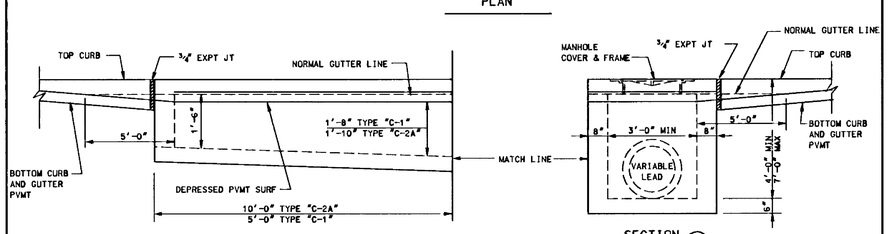
PLAN
(COVER NOT SHOWN)

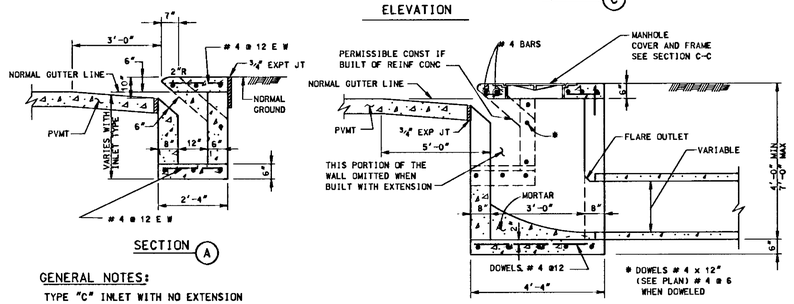


STORM SEWER MANHOLE TYPE "C" FOR 42" DIA RCP AND SMALLER

(NOT TO SCALE)
DWG.NO.02081-03







GENERAL NOTES:

TYPE "C" INLET WITH NO EXTENSION

TYPE "C-1" INLET WITH ONE EXTENSION (5'-0" LONG)

TYPE "C-2" INLET WITH ONE EXTENSION ON EACH SIDE

TYPE "C-2A" INLET WITH DOUBLE EXTENSION (10'-0" LONG)

NOTES:

1. FOR TYPE "C-2A" INLETS PROVIDE A CENTER 6"X6" COLUMNS IN THE CURB LINE BETWEEN ALL EXTENSIONS.
2. WALLS TO BE 6" IF BUILT WITH REINFORCED CONCRETE. WHEN BUILT WITH BRICK WALL, USE STRAIGHT WALL IN BACK WITH 6" REINFORCED CONCRETE TOP SLABS DOWELLED INTO BRICK WALLS WITH # 4 X 8" @ 12.

STORM SEWER TYPE "C", "C-1", "C-2" AND "C-2A" INLETS

(NOT TO SCALE)
DWG.NO.02632-06

NOTES:

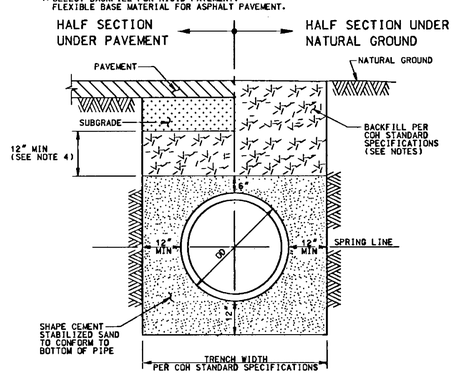
1. THE METHOD OF INSTALLING CONCRETE PIPE STORM SEWERS SHOWN HEREON TO BE USED ONLY WHERE SOIL CONDITIONS ARE SATISFACTORY.

   FOR ALL OTHER SOIL CONDITIONS USE RCP INSTALLED PER CON STANDARD DETAIL WRC CONSTRUCTION PER CON STANDARD DETAIL OR APPROVED SPECIAL DESIGN AS SHOWN ON DRAWINGS.

2. BACKFILL MATERIAL UNDER PAVEMENT AND WITHIN 1-FOOT BEHIND CURB. SHALL BE SUITABLE MATERIAL.

3. BACKFILL MATERIAL OUTSIDE OF PAVEMENT AREA SHALL BE SUITABLE ON-SITE MATERIAL. IF ON-SITE MATERIAL IS UNACCEPTABLE, MIXING 1-FOOT OF EXCAVATED MATERIALS FROM THE SITE TO OBTAIN ACCEPTABLE SOIL CLASSIFICATION FROM TRENCH BACKFILL IS ALLOWED.

4. SELECT BACKFILL FOR RIGID PAVEMENT: FLEXIBLE BASE MATERIAL FOR ASPHALT PAVEMENT.



STORM SEWER BEDDING AND BACKFILL FOR 42" DIA RCP AND LARGER WHERE SATISFACTORY SOIL CONDITIONS EXIST

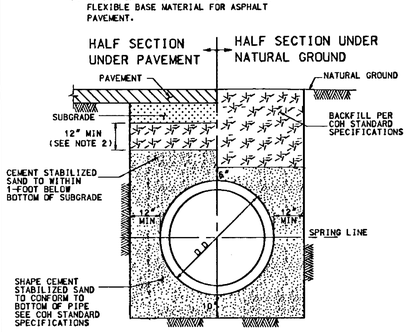
(NOT TO SCALE)
DWG.NO.02317-09

NOTES:

1. THE METHOD OF INSTALLING CONCRETE PIPE STORM SEWERS SHOWN HEREON TO BE USED ONLY WHERE SOIL CONDITIONS ARE SATISFACTORY.

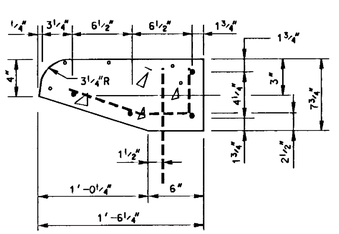
   FOR ALL OTHER SOIL CONDITIONS USE RCP INSTALLED PER CON STANDARD DETAIL WRC CONSTRUCTION PER CITY APPROVED SPECIAL DESIGN AS SHOWN ON DRAWINGS.

2. SELECT BACKFILL FOR RIGID PAVEMENT: FLEXIBLE BASE MATERIAL FOR ASPHALT PAVEMENT.



STORM SEWER BEDDING AND BACKFILL FOR 24" TO 36" DIA RCP WHERE SATISFACTORY SOIL CONDITIONS EXIST

(NOT TO SCALE)
DWG.NO.02317-04



PRECAST CURB BEAM

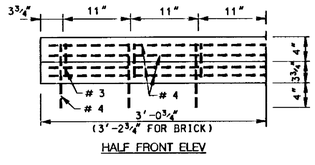
CURB BEAM BAR LIST				
NO	SIZE	LENGTH	SHAPE	LOC
4	# 4	5'-10"	ST	HOR
7	# 4	0'-10"	ST	VERT
7	# 3	1'-6"	BT	

GENERAL NOTES:

USE STD CAST IRON FRAME & PLATES.
LEAD SHALL LEAVE INLET AT LOCATION AND GRADE REQUIRED.
WHEN BRICK INLETS ARE BUILT EXTEND DOWELS 4 INCHES FROM CURB BEAM INTO BRICKWORK.
WHEN BRICK INLETS ARE BUILT, WALLS SHALL BE INCREASED TO 8 INCHES, AND INLET BEAMS TO BE 4 INCHES LONGER.

NOTES:

1. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
2. CENTER REINFORCING IN SLAB AND WALLS.
3. CENTER STEEL BEAM ON INLET AND CAST INTO WALLS AS SHOWN.



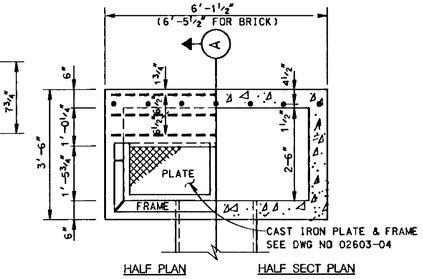
HALF FRONT ELEV

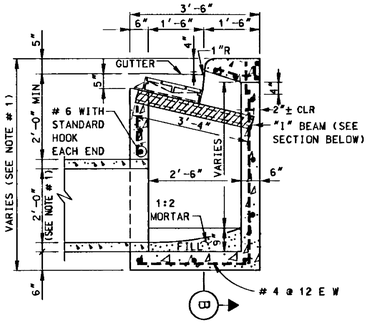
ACCEPTABLE ALTERNATE STEEL BEAM SIZES:
S6x17.5
W6x16
(GALVANIZED)

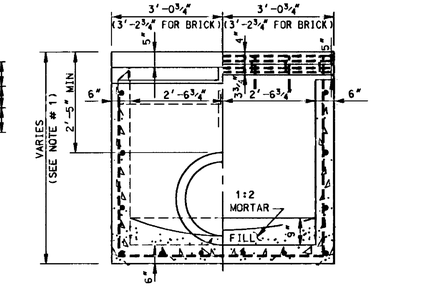
SECTION THRU BEAM

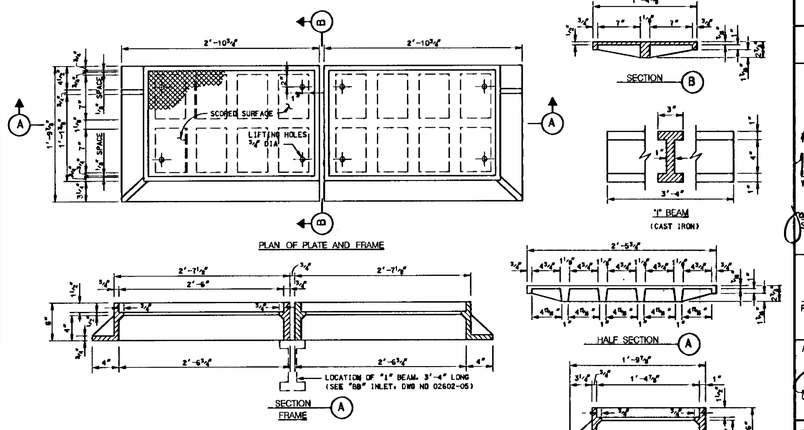
STORM SEWER TYPE "BB" INLET

(NOT TO SCALE)
DWG.NO.02632-04









STORM SEWER TYPE "BB" INLET PLATE, FRAME, AND I BEAM

(NOT TO SCALE)
DWG.NO.02084-04

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

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Houston, Texas 77042-3778
713/782-0042

4/16/98
J.A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

STORM SEWER DETAILS

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/5/98 — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98 — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/5/98

APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 4/16/98

SUBMITTED: JAV
SCALE: N.T.S.
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 20 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

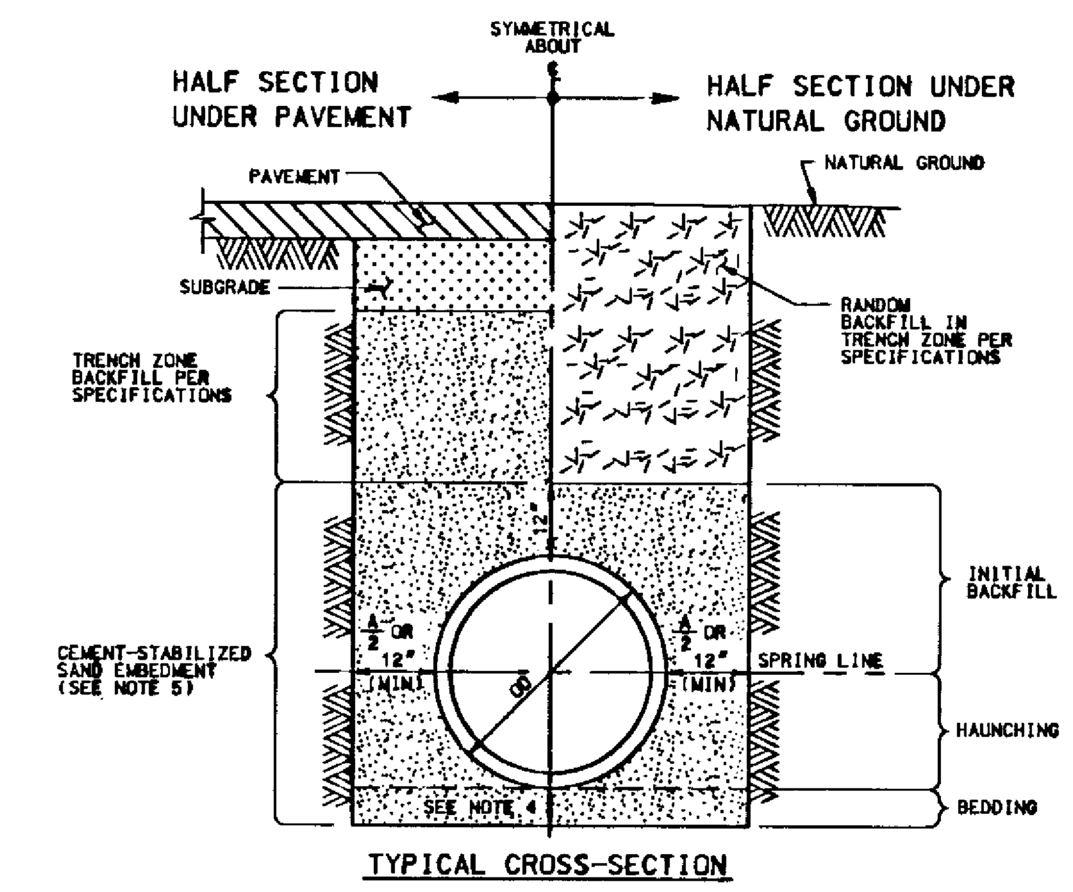
\10902\003-1\cad\dtl-stm.dgn Mar 20, 1998 18:06:46

