Deborah M. Vaughn, P.E.
Director

22 February 2008

Mr. Sam Shelton
Benchmark Engineering Corporation
2401 Fountainview, Suite 220
Houston, Texas 77057

SUBJECT: Drainage Analysis for Sunset Ridge Phase 3 Development; Unit G103-15-00; Key Map 376UV; Pct 4; Project No. 1012239

Dear Mr. Shelton:

Harris County and the Harris County Flood Control District (HCFCD) have reviewed the above referenced report. Details of our understanding of the design are given on the attached review memo.

The report includes a statement that the project will cause no adverse impact to receiving waterways. 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.

If you have any questions or need any additional information, please do not hesitate to contact the reviewers.

Sincerely,

Shannon Watson, PE
Assistant Deputy Director

SCW/drb
Attachments

cc: Raymond J. Anderson, HCPID   David Saha, HCFCD
      Dan Mushen, HCPID   James Thompson, HCPID

10000 Northwest Frwy. ★ Suite 102 ★ Houston ★ Texas ★ 77092 ★ (713) 956-3000

p:\administration group\dbledsoe\dbledsoe\drainage analysis letters\2008\a sunset ridge phase 3 development_p 1012239.doc

MEMORANDUM

Harris County
Flood Control District

9900 Northwest Freeway
Houston, Texas 77092
713 684-4000

DATE: February 20, 2008

TO: Shannon C. Watson, P.E.
Harris County Permits Division

FROM: David B. Saha, P.E.
Watershed Coordination Department

RE: Project No. 1012239
Drainage Analysis for
Sunset Ridge Phase 3 Development
HCFCD Unit G103-15-00; Key Map 376UV; Pct 4

Objective

The submitted 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.

Submitted Report

Drainage Report For
Sunset Ridge Phase III Development
August 4, 2007
Revised January 30, 2008

Consulting Engineer

The Report was prepared by:
Benchmark Engineering Corp.
2401 Fountainview, Suite 220
Houston, TX 77057
Saib Yacoob Saour, P.E.
TX P.E.# 40094

Project Type

Drainage analysis for 72.47-acre Phase 3 of the Sunset Ridge Subdivision.

| **HCFCD Jurisdiction**	The proposed drainage improvements are located within HCFCD right-of-way. Therefore, HCFCD criteria will apply.
Report's Findings	The report states, "...it is concluded that the proposed site along with the construction of the linear channel/detention with the 2-5x5 sq ft restrictor structure will not impact the existing drainage conditions in the downstream reaches of G103-15-00 outfall channel."
Planning Department Technical Review	The report includes statements that the project will cause no adverse impact the receiving waterways in storm events up to and including the 100-year 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. All work proposed within existing and future HCFCD right-of-way must be designed and constructed in accordance with the HCFCD Policy, Criteria, and Procedure Manual.
Environmental Review & Permitting	Harris County Flood Control District's Environmental Department suggests that the U.S. Army Corps of Engineers be contacted to determine if a permit is required for this project. Copies of permits necessary for work within HCFCD rights-of-way should be given to HCFCD at least 48 hours prior to construction.

DBS:td

cc: Diane Blackburn, HCFCD

DRAINAGE REPORT

FOR

SUNSET RIDGE PHASE III DEVELOPMENT

WITHIN H.C.F.C.D. UNIT NO. G103-15-00 WATERSHED

IN

HARRIS COUNTY, TEXAS

PREPARED BY:

BENCHMARK ENGINEERING CORPORATION
2401 FOUNTAINVIEW, SUITE 220
HOUSTON, TEXAS 77057

APRIL 2005

STATE OF TEXAS
SAIB YACOOB SAOUR
40094
REGISTERED
PROFESSIONAL ENGINEER
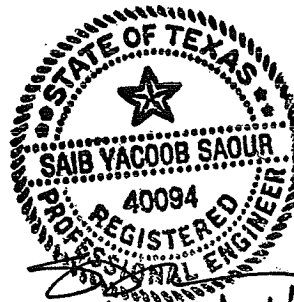
April 14, 2005

I. PURPOSE OF THIS REPORT

- Determine the drainage impact due to development of remaining 238.3 acres Phase II tract. It should be noted that Phase I included 66.09 acres which was approved September 2002. Therefore for the purpose of this drainage report, the proposed hydraulic routing analysis will include the proposed 238.30 acres and the 66.09 acres totaling 304.40 acres.

- Estimate the required 100-year storage volume needed to offset the increased 100-year runoff due to the development of 304.40 acres.

- Determine the required outlet restrictor pipe needed to maintain existing conditions in the downstream reached of G103-15-00.