NOTES:

1. THIS DETAIL MAY BE USED ONLY FOR DRY STABLE TRENCH CONDITIONS PER C.O.H. STANDARD. SEE SPECIFICATION FOR REQUIREMENTS IN OTHER CONDITIONS.
2. MIN TRENCH WIDTH SHALL BE PIPE OD PLUS AN ALLOWANCE "A" FOR THE NOMINAL PIPE SIZE:

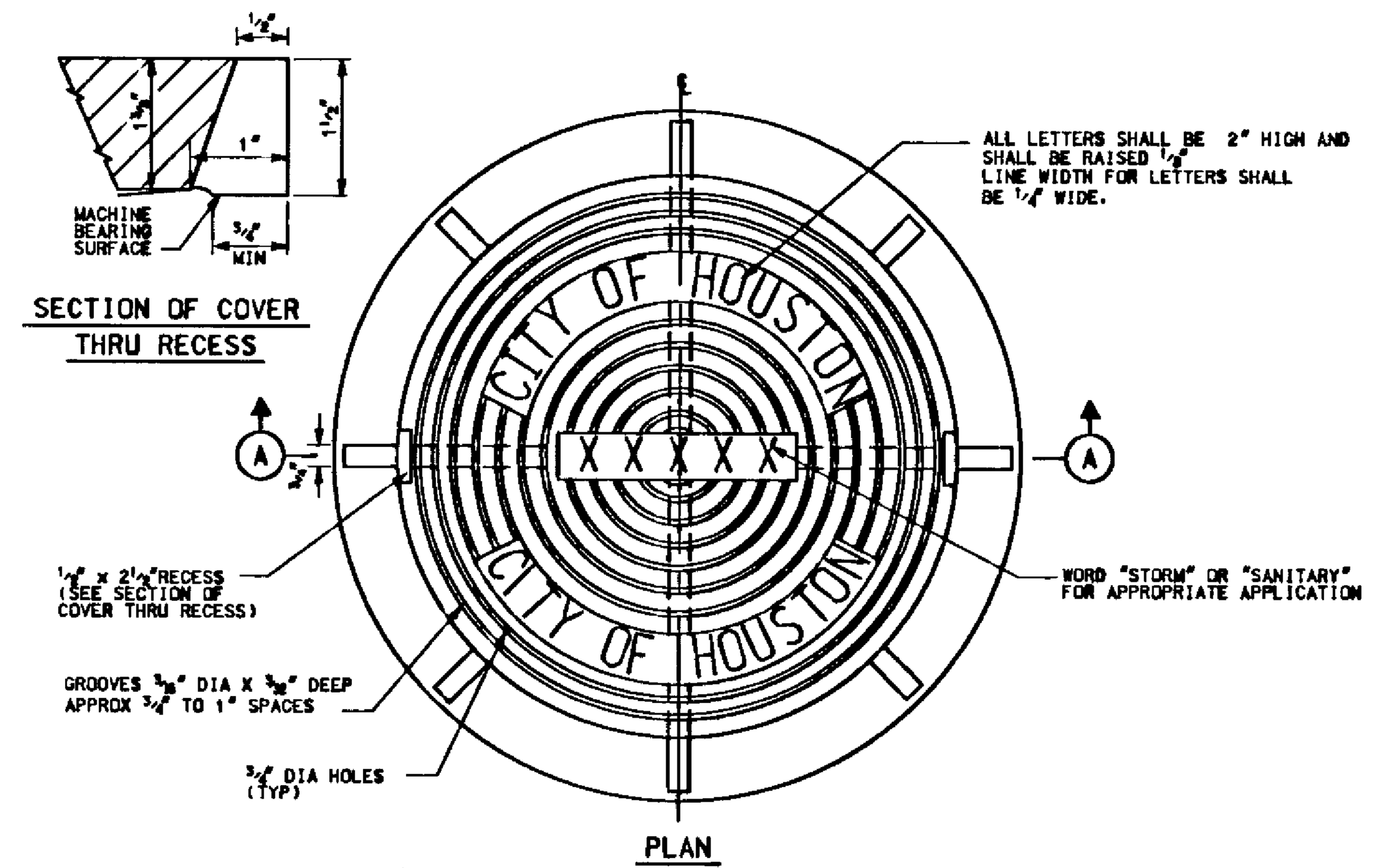
NOMINAL PIPE SIZE	"A"
18" TO 30"	24"
OVER 30"	36"

3. MAX TRENCH WIDTH SHALL BE NOT GREATER THAN MIN TRENCH WIDTH PLUS 24 INCHES. UNLESS OTHERWISE NOTED.
4. MIN BEDDING DEPTH SHALL BE THE GREATER OF 1/8 OD OR 6 INCHES.
5. ALTERNATIVE EMBEDMENT BACKFILL MATERIALS FOR FORCE MAINS MAY BE ALLOWED. SEE C.O.H. STANDARD SPECIFICATIONS.



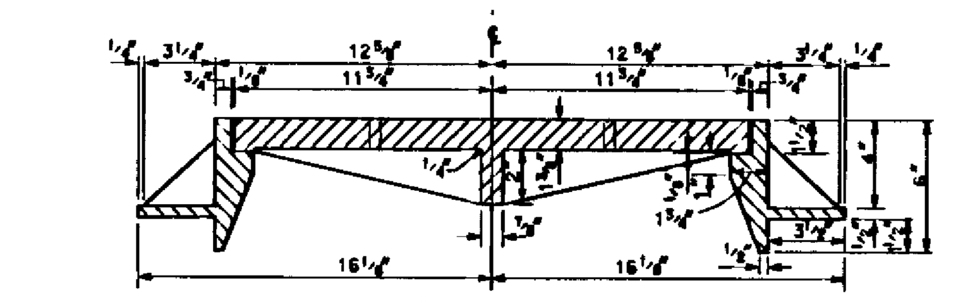
TYPICAL CROSS-SECTION

SANITARY SEWER BEDDING AND BACKFILL FOR DRY STABLE TRENCH

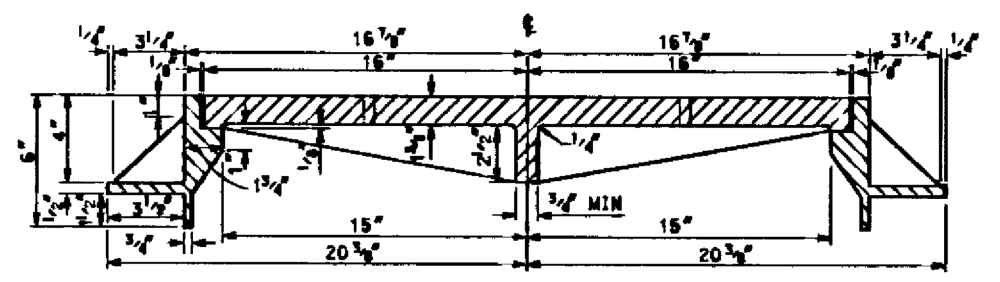


SECTION OF COVER THRU RECESS

PLAN
23 1/2" AND 32" MANHOLE COVER WITH FRAME



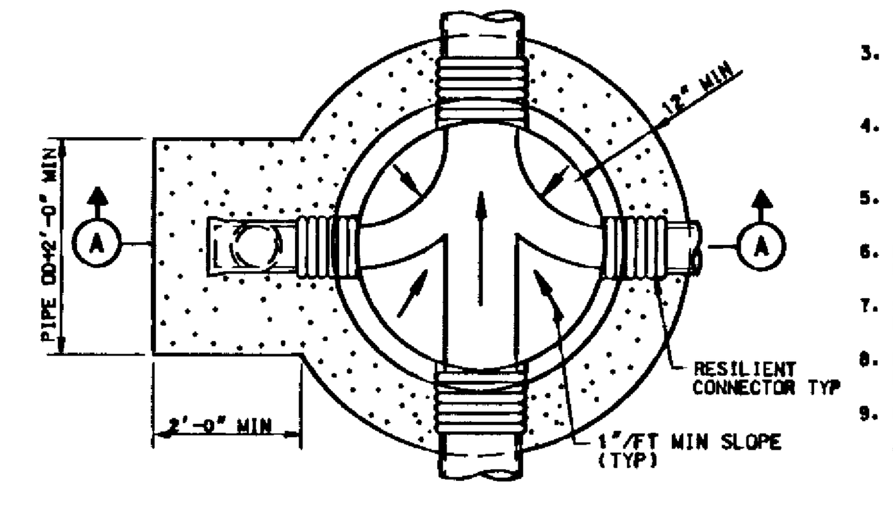
SECTION (A)
23 1/2" MANHOLE COVER WITH FRAME



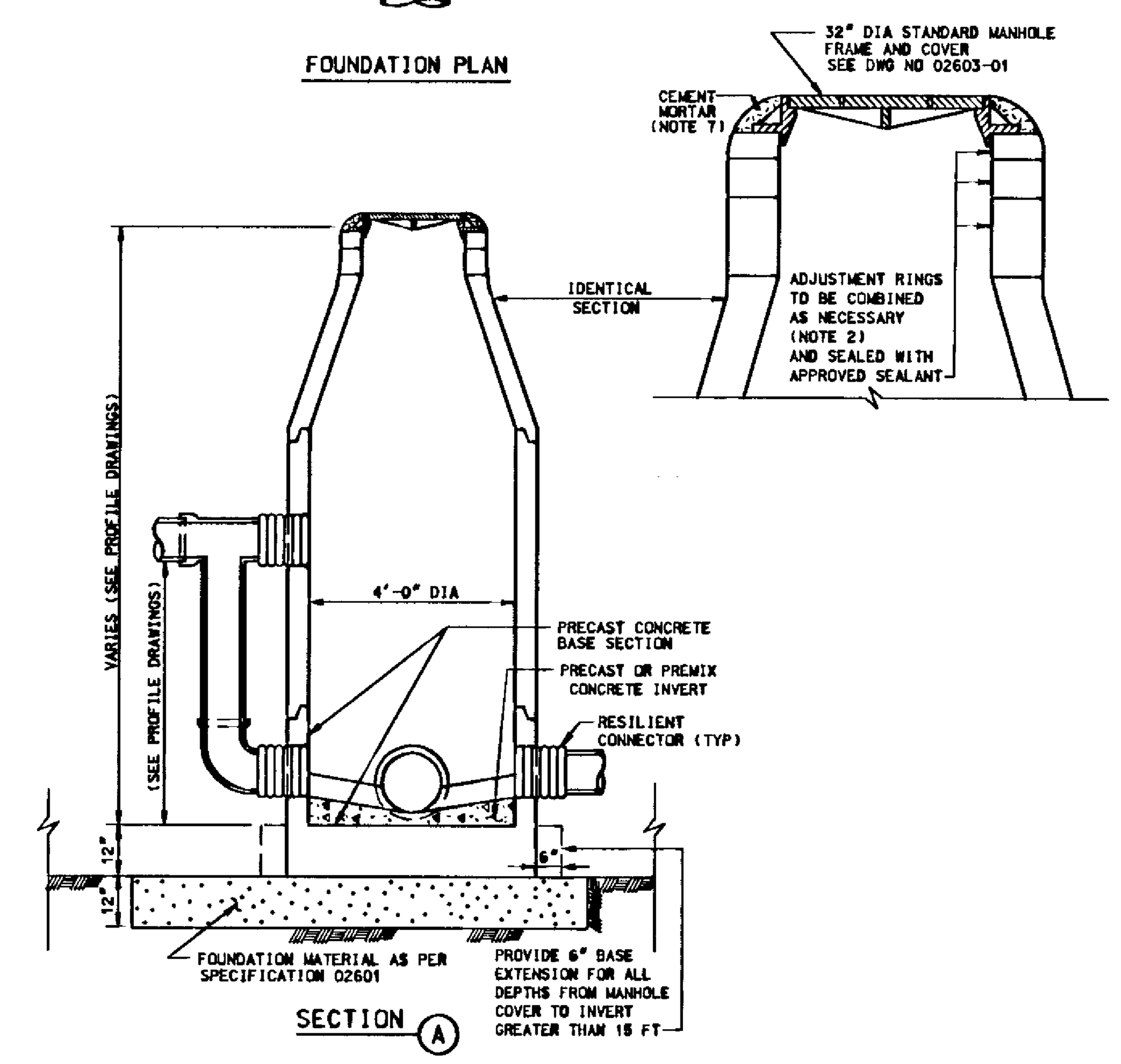
SECTION (A)
32" MANHOLE COVER WITH FRAME

NOTES:

1. DEPTH OF MANHOLE DETERMINES SECTIONS REQUIRED.
2. PRECAST CONCRETE RINGS SHALL BE PROVIDED FOR A COMBINED ADJUSTMENT HEIGHT OF AT LEAST 12". THE TOTAL HEIGHT OF THE ADJUSTMENT RINGS SHALL NOT EXCEED 1'-6".
3. MANHOLE WALL THICKNESS FOR DEPTH EXCEEDING 12'-0" SHALL BE DETERMINED TO MEET LOADING CONDITIONS. MIN THICKNESS 5".
4. MANHOLE DROP AND INTERSECTING PIPES SHALL BE INSTALLED ONLY WHEN CALLED FOR IN PLAN AND PROFILE DRAWING.
5. SEAT MANHOLE FRAME IN SEALANT PER SPECIFICATION SECTION 02601.
6. ECCENTRIC PRECAST CONCRETE MANHOLE MAY BE USED.
7. OMIT CEMENT MORTAR WHEN MANHOLE IS LOCATED IN PAVED AREAS.
8. MIN REINFORCING IN THE PRECAST CONCRETE BASE SHALL BE # 5 @ 8 EW.
9. PROVIDE BACKFILL TO MATCH ADJACENT PIPE TRENCH BACKFILL PER SPECIFICATION SECTION 02601.

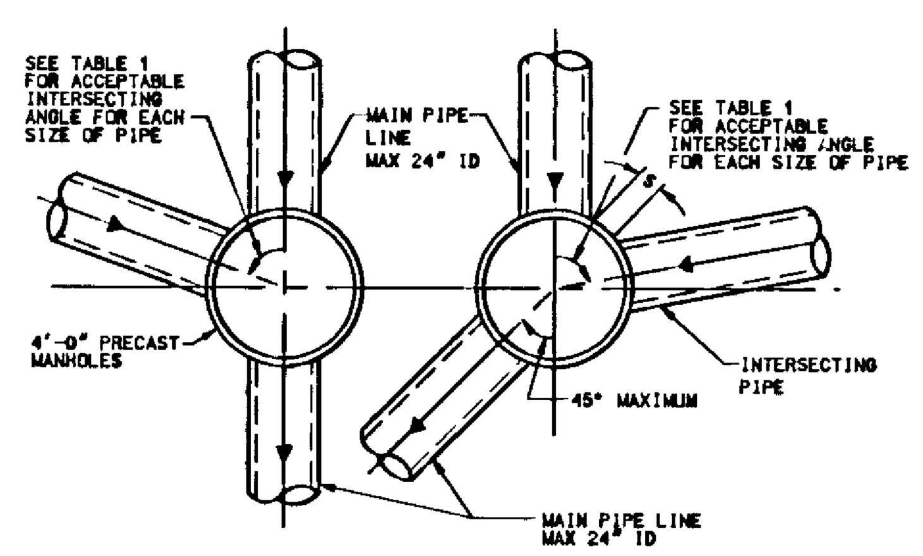


FOUNDATION PLAN



SECTION (A)

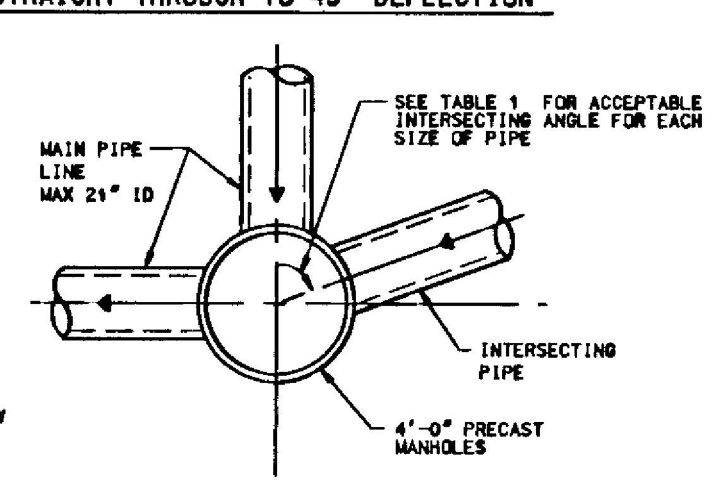
MANHOLE DETAILS



MAX 24" ID MAIN PIPE ALLOWED FOR STRAIGHT THROUGH TO 45° DEFLECTION

NOTES TO SPECIFIER:

1. *'-' INDICATES THAT A SPECIAL DESIGN OR THE NEXT LARGER MANHOLE SIZE SHALL BE USED.*
2. *TABLE 1 IS BASED ON A MIN SEPARATION DISTANCE 'S' OF 15.5" OR INTERSECTION PIPE OD/2, WHICHEVER IS GREATER, BETWEEN MAIN AND INTERSECTING PIPES ALONG THE MANHOLE INSIDE WALL ARC.*
3. *PIPE WALL THICKNESS USED IN TABLE 1 ARE BASED ON RCP. THE DESIGN ENGINEER MAY CALCULATE TO SEE IF THINNER WALL PIPES CAN MEET THE SEPARATION CRITERIA FOR ANGLES SMALLER THAN THE TABLE ALLOWS.*



MAX 21" ID MAIN PIPE ALLOWED FOR 45 TO 90° DEFLECTION

TABLE 1

MIN ANGLE AND INTERSECTING PIPE SIZES FOR A 4'-0" DIA MANHOLE

INTERSECTING PIPE SIZE (INCHES)	MIN INTERSECTING ANGLE IN DEGREES FOR FOR VARIOUS MAIN PIPE SIZES IN INCHES							
	6"	8"	10"	12"	15"	18"	21"	24"
6	55	58	60	65	70	75	80	85
8		60	63	68	73	77	82	87
10			66	71	75	80	85	90
12				76	80	85	90	-
15					85	90	-	-
18	NOT APPLICABLE UNLESS HYDRAULICS DICTATE (INTERSECTING PIPE > MAIN PIPE)					-	-	-
21							-	-
24								-

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
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TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

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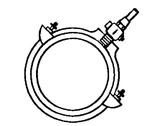
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644

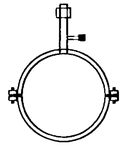
PIPE TAPPING SCHEDULE

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 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 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 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 CEMENT	DWBSS	DWBSS	DWBSS	DWBSS
16" AND UP PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

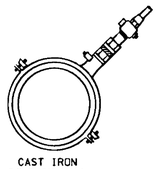
DSS - DUAL STRAP SADDLES
WBSS - WIDE BAND STRAP SADDLES
DWBSS - DUAL WIDE BAND STRAP SADDLES



ASBESTOS CEMENT/PVC DUAL STRAP SADDLE (DSS)

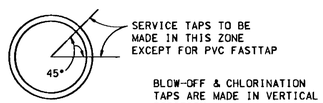


PVC PIPE FASTTAP (PTP)

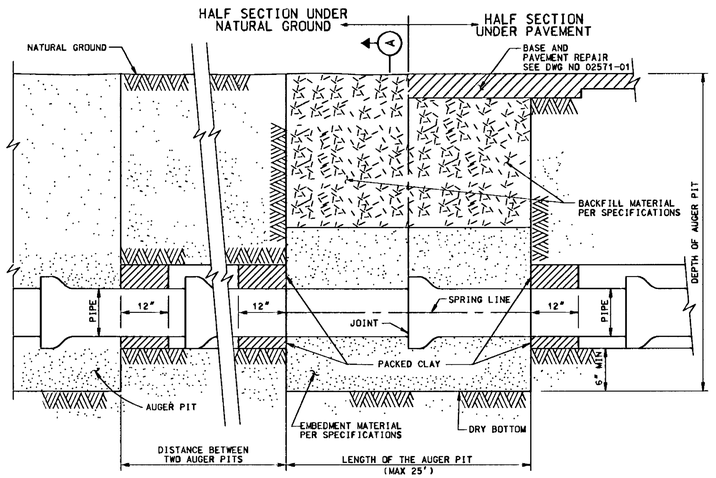


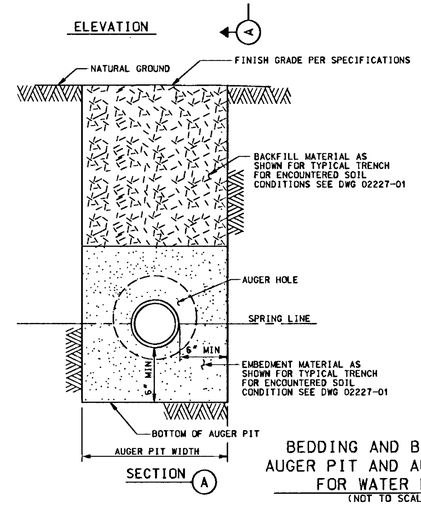
CAST IRON 2" THIN WALL COMBINATION SADDLESTOP

CAST IRON 4" AND LARGER TAPPERED THREAD TAP

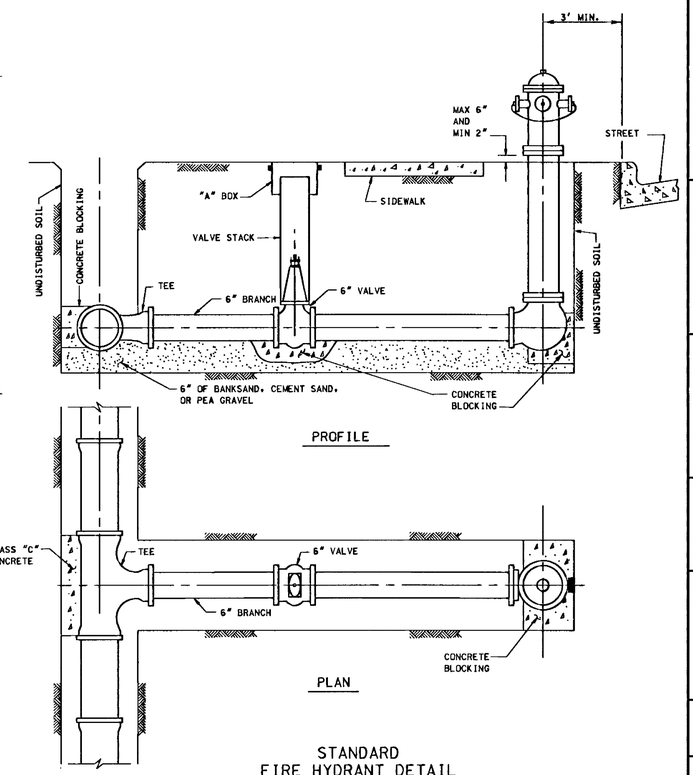


SERVICE TAPS
(NOT TO SCALE)