II. GENERAL PROJECT INFORMATION

- ### LOCATION

  Phase II development consist of 238.30 acres development located in the northeast Harris County, it is part of 303.30 acres tract, 66.09 acres was developed analyzed and approved in September 2002 which included 45.8 ac-ft detention pond. Phase II will include the excavation of ~~the remaining~~ _Additional 991'_ ~~of~~ detention pond. The subject site located approximately 15 miles northeast of the central business district of City of Houston, immediately north of Sam Houston Tollway BW 8 (see Exhibit 1). The entire tract is located in the HCFCD Unit G103-15-00 watershed. The site is outside the city limits of the City of Houston, but it is within its extra-territorial jurisdiction.

- ### EXISTING CONDITIONS

  Based on the existing topographic map, it appears that entire site sheet flow into HCFCD G103-15-00. The existing condition of the subject site is open pasture with some scattered tress. Generally, it sloped to drain in the southeast direction into G103-15-00 outfall channel then east to Lake Houston.

- ### PROPOSED CONDITIONS

  The term of proposed conditions refer to the proposed improvements associated with the development of the 238.30 acres development, however, the proposed hydraulic analysis will include the total drainage area draining to the existing detention pond that constructed as part of the Phase I development and will require the excavation of ~~the remaining~~ _Additional_ storage volume needed for

the development of the 238.30 acres. The proposed development will consist of 64.32 acres commercial and 240.08 acres single family. This primarily includes a change in flow characteristics brought about from an increased percentage of impervious area. The proposed 100-year runoff from the subject site will drain into a channel/detention that was constructed in Phase I development and will expanded due to the additional development of Phase II, and then restricted 100-year flow will be drained into G103-15-00 outfall channel via a restrictor pipe

III. HYDROLOGY AND HYDRAULIC ANALYSIS

• METHODOLOGY

1. <u>Small Watershed Method</u>: As presented in the Harris County Flood Control District Drainage Criteria manual, the small watersheds as has been presented by H.R. Malcom (Reference 2) can be used for the routing analysis required for the subject development. The methodology utilizes a pattern hydrograph to obtain a curvilinear design hydrograph which peaks at the design flow rate and which contains a runoff volume consistent with the design rainfall. The pattern hydrograph is a step function approximation to the dimensionless hydrograph proposed by the Bureau of Reclamation (Reference 3) and the Soil Conservation Service (Reference 4).

The Small Watershed Method consists of the following equations:

$$(1) \quad T_p = \frac{V}{1.39 \, Q_p}$$

$$(2) \quad q_i = \frac{Q_p}{2} \left[1 - \cos \left(\frac{\pi t_i}{T_p} \right) \right]^*$$

$$\text{for } t_i \leq 1.25 \, T_p$$

$$(3) \quad q_i = 4.34 Q_p e^{-1.30 \frac{t_i}{T_p}}$$

$$\text{for } t_i > 1.25 \, T_p$$

* Calculator must be in radian mode

RUNOFF CALCUALTIONS:

- **100-year storm event:**
Utilizing the HCFCD site runoff curves for 100-year storm event,
DA = 304.40 ACRES
64.32 acre at 90 % imp and 240.08 acres at 40 % imp.
Therefore, the composite % imp. = 50 %
Existing 100-year peak flow = 380 CFS @ 0% imp
Proposed 100-year peak flow = 900 cfs @ 50% imp.
Delta = 0.25
Rainfall volume = 9.7 in

Based on the attached small watershed routing analysis of the 100-year required storage volume, it was determined that 142.38 ac-ft of storage volume needed to offset the increased 100-year peak flow due to the development of the 304.40 acre site.

- **25-year storm event:**
Utilizing the HCFCD site runoff curves for 25-year storm event,
DA = 304.40 ACRES
64.32 acre at 90 % imp and 240.08 acres at 40 % imp.
Therefore, the composite % imp. = 50 %
Existing 100-year peak flow = 270 CFS @ 0% imp
Proposed 100-year peak flow = 640 cfs @ 50% imp.
Delta = 0.25
Rainfall volume = 9.7 in

Based on the attached small watershed routing analysis of the 25-year required storage volume, it was determined that 105.08 ac-ft of storage volume needed to offset the increased 100-year peak flow due to the development of the 304.40 acre site.

AVAILABLE STORAGE VOLUME:

The proposed onsite detention pond will provide a 165.5 ac-ft of storm water detention volume for the development of the 304.40 acres tract. The storage volume rate provided for the entire 304.40 acres development is 0.55 ac-ft.

RESTRICTOR SIZE:

Tail water elevation (top of outfall) = 52.5
Head water = 56.0
Available head = 3.5 '
100-year release rate= 380 cfs
Utilizing the orifice formula for box culverts under head,

The required opening area for the restrictor = 37.50 sqft.

Therefore, use 2- 5'x 5' restrict 1 box to 12.5 sqft opening.

IV. CONCLUSION:

Based on the channel/reservoir routing analysis, it was determined that the required storage volume needed to offset the increased 100-year runoff equal 142.38 ac-ft, and the available storage volume within the proposed Phase II development is 165.5 ac-ft, therefore, it is concluded that the proposed 304.40 acres site along with the construction of the Linear channel/detention will not impact the existing drainage conditions in the downstream reaches of G103-15-00 outfall channel.