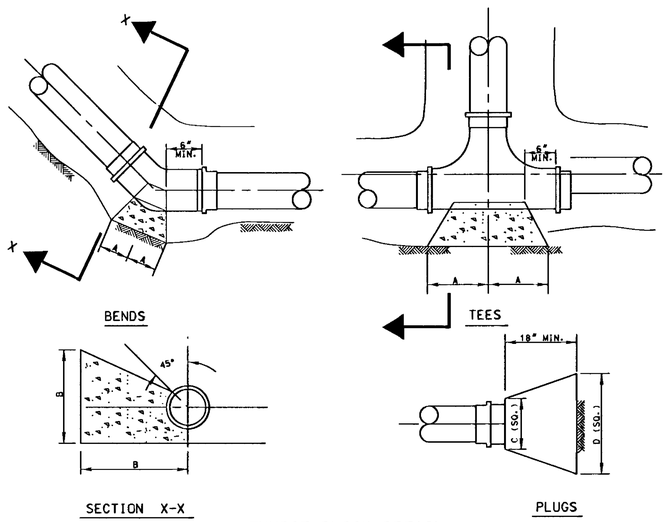
BEDDING AND BACKFILL AUGER PIT AND AUGER HOLE FOR WATER MAIN
(NOT TO SCALE)



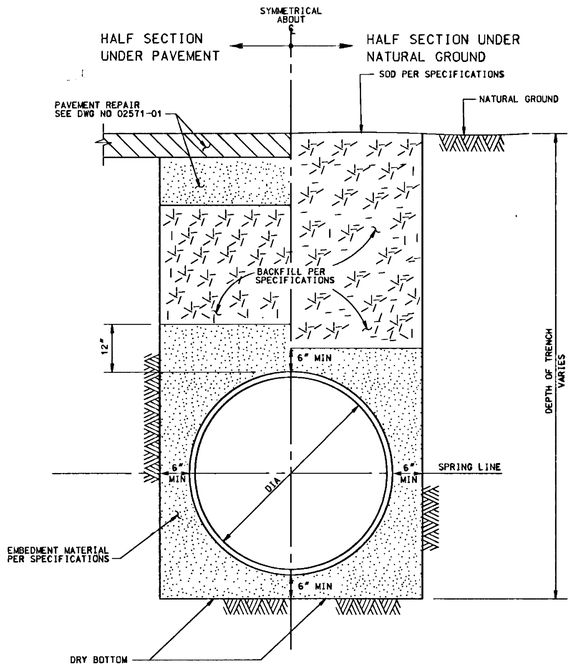
STANDARD
FIRE HYDRANT DETAIL
(NOT TO SCALE)

SOIL TYPE	PIPE SIZE	90° BENDS		45° BENDS		22.5° BENDS		TEES		PLUGS	
		A	B	A	B	A	B	A	B	C	D
TYPE I 4000 PSF SOIL	6"	8"	10"	6"	8"	3"	8"	8"	8"	10"	15"
	8"	12"	12"	8"	10"	5"	9"	9"	12"	12"	20"
	10"	16"	14"	10"	12"	6"	10"	11"	14"	14"	25"
	12"	19"	16"	12"	14"	8"	11"	14"	16"	16"	30"
	14"	23"	18"	14"	16"	10"	12"	16"	18"	18"	34"
	16"	26"	20"	16"	18"	11"	13"	18"	20"	20"	38"
TYPE II 2000 PSF SOIL	6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
	14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
	16"	38"	27"	12"	27"	12"	24"	24"	30"	20"	54"

NOTE: BASES ON 100 P.S.I. STATIC PRESSURE PLUS A.W.W.A. HAMMER.
ALL BEARING SURFACES TO BE CARRIED TO UNDISTUEBED GROUND.



THURST BLOCK DETAIL



WATER DISTRIBUTION MAIN
BEDDING AND BACKFILL FOR
OPEN CUT TRENCHES

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
JOHN A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

WATER LINE DETAILS

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING 6-6-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING 6/6/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 6/1/98
CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/9/98

APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/24/98

SUBMITTED: JAV
SCALE: N.T.S.
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO 22 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1
DWG. NO. P-644

22

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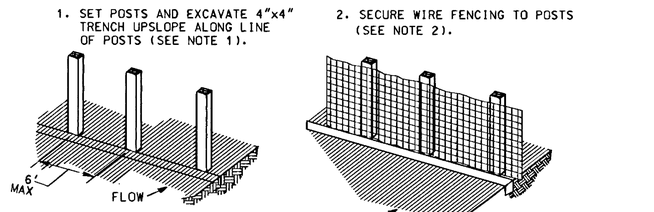
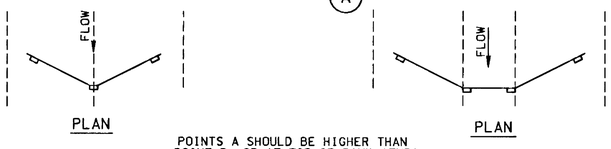
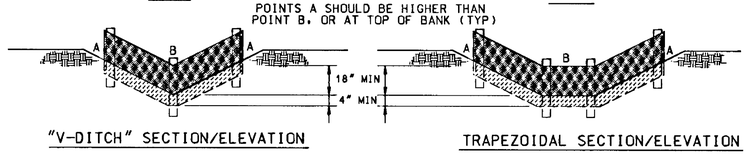




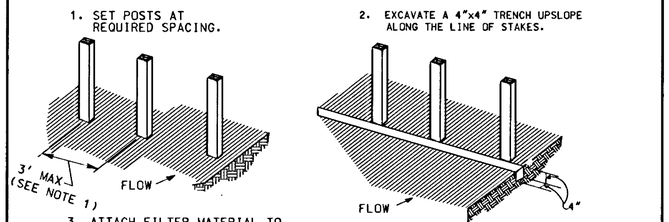


CONSTRUCTION NOTES:

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 FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH STAPLES.
3. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE, 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 SECTION 01568 - REINFORCED FILTER FABRIC BARRIER.

×—(RFB)—×
SYMBOL

REINFORCED FILTER FABRIC BARRIER

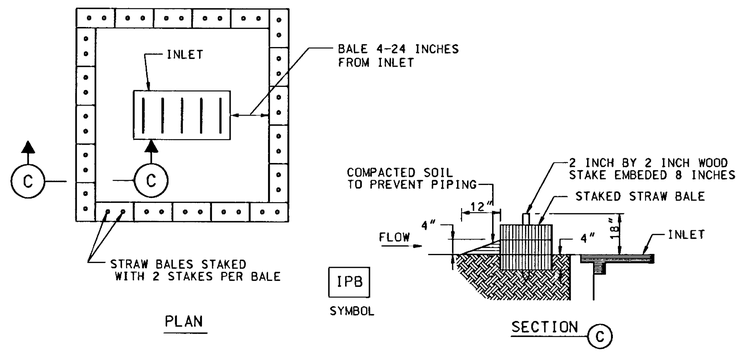


CONSTRUCTION NOTES:

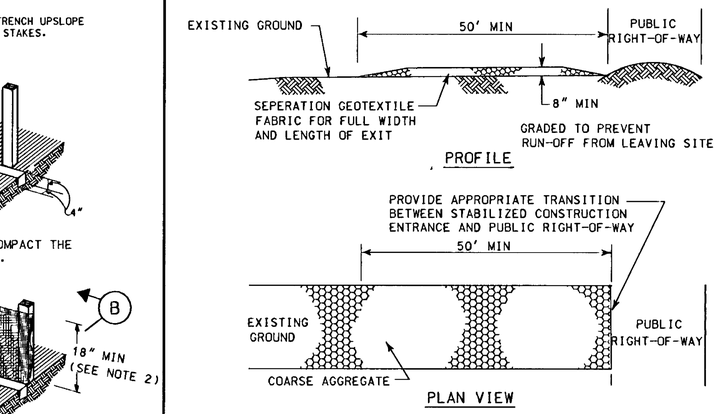
1. 2 INCH THICK BY 2 INCH WOODEN STAKES TO BE SET AT MAX SPACING OF 3 FEET AND EMBEDDED A MIN OF 8 INCHES. IF PREASSEMBLED FENCE WITH SUPPORT NETTING IS USED, SPACING OF POST MAY BE INCREASED TO 8 FEET MAX.
2. ATTACH FILTER FABRIC TO WOODEN STAKES. FILTER FABRIC FENCE SHALL HAVE A MIN HEIGHT OF 18 INCHES 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 SECTION 01567 - FILTER FABRIC FENCE.

×—(FF)—×
SYMBOL

FILTER FABRIC FENCE



STRAW BALE DROP INLET PROTECTION BARRIER

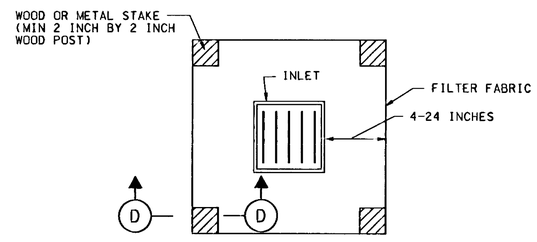


CONSTRUCTION NOTES:

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 EXIT, UNLESS OTHERWISE SHOWN ON THE CONSTRUCTION DRAWINGS.
5. STABILIZED AREA MAY BE WIDENED OR LENGTHENED TO ACCOMODATE A TRUCK WASHING AREA. AN OUTLET SEDIMENT TRAP MUST BE PROVIDED FOR THE TRUCK WASHING AREA.
6. SEE SECTION 01569 - STABILIZED CONSTRUCTION EXIT.
7. STABILIZED CONSTRUCTION EXIT SHALL BE MAINTAINED FREE OF SEDIMENT FOR THE DURATION OF THE PROJECT.

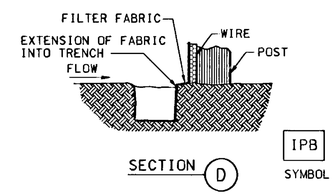
(SC)
SYMBOL

STABILIZED CONSTRUCTION EXIT



CONSTRUCTION NOTE:

1. SEE CONSTRUCTION NOTES FOR RFB.



SILT FENCE INLET PROTECTION BARRIER

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
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NOTES

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4/18/98
STATE OF TEXAS
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FLOOD CONTROL

COUNTY ENGINEER
NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

STORM WATER RUNOFF POLLOUTION PREVENTION PLAN DETAILS

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

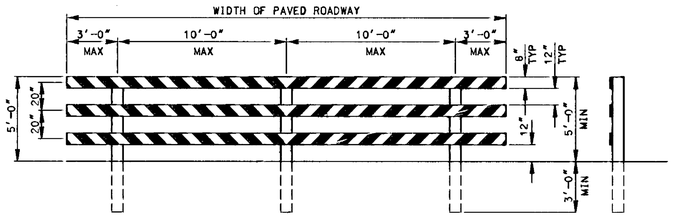
WATER ENGINEERING
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING 4/1/98
CONSTRUCTION

OTHER DEPARTMENT
PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/10/98

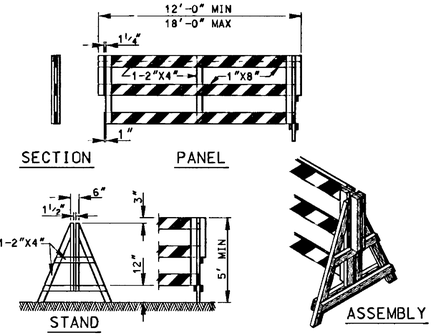
APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/11/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: N.T.S.	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 23 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644



TYPE III BARRICADE
FOR END OF ROAD

FOR TYPE III BARRICADE FOR END OF ROAD, THE THREE (3) RAILS SHALL BE REFLECTIVE RED AND RELFLECTIVE WHITE SRIPES 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.

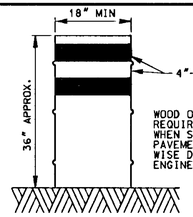
BARRICADES MAY BE DESIGNED AND CONSTRUCTED FROM WOOD OR ANY OTHER SUITABLE MATERIAL IN A MANNER APPROVED BY THE DEPARTMENT OF TRAFFIC AND TRANSPORTATION. THE CONSTRUCTION DETAILS SHOWN HEREON ARE TYPICAL AND ARE SUGGESTED DETAILS FOR WOOD SUPPORT SYSTEMS FOR BARRICADES. THE DETAILS OF RAIL WIDTH AND 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.

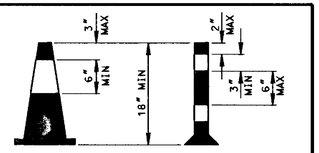
BARRICADES SHALL BE REMOVED UPON COMPLETION OF THE WORK AND/OR THE ELIMINATION OF THE HAZARD ON ANY SECTION.



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.

CW1-8 CHEVRON SIGNS, CW1-6A ARROW SIGNS OR VP-1 VERTICAL PANELS MOUNTED ABOVE DRUMS MAY BE USED AS SUPPLEMENTS TO DRUM DELINEATION.

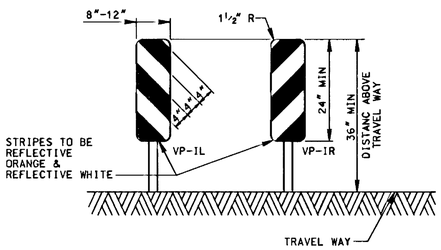


CONES

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.

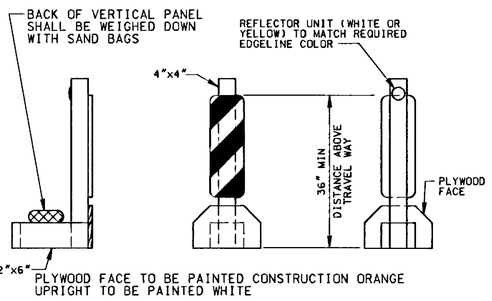
REFLECTORIZATION OF TUBULAR MARKERS SHALL BE A MIN OF TWO THREE-INCH BANDS PLACED A MAX OF 2" FROM THE TOP WITH A MAX OF 6" BETWEEN THE BANDS. REFLECTORIZATION OF CONES SHALL BE PROVIDED BY A MIN 6" BAND PLACED A MAX OF 3" FROM THE TOP.

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.



VERTICAL PANELS (VP)

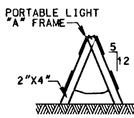
VERTICAL PANELS ARE NORMALLY USED AS CHANNELIZING DEVICES TO INDICATE TANGENT OR NEARLY TANGENT ROADWAY ALIGNMENT WHERE GOOD TARGET VALUE OF A DEVICE IS NEEDED IN DAYTIME AS WELL AS THE NIGHTTIME. IN ADDITION, VERTICAL PANELS SHOULD BE USED AT THE EDGE OF SHOULDER DROP-OFFS AND OTHER SUCH AREAS AS LANE 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.



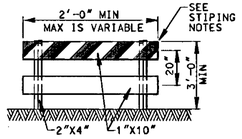
PLYWOOD FACE TO BE PAINTED CONSTRUCTION ORANGE UPRIGHT TO BE PAINTED WHITE

TYPICAL PORTABLE VERTICAL PANEL OR DELINEATOR

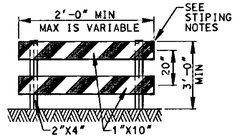
OTHER SIMILAR SUPPORTS MAY BE USED WHEN APPROVED OR DIRECTED BY THE COH DEPT OF TRAFFIC AND TRANSPORTATION



"A" FRAME



TYPE I



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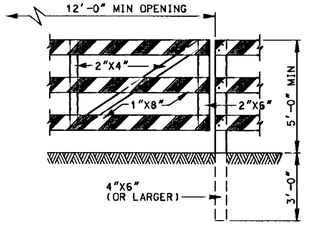
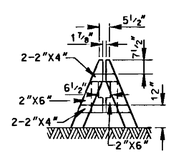
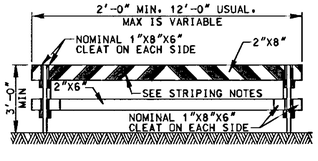


GATE FOR
TYPE III BARRICADE

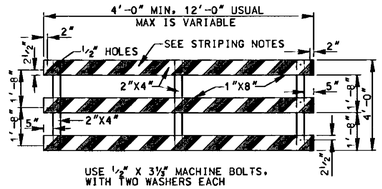


DEMOUNTABLE

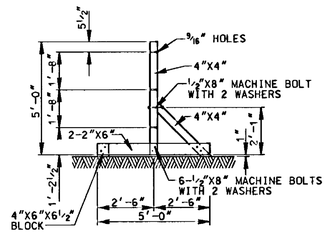


TYPE I

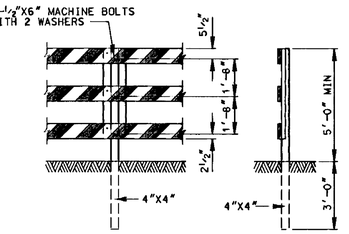
TYPE II



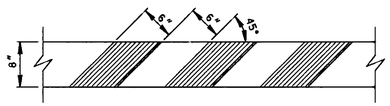
PANEL FOR
TYPE III BARRICADE



STAND FOR
TYPE III BARRICADE



POST FOR
TYPE III BARRICADE



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.

BENCH MARK

REFERENCE BENCHMARK
RM 164 - CHISELED SQUARE ON TOP OF HEADWALL ON EAST SIDE OF CYPRESS ROSEHILL ROAD, APPROXIMATELY 3,400 FEET SOUTH OF FENSKE ROAD.
ELEVATION = 162.59 (1973 ADJUSTMENT)

TBM 1
RR SPIKE IN POWER POLE ON SPRING CYPRESS ROAD ON THE SOUTH R.O.W. ACROSS FROM PIPELINE.
ELEVATION = 147.70

TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
ELEVATION = 147.22

NOTES

Steffek & VanDeWiele Incorporated
Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
A.A. VAN DE WIELE
41295
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

BARRICADE STANDARD DETAILS

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — 6-4-98
TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — 4/8/98
STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — 4/8/98
CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT
SPONSOR DEPARTMENT

APPROVED BY:
CITY ENGINEER 6/10/98

APPROVED BY:
DIRECTOR OF PUBLIC WORKS AND ENGINEERING 6/21/98

SUBMITTED: JAV	DESIGNED BY: RFL
SCALE: N.T.S.	DRAWN BY: SMP,DD
DATE: 3 / 98	SHEET NO. 24 OF 25 SHEETS
SURVEY BY: S&V SURVEYING	CITY DWG NO:
F B NO:	
JOB NO. 10902-003-1	DWG. NO. P-644

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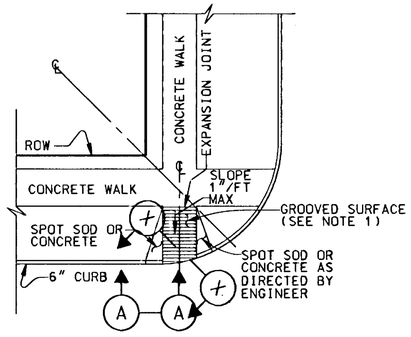
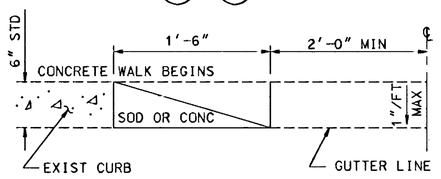
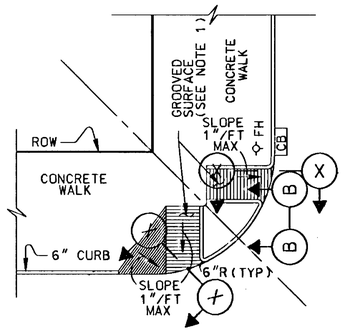
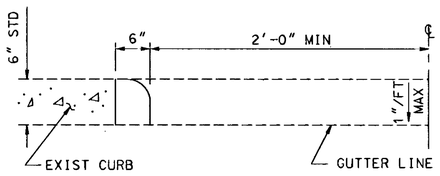




SECTION (A)

(A) RESIDENTIAL & RURAL CONDITIONS

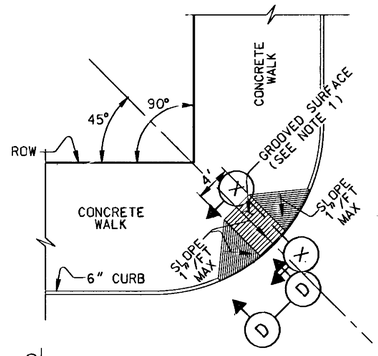


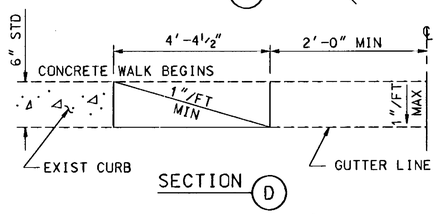


SECTION (B)

(B) URBAN AREAS RESTRICTED BY SMALL RADII, FH, ETC

(C) COMBINATION OF (B) & (D)



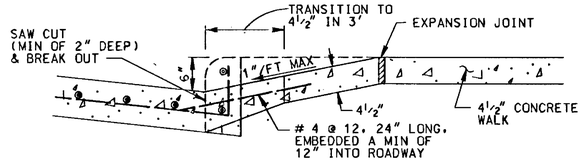


SECTION (D)

(D) URBAN & METROPOLITAN AREAS WITH LARGE RADII & NO RESTRICTIONS

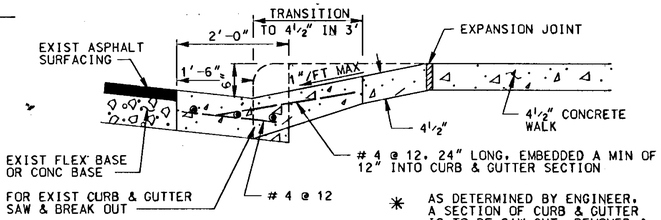
NOTES:

1. THE FINISHED SURFACE OF A WHEELCHAIR RAMP IS TO BE GROOVED LATERALLY WITH ¼" WIDE BY ¼" DEEP GROOVES, SPACED 2¼", AND ROUGHENED WITH NO LESS THAN A BROOM FINISH TO PREVENT SLIPPING, AND TO DIFFERENTIATE ITS TEXTURE FROM THAT OF STANDARD SIDEWALK.
2. THE LOCATION OF A WHEELCHAIR RAMP MAY BE SHIFTED FROM THE PROPOSED LOCATION ON THE PLANS, BECAUSE OF UNFORSEEN EXISTING CONDITIONS AT THE TIME OF CONSTRUCTION. A CHANGE IN LOCATION WILL BE AS DIRECTED BY THE CITY ENGINEER.
3. THE LOCATIONS AND AREAS OF USES OF THE VARIOUS TYPES OF WHEELCHAIR RAMPS SHOWN ARE FOR ILLUSTRATIVE AND SUGGESTIVE PURPOSES ONLY. ANY ONE OF THE TYPES SHOWN (A, B, C, D OR E) MAY BE LOCATED IN ANY AREA, IE URBAN, RESIDENTIAL OR AT ANY POINT ON OR OFF THE RADIUS, ACCORDING TO TYPE AND LOCATION AS SHOWN ON PLANS OR AS DIRECTED BY THE CITY ENGINEER.
4. ALL REINFORCING STEEL SHALL BE NEW BILLET STEEL AND MEET THE REQUIREMENTS OF ASTM DESIGNATION A-615, GRADE 60 DEFORMED BARS, FOR CONCRETE REINFORCEMENT.
5. MINIMUM CLEAR WIDTH OF WHEELCHAIR RAMP IS 4'-0".
6. IF SIDEWALKS ARE NEITHER EXISTING NOR PROPOSED WHERE WHEELCHAIR RAMP ACCESS IS REQUIRED, CARE SHOULD BE TAKEN TO ENSURE THAT AND ADDEQUATE CONCRETE LANDING SURFACE IS PROVIDED TO REACH THE PEDESTRIAN SIGNALS.



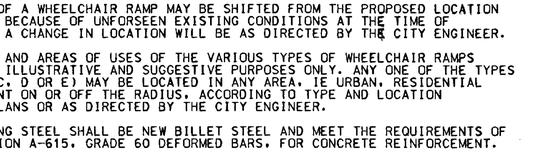
SECTION (X)

EXISTING CONCRETE PAVEMENT CONSTRUCTION



SECTION (X)

NEW & EXISTING * CURB & GUTTER CONSTRUCTION

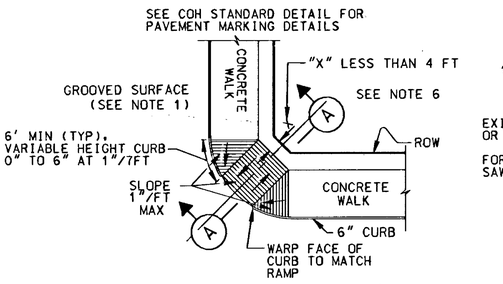


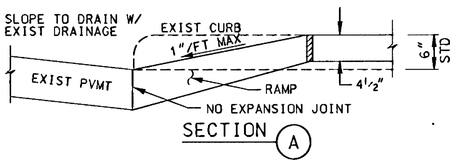
SECTION (X)

NEW CONCRETE PAVEMENT CONSTRUCTION

SECTION (Y)

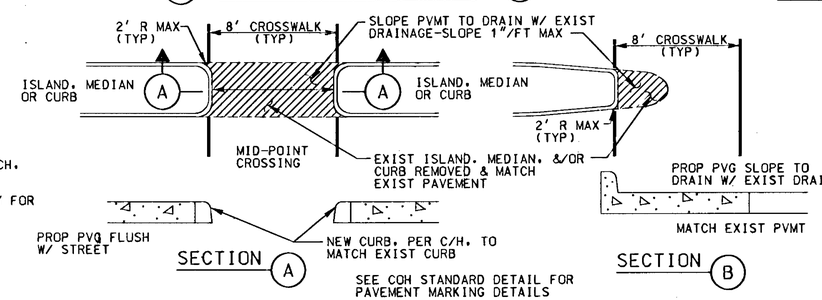
(F) ACCESS TO AREAS WHERE CUT IS NOT REQUIRED





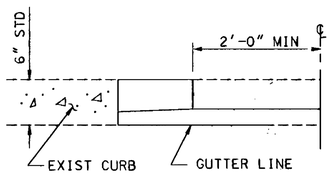
SECTION (A)

(G) MODIFICATION OF TYPE (D)



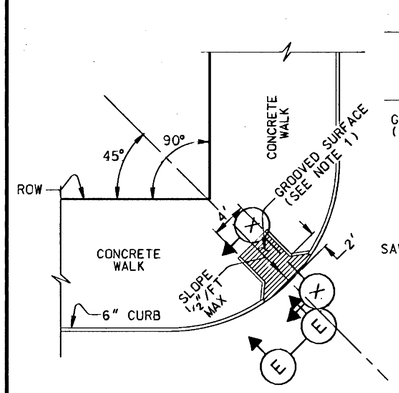
SECTION (A) SECTION (B)

FOR ISLAND, MEDIAN, OR CURB MODIFICATIONS FOR CROSSWALKS



SECTION (E)

(E) MODIFICATION OF TYPE (B)



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TBM 2
RR SPIKE IN POWER POLE ON WEST R.O.W. OF HUFFMEISTER ROAD, 50' NORTH OF PIPELINE.
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Consulting Engineers
2925 Briarpark, Suite 275
Houston, Texas 77042-3778
713/782-0042

4/8/98
STATE OF TEXAS
A.A. VAN DE WIELE
42195
REGISTERED PROFESSIONAL ENGINEER
SEAL

FLOOD CONTROL

COUNTY ENGINEER

NORTHWEST HARRIS COUNTY M.U.D. 10

NORTHLAKE FOREST SECTION THREE

STANDARD WHEELCHAIR RAMP DETAILS

CITY OF HOUSTON

DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE GROUP

WATER ENGINEERING — TRAFFIC AND SIGNAL ENGINEERING
WASTEWATER ENGINEERING — STREET & BRIDGE ENGINEERING
STORM SEWER ENGINEERING — CONSTRUCTION

OTHER DEPARTMENT

PLANNING AND DEVELOPMENT — SPONSOR DEPARTMENT

APPROVED BY: CITY ENGINEER

APPROVED BY: DIRECTOR, PUBLIC WORKS & ENGINEERING

SUBMITTED: JAV
SCALE: N.T.S.
DATE: 3 / 98
SURVEY BY: S&V SURVEYING
F B NO:

DESIGNED BY: RFL
DRAWN BY: SMP,DD
SHEET NO. 25 OF 25 SHEETS
CITY DWG NO:

JOB NO. 10902-003-1

DWG. NO. P-644

APPENDIX C

INO LETTER

HARRIS COUNTY FLOOD CONTROL DISTRICT

9900 Northwest Freeway
Houston, Texas 77092
346-286-4000
www.hcfcd.org

June 4, 2021

Mr. Shawn Sturhan, PE
Permits Manager
Harris County Permits Division
10555 Northwest Freeway, Suite 120
Houston, TX 77092
shawn.sturhan@eng.hctx.net

SENT VIA ELECTRONIC MAIL: NO HARD COPY TO FOLLOW

RE: Project No. 2012100253
Northlake Forest Subdivision Drainage Improvements
HCFCD Unit L106-00-00; Key Map 327-Z; Pct. 3

Dear Mr. Sturhan:

The referenced report has been reviewed pursuant to the HCFCD Policy, Criteria, and Procedure Manual and Section 3.02 of the *"Regulations of Harris County, Texas for the Approval and Acceptance of Infrastructure."* The goals of the review are to provide technical support to the Harris County Floodplain Administrator and to apply HCFCD policy and criteria where appropriate.

This review addresses issues regarding hydraulic and hydrologic drainage design criteria only. Design criteria regarding the site layout of the proposed development and drainage facilities will be reviewed upon submittal of site plans.

Our understanding of the report is described below. Please see the response contained within the *"Hydrologic & Hydraulic Technical Review"* section.

HCFCD Jurisdiction

The project meets at least one of the following conditions; HCFCD criteria apply:

- The project directly affects HCFCD Infrastructure.
- The project proposes infrastructure to be maintained by HCFCD.
- The project is located within a watershed where HCFCD has a regional project adopted by Harris County Commissioners Court.
- A technical review has been requested by Harris County.

Submittal Information

Submitted Report	Consulting Engineer
Northlake Forest Subdivision Drainage Improvements May 17, 2021	HDR Engineering, Inc. 4828 Loop Central Drive, Suite 800 Houston, TX 77081-2220 TBPE Registration No. F-754 Jeremy Blevins, PE, CFM TX P.E. # 109719

Project Summary

This memorandum provides the results of a drainage analysis associated with the proposed storm sewer improvements within the Northlake Forest subdivision in Harris County Precinct 3. The subdivision experienced significant structural flooding during the Tax Day flood of 2016 and Hurricane Harvey in 2017. Storm sewer improvements are proposed along Clear Point Drive, Corktree Knolls, and Medlowe Court. Additional inlet capacity is proposed by replacing existing Type B-B inlets with Type C-1 inlets along Light Falls Court, Bach Springs Court, Fable Court, and Elinor Court. The storm sewer improvements involve extending the existing storm sewer toward the end of each respective cul-de-sac and to provide additional inlet capacity. Additionally, the storm sewer outfall to the System 1 detention basin was modified to the proposed size of 6'x4' RCB with 5'x4' restrictor plate.

Detention Summary

N/A

Floodplain Related Information

Based on FEMA FIRM Panel No. 48201C0410M, dated October 16, 2013, the subdivision is currently mapped within FEMA effective Special Flood Hazard Area Shaded Zone X, which indicates that the entire subdivision lies within the 0.2% annual chance (500- year) floodplain of Little Cypress Creek.

Please also note that Harris County is the Floodplain Administrator for the receiving waterways. All issues regarding local floodplain regulations must be coordinated through Harris County.

Report Findings

The report states, *"Based on the results of this analysis, the proposed project will cause no adverse impacts to flood hazard conditions on the receiving waterways, including downstream properties within the City of Houston, for storm events up to and including the NOAA Atlas 14 1% annual chance (100-year) storm event."*

Hydrologic & Hydraulic Technical Review

HCFCD offers the following:

The report includes statements that the project will cause no adverse impact to the receiving waterways, including downstream properties within the City of Houston, in storm events up to and including the Atlas 14 100-year storm event. The documentation within the report generally supports the conclusions stated by the engineer. Based on the stated conclusions, HCFCD interposes no objection to the referenced report. Please note, this acceptance does not necessarily mean that the entire report, including all supporting data and calculations, has been completely checked and verified. However, the report is signed, dated, and sealed by a Professional Engineer licensed to practice in the State of Texas, which therefore conveys the licensed engineer's responsibility and accountability.

Additional HCFCD Criteria

Site plans must be submitted to HCFCD for review and signature.

The local municipal utility district will be required to maintain the proposed basin and written agreement between the developer and local municipal utility district for maintenance of the basins must be submitted with the site plans.

Environmental Review & Permitting

The Harris County Flood Control District's Regulatory Compliance Department requires that proposed projects impacting regulated waters of the U.S. obtain and document the required U.S. Army Corps of Engineers permit(s) for any portions of the project located within any existing or proposed HCFCD right-of-way. The type of permit required (if any) must be stated on the site plans even if written permit authorization from the Corps of Engineers is not required. If written permit authorization is required, copies of approved Corps of Engineers permits must be submitted with the HCFCD *Notification of Construction in Right-of-Way* and submitted to the HCFCD Development Coordination and Inspection Department at least 48 hours prior to construction along with the *48-hour Pre-Construction Notification*.

Thank you for coordinating this project with the Flood Control District. If you have any questions regarding the technical comments, please contact Mr. Wen Zhang, P.E. via email at *Wen.Zhang@hcfcd.hctx.net*. For any other questions, you may contact me at *chris.bennett@hcfcd.hctx.net*.

Sincerely,

Chris Bennett
Watershed Coordinator

CB:ag

APPENDIX D

EXISTING ROW MAPS

INDEX OF DRAWINGS

SHEET	DESCRIPTION
1	COVER SHEET
2	EXISTING R.O.W. MAP (SHEET 1 OF 2)
3	EXISTING R.O.W. MAP (SHEET 2 OF 2)

HARRIS COUNTY ENGINEERING DEPARTMENT

EXISTING RIGHT-OF-WAY MAP
NORTHLAKE FOREST SUBDIVISION
DRAINAGE IMPROVEMENTS - 2018

UPIN NO. 19103MF14F01

HARRIS COUNTY ROAD LOG IDENTIFIER NO.

Clear Pointe Drive 0305601
Bach Springs Court 0305501
Light Falls Court 0305401
Corktree Knolls 0305201
Northlake Forest Drive 3603101
Fable Court 0304201
Elinor Court 0304401
Medlowe Court 0304601
Kedgwick Lane 0305001
Chapel Hollow Lane 0304701

RODNEY ELLIS
COMMISSIONER — PRECINCT 1

STEVE RADACK
COMMISSIONER — PRECINCT 3

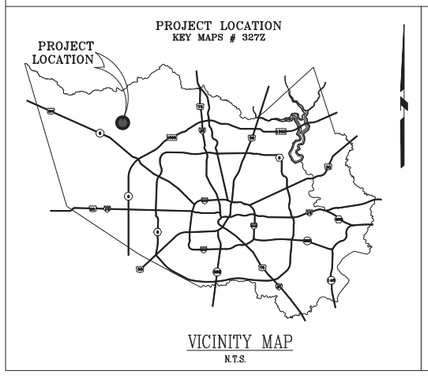
LINA HIDALGO
COUNTY JUDGE

ADRIAN GARCIA
COMMISSIONER — PRECINCT 2

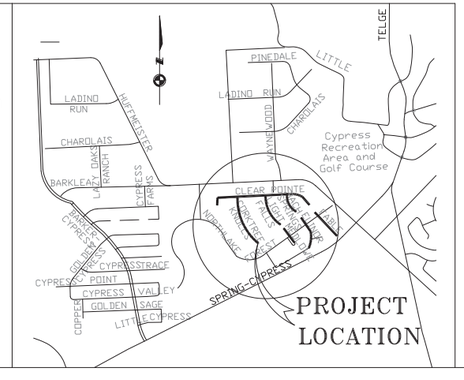
R. JACK CAGLE
COMMISSIONER — PRECINCT 4

MICHAEL POST, CPA
COUNTY AUDITOR

JOHN R. BLOUNT, P.E.
COUNTY ENGINEER



VICINITY MAP
N.T.S.



HARRIS COUNTY
1836
TEXAS

DECEMBER 2020
PRECINCT 3
Harris County, Texas

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800
Houston, TX 77042
Tel: (713) 975-8769
Fax: (713) 975-0920
www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

APPROVED: _____
HCED—Permit Group
Flood Plain Management

CIVIL STANDARD PCS

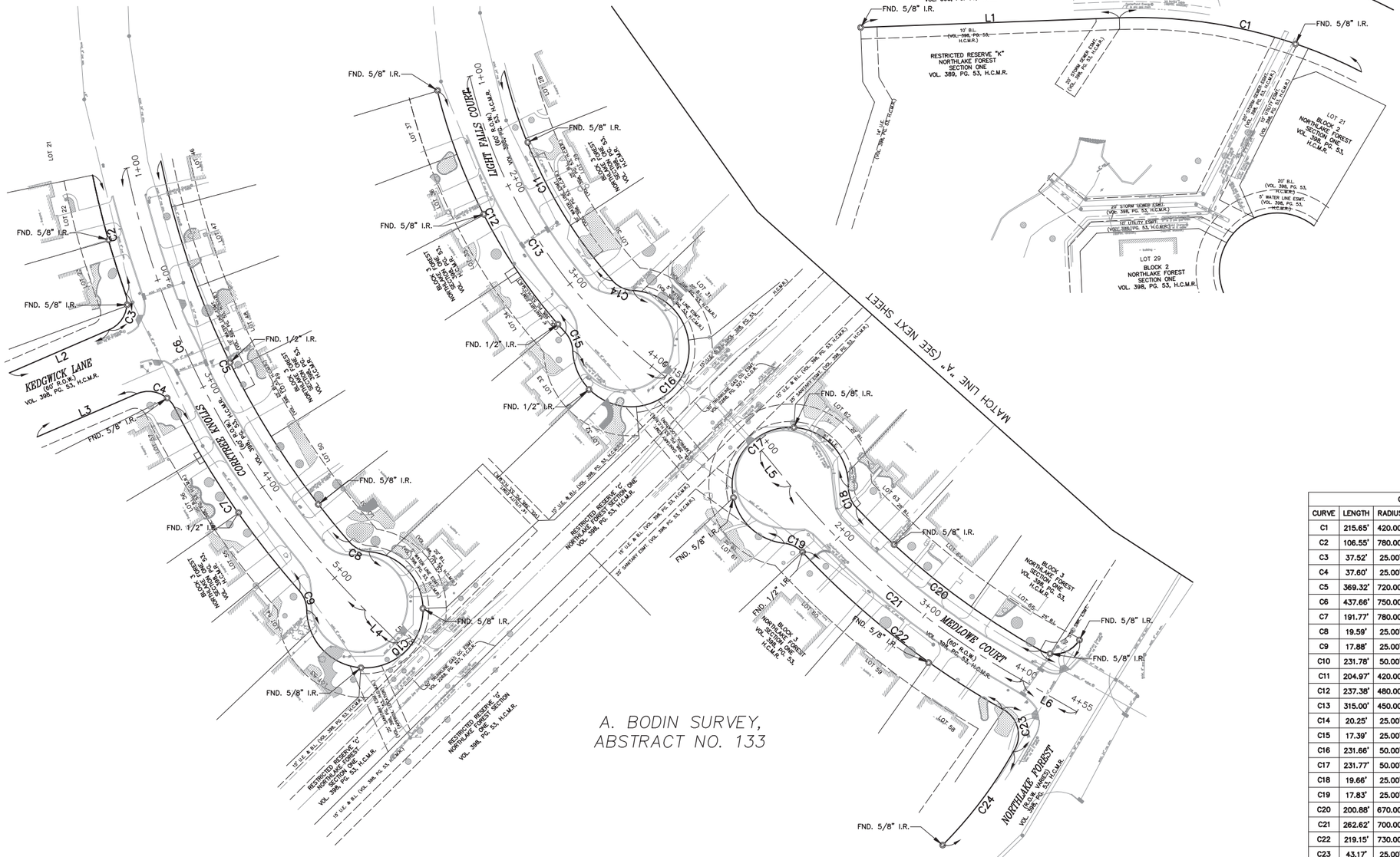
S:\Proj-2020\20109 (NORTHLAKE FOREST)\Dwgs\HCED CVR SHT-ROW.dwg

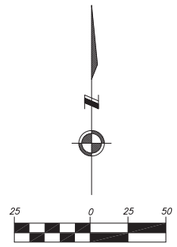
LEGEND:

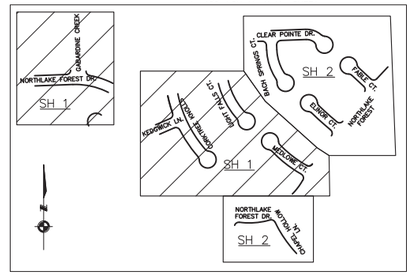
ASPHALT SYMBOL	MANHOLE	BRUSH ROW
B OR BB INLET	PLANTER	DITCH/SWALE CENTER LINE
C INLET	POWER POLE	FENCE
CLEANOUT	POWER POLE W/LT.	GAS LINE
DOWN GUY	SIGN	GUARD RAIL
E INLET	SIGNAL POLE	HEDGE ROW OR TREE LINE
ELEC MANHOLE	STREET LIGHT	HIGH BANK
FIRE HYDRANT	TREE	OVERHEAD POWER LINE
GAS METER	TREE STUMP	SANITARY SEWER LINE
GAS VALVE	TREE-CREPE MYRTLE	STORM LINE
GRATE INLET	TREE-PINE	TELEPHONE LINE
GRATE INLET	WATER METER	UG STREET LIGHT CABLE
MAIL BOX	WATER VALVE	WATER LINE

ABBREVIATIONS

A.E.–AERIAL EASEMENT
B.L.–BUILDING LINE
FND.–FOUND
H.C.C.F. NO.–HARRIS COUNTY CLERK'S FILE NUMBER
H.C.D.R.–HARRIS COUNTY DEED RECORDS
H.C.M.R.–HARRIS COUNTY MAP RECORDS
O.P.R.O.R.P.H.C.–OFFICIAL PUBLIC RECORDS OF REAL PROPERTY HARRIS COUNTY
I.P.–IRON PIPE
I.R.–IRON ROD
SAN. S.E. – SANITARY SEWER EASEMENT
STM. S.E.–STORM SEWER EASEMENT
U.E.–UTILITY EASEMENT
U.R.D.E.–UNOBSTRUCTED RETENTION & DRAINAGE EAEMENT
VOL., PG.–VOLUME AND PAGE
W.L.E.–WATER LINE EASEMENT







SHEET LAYOUT
N.T.S.

NOTES:

1. ALL BEARINGS AND DISTANCES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83 (CORS96). ALL DISTANCES ARE IN SURFACE.

2. THE COORDINATES SHOWN HEREON ARE TEXAS SOUTH CENTRAL ZONE NO. 4204 STATE PLANE GRID COORDINATES (NAD83) AND MAY BE BROUGHT TO SURFACE BY DIVIDING BY THE COMBINED SCALE FACTOR 0.999870017.

3. EXISTING UNDERGROUND UTILITY INFORMATION (TYPE, SIZE & OWNERSHIP) ARE SHOWN APPROXIMATELY BASED ON THE AVAILABLE RECORD DRAWINGS AND FIELD VERIFICATION (WHERE FEASIBLE) WITHOUT PROBING AND EXCAVATION. NO WARRANTY IS MADE AS TO THE ACCURACY OR COMPLETENESS OF UTILITY LOCATION SHOWN ON THE DRAWING. CAUTION SHOULD BE EXERCISED WHEN EXCAVATING OR BORE AND JACKING IN THE VICINITY OF UNDERGROUND UTILITIES. OWNERS OF THE UTILITIES SHOULD BE NOTIFIED PRIOR SUCH ACTIVITIES. CALL UTILITY COORDINATING COMMITTEE AT 713-223-4567, AT LEAST 48 HOURS PRIOR TO EXCAVATING IN THE STREET RIGHT-OF-WAY.

4. BY GRAPHICAL PLOTTING AND ACCORDING TO F.I.R.M. MAP NUMBER 48201C0410MM FOR HARRIS COUNTY, TEXAS AND INCORPORATED AREAS (MAP REVISED OCT. 16, 2013) THE TRACTS OF LAND SHOWN ON THESE ALIGNMENT MAPS ARE SITUATED IN ZONE 'X' (SHADED), OTHER FLOOD AREAS: AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. THIS INFORMATION IS TO DETERMINE FLOOD INSURANCE RATES ONLY AND IS NOT INTENDED TO IDENTIFY SPECIFIC FLOODING CONDITIONS.

CURVE TABLE				
CURVE	LENGTH	RADIUS	DELTA	CHORD DIRECTION
C1	215.65'	420.00'	29°25'07"	N77°25'08"W–213.29'
C2	106.55'	780.00'	7°49'36"	S15°33'17"E–106.47'
C3	37.52'	25.00'	85°58'52"	N23°37'25"E–34.09'
C4	37.60'	25.00'	86°11'01"	N70°17'38"W–34.16'
C5	369.32'	720.00'	29°23'23"	S26°18'24"E–365.29'
C6	437.66'	750.00'	33°26'05"	S28°19'54"E–431.48'
C7	191.77'	780.00'	14°05'11"	N34°14'43"W–191.28'
C8	19.59'	25.00'	44°53'44"	S63°26'58"E–19.09'
C9	17.88'	25.00'	40°59'11"	N20°47'43"W–17.50'
C10	231.78'	50.00'	265°35'43"	S46°54'01"W–73.38'
C11	204.97'	420.00'	27°57'44"	N27°16'28"W–202.94'
C12	237.38'	480.00'	28°20'07"	S27°53'24"E–234.97'
C13	315.00'	450.00'	40°06'25"	S33°02'23"E–308.61'
C14	20.25'	25.00'	46°24'48"	N64°27'43"W–19.70'
C15	17.39'	25.00'	39°51'22"	S22°07'47"E–17.04'
C16	231.66'	50.00'	265°28'01"	N45°03'54"E–73.45'
C17	231.77'	50.00'	265°35'05"	N48°38'50"E–73.38'
C18	19.66'	25.00'	45°03'09"	S21°05'12"E–19.16'
C19	17.83'	25.00'	40°51'42"	N63°42'51"W–17.45'
C20	200.88'	670.00'	17°10'42"	S52°12'07"E–200.13'
C21	262.62'	700.00'	21°29'45"	S50°02'36"E–261.08'
C22	219.15'	730.00'	17°12'02"	N51°53'01"W–218.33'
C23	43.17'	25.00'	98°56'15"	N14°14'24"W–38.00'
C24	100.86'	370.00'	15°37'07"	N37°05'24"E–100.55'

LINE TABLE		
LINE	DIRECTION	LENGTH
L1	S87°52'20"W	222.44'
L2	N66°36'51"E	93.73'
L3	S66°36'51"W	93.54'
L4	S45°03'19"E	40.34'
L5	S39°16'47"E	39.39'
L6	S59°54'16"E	53.24'

I HEREBY CERTIFY THAT THIS PLAT CORRECTLY REPRESENTS THE FACTS FOUND AT THE TIME OF SURVEY MADE ON THE GROUND UNDER MY SUPERVISION ON SEPTEMBER, 2020.

THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 1B CONDITION II SURVEY AND THE CURRENT MINIMUM REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYING ACT.

Shaheen Chowdhury 10/13/20

SHAHEEN CHOWDHURY., R.P.L.S.
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 5858

STATE OF TEXAS · REGISTERED · SHAHEEN CHOWDHURY · 5858 · PROFESSIONAL LAND SURVEYOR

NO.	REVISIONS	DATE	APP

HARRIS COUNTY ENGINEERING DEPARTMENT

HARRIS COUNTY 1836 TEXAS

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Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800
Houston, TX 77042
Tel: (713) 975-8769
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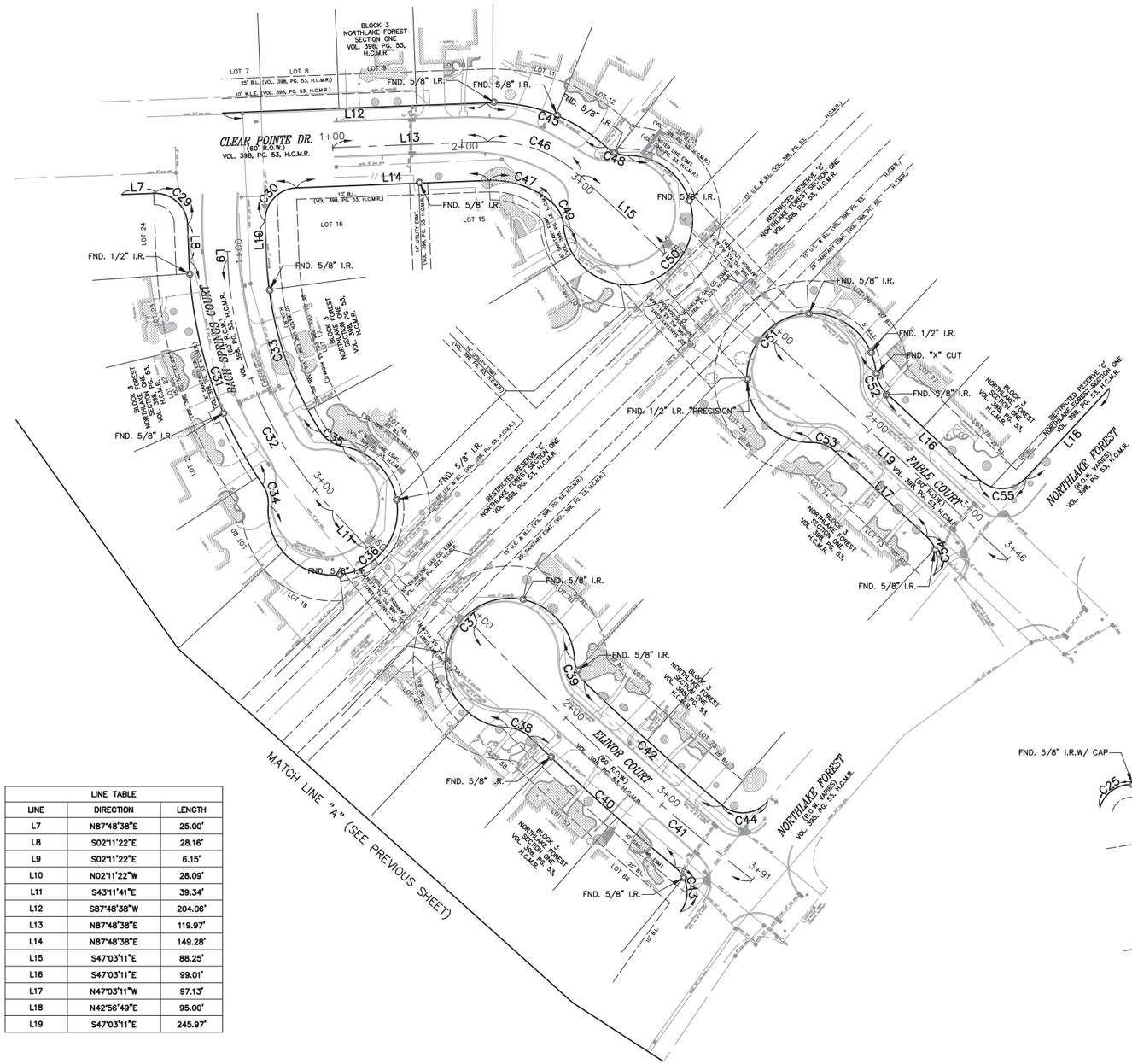
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE:	NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS UPIN 19103MF14F01
DRAWN BY: A.G.C.	SHEET DESCRIPTION: EXISTING R.O.W. MAP (SHEET 1 OF 2)
CK'D BY: S.C.	HCED STANDARD
SCALE: 1"=50'	SHEET NO: 2 OF 3
DATE: 10/13/2020	APPROVED BY:



LINE TABLE		
LINE	DIRECTION	LENGTH
L7	N87°48'38"E	25.00'
L8	S02°11'22"E	28.16'
L9	S02°11'22"E	6.15'
L10	N02°11'22"W	28.09'
L11	S43°11'41"E	39.34'
L12	S87°48'38"W	204.06'
L13	N87°48'38"E	119.97'
L14	N87°48'38"E	149.28'
L15	S47°03'11"E	88.25'
L16	S47°03'11"E	99.01'
L17	N47°03'11"W	97.13'
L18	N42°56'49"E	95.00'
L19	S47°03'11"E	245.97'

LEGEND:

- //// ASPHALT SYMBOL
- ▤ B OR BB INLET
- ● C INLET
- ◎ CLEANOUT
- DOWN GUY
- ● E INLET
- ● ELEC MANHOLE
- ● FIRE HYDRANT
- ○ GAS METER
- ∅ GAS VALVE
- ▦ GRATE INLET
- ⊕ GRATE INLET
- ▯ MAIL BOX
- ● MANHOLE
- ▨ PLANTER
- ● POWER POLE
- ● POWER POLE W/LT.
- SIGN
- ⬡ SIGNAL POLE
- ☼ STREET LIGHT
- TREE
- ⊖ TREE STUMP
- TREE–CREPE MYRTLE
- TREE–PINE
- ● WATER METER
- ● WATER VALVE
- BRUSH ROW
- DITCH/SWALE CENTER LINE
- FENCE
- GAS LINE
- GUARD RAIL
- HEDGE ROW OR TREE LINE
- HIGH BANK
- OVERHEAD POWER LINE
- SANITARY SEWER LINE
- STORM LINE
- TELEPHONE LINE
- UG STREET LIGHT CABLE
- WATER LINE

CURVE TABLE				
CURVE	LENGTH	RADIUS	DELTA	CHORD DIRECTION
C25	35.35'	25.00'	81°01'22"	S57°18'19"W–32.48'
C26	182.54'	430.00'	24°19'21"	S85°39'25"W–181.17'
C27	35.29'	25.00'	80°52'20"	N66°04'13"W–32.43'
C28	223.53'	730.00'	17°32'38"	N34°24'24"W–222.65'
C29	39.27'	25.00'	90°00'00"	S47°11'22"E–35.36'
C30	39.27'	25.00'	90°00'00"	N42°48'38"E–35.36'
C31	184.65'	330.00'	32°03'36"	S18°13'31"E–182.25'
C32	214.66'	300.00'	40°59'50"	S22°43'05"E–210.11'
C33	142.51'	270.00'	30°14'30"	N17°18'13"W–140.86'
C34	16.82'	25.00'	38°32'29"	S14°59'05"E–16.50'
C35	21.16'	25.00'	48°30'10"	N56°40'33"W–20.54'
C36	231.44'	50.00'	265°12'48"	N51°40'46"E–73.60'
C37	231.83'	50.00'	265°39'25"	N44°39'41"E–73.34'
C38	18.38'	25.00'	42°07'04"	N67°06'29"W–17.97'
C39	19.02'	25.00'	43°34'45"	S24°17'59"E–18.56'
C40	151.29'	2,030.00'	4°16'12"	N48°11'03"W–151.25'
C41	291.01'	2,000.00'	8°20'12"	S47°38'36"E–290.75'
C42	142.70'	1,970.00'	4°09'01"	S48°09'52"E–142.67'
C43	38.10'	25.00'	87°19'21"	N7°00'46"W–34.52'
C44	39.28'	25.00'	90°01'23"	N85°02'56"E–35.36'
C45	101.33'	130.00'	44°39'32"	N69°51'39"W–98.78'
C46	78.78'	100.00'	45°08'19"	S69°37'16"E–76.76'
C47	53.17'	70.00'	43°31'18"	S70°25'47"E–51.90'
C48	18.48'	25.00'	42°21'40"	N68°42'43"W–18.07'
C49	19.39'	25.00'	44°25'44"	S26°27'15"E–18.90'
C50	231.83'	50.00'	265°39'10"	N42°56'02"E–73.34'
C51	231.39'	50.00'	265°09'03"	N41°43'29"E–73.64'
C52	18.69'	25.00'	42°50'04"	S25°38'09"E–18.26'
C53	19.11'	25.00'	43°47'51"	N68°57'07"W–18.65'
C54	31.92'	25.00'	73°09'19"	N10°28'32"W–29.80'
C55	39.27'	25.00'	90°00'01"	N87°56'49"E–35.36'

SHEET LAYOUT
N.T.S.

ABBREVIATIONS

A.E.–AERIAL EASEMENT
B.L.–BUILDING LINE
FND.–FOUND
H.C.C.F. NO.–HARRIS COUNTY CLERK'S FILE NUMBER
H.C.D.R.–HARRIS COUNTY DEED RECORDS
H.C.M.R.–HARRIS COUNTY MAP RECORDS
O.P.R.O.R.P.H.C.–OFFICIAL PUBLIC RECORDS OF REAL PROPERTY HARRIS COUNTY
I.P.–IRON PIPE
I.R.–IRON ROD
SAN. S.E. – SANITARY SEWER EASEMENT
STM. S.E.–STORM SEWER EASEMENT
U.E.–UTILITY EASEMENT
U.R.D.E.–UNOBSTRUCTED RETENTION & DRAINAGE EAEMENT
VOL., PG.–VOLUME AND PAGE
W.L.E.–WATER LINE EASEMENT

NOTES:

1. ALL BEARINGS AND DISTANCES ARE BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD83 (CORS96). ALL DISTANCES ARE IN SURFACE.

2. THE COORDINATES SHOWN HEREON ARE TEXAS SOUTH CENTRAL ZONE NO. 4204 STATE PLANE GRID COORDINATES (NAD83) AND MAY BE BROUGHT TO SURFACE BY DIVIDING BY THE COMBINED SCALE FACTOR 0.999870017.

3. EXISTING UNDERGROUND UTILITY INFORMATION (TYPE, SIZE & OWNERSHIP) ARE SHOWN APPROXIMATELY BASED ON THE AVAILABLE RECORD DRAWINGS AND FIELD VERIFICATION (WHERE FEASIBLE) WITHOUT PROBING AND EXCAVATION. NO WARRANTY IS MADE AS TO THE ACCURACY OR COMPLETENESS OF UTILITY LOCATION SHOWN ON THE DRAWING. CAUTION SHOULD BE EXERCISED WHEN EXCAVATING OR BORE AND JACKING IN THE VICINITY OF UNDERGROUND UTILITIES. OWNERS OF THE UTILITIES SHOULD BE NOTIFIED PRIOR SUCH ACTIVITIES. CALL UTILITY COORDINATING COMMITTEE AT 713–223–4567, AT LEAST 48 HOURS PRIOR TO EXCAVATING IN THE STREET RIGHT–OF–WAY.

4. BY GRAPHICAL PLOTTING AND ACCORDING TO F.I.R.M. MAP NUMBER 48201C0410MM FOR HARRIS COUNTY, TEXAS AND INCORPORATED AREAS (MAP REVISED OCT. 16, 2013) THE TRACTS OF LAND SHOWN ON THESE ALIGNMENT MAPS ARE SITUATED IN ZONE 'X' (SHADED), OTHER FLOOD AREAS: AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. THIS INFORMATION IS TO DETERMINE FLOOD INSURANCE RATES ONLY AND IS NOT INTENDED TO IDENTIFY SPECIFIC FLOODING CONDITIONS.

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THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYORS STANDARDS AND SPECIFICATIONS FOR A CATEGORY 1B CONDITION II SURVEY AND THE CURRENT MINIMUM REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYING ACT.

Shaheen Chowdhury 10/13/20

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REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS, NO. 5858

SHAHEEN CHOWDHURY
5858

NO.	REVISIONS	DATE	APP

HARRIS COUNTY
ENGINEERING DEPARTMENT

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& Surveyors

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www.kuoassociates.com
TBPE Firm Registration No. F-4578
TBPLS Firm Registration No. 10075600

PROJECT TITLE: NORTHLAKE FOREST SUBDIVISION DRAINAGE IMPROVEMENTS UPIN 19103MF14F01		
DRAWN BY: A.G.C.	SHEET DESCRIPTION: EXISTING R.O.W. MAP	HCED STANDARD
CK'D BY: S.C.	(SHEET 2 OF 2)	
SCALE: 1"=50'		SHEET NO: 3 OF 3
DATE: 10/13/2020	APPROVED BY:	