MALCOMS METHOD HYDROGRAPH
Site Run Off Curve

25 - Year Event

	Existing Conditions	Proposed Conditions
Drainage Area (Acres	304.40	304.40
Percent Impervious	0.00	55.00
Excess rainfall volume	7.15	7.15
Peak Flow Rate (cfs)	270	640
Computed Tp (hrs)	5.85	2.47
Tlime Increment (hrs)	0.08	0.08

Required Storage   105.08   **ac-ft**

Detention Analysis						
Existing Conditions		Proposed Conditions				
TIME (t_i)	Q	TIME	Q	Volume	Volume	Cum. Vol.
(hrs)	(cfs)	(hrs)	(cfs)	(cubic feet)	(acre-feet)	(acre-feet)
0.00	0.0	0.00	0.0			
0.08	0.1	0.08	1.8	249.09	0.01	0.01
0.17	0.5	0.17	7.2	1242.49	0.03	0.03
0.25	1.2	0.25	16.0	3217.39	0.07	0.11
0.33	2.2	0.33	28.3	6150.12	0.14	0.25
0.42	3.4	0.42	43.9	10005.35	0.23	0.48
0.50	4.8	0.50	62.6	14737.41	0.34	0.82
0.58	6.6	0.58	84.1	20288.90	0.47	1.28
0.67	8.6	0.67	108.3	26593.28	0.61	1.89
0.75	10.8	0.75	134.9	33574.62	0.77	2.66
0.83	13.3	0.83	163.5	41148.74	0.94	3.61
0.92	16.0	0.92	193.9	49224.06	1.13	4.74
1.00	19.0	1.00	225.8	57702.72	1.32	6.06
1.08	22.2	1.08	258.7	66481.66	1.53	7.59
1.17	25.6	1.17	292.2	75453.81	1.73	9.32
1.25	29.3	1.25	326.1	84509.28	1.94	11.26
1.33	33.2	1.33	359.9	93536.64	2.15	13.41
1.42	37.2	1.42	393.3	102424.17	2.35	15.76
1.50	41.5	1.50	425.8	111061.16	2.55	18.31
1.58	45.9	1.58	457.2	119339.15	2.74	21.05
1.67	50.6	1.67	487.0	127153.18	2.92	23.97
1.75	55.4	1.75	514.9	134403.00	3.09	27.05
1.83	60.3	1.83	540.7	140994.19	3.24	30.29
1.92	65.4	1.92	564.0	146839.28	3.37	33.66
2.00	70.7	2.00	584.5	151858.77	3.49	37.15
2.08	76.0	2.08	602.1	155981.99	3.58	40.73
2.17	81.5	2.17	616.5	159147.97	3.65	44.38
2.25	87.1	2.25	627.6	161306.15	3.70	48.09
2.33	92.8	2.33	635.2	162416.98	3.73	51.81
2.42	98.6	2.42	639.3	162452.35	3.73	55.54
2.50	104.5	2.50	639.8	161396.00	3.71	59.25
2.58	110.4	2.58	636.7	159243.70	3.66	62.90
2.67	116.3	2.67	630.0	156003.33	3.58	66.49
2.75	122.3	2.75	619.9	151694.83	3.48	69.97
2.83	128.4	2.83	606.4	146350.02	3.36	73.33
2.92	134.4	2.92	589.7	140012.24	3.21	76.54
3.00	140.4	3.00	570.0	132735.94	3.05	79.59
3.08	146.5	3.08	547.5	124586.08	2.86	82.45
3.17	152.5	3.17	524.6	115973.20	2.66	85.11
3.25	158.4	3.25	502.1	107372.34	2.46	87.58
3.33	164.4	3.33	480.6	98979.20	2.27	89.85
3.42	170.2	3.42	459.9	90885.52	2.09	91.94
3.50	176.0	3.50	440.2	83082.67	1.91	93.84
3.58	181.7	3.58	421.3	75562.51	1.73	95.58
3.67	187.4	3.67	403.2	68317.34	1.57	97.15
3.75	192.9	3.75	385.9	61339.89	1.41	98.55
3.83	198.3	3.83	369.4	54623.31	1.25	99.81
3.92	203.5	3.92	353.5	48161.09	1.11	100.91
4.00	208.7	4.00	338.3	41947.08	0.96	101.88
4.08	213.7	4.08	323.8	35975.47	0.83	102.70
4.17	218.5	4.17	309.9	30240.71	0.69	103.40
4.25	223.2	4.25	296.6	24737.57	0.57	103.96
4.33	227.6	4.33	283.9	19461.03	0.45	104.41
4.42	231.9	4.42	271.7	14406.34	0.33	104.74
4.50	236.0	4.50	260.1	9568.95	0.22	104.96
4.58	240.0	4.58	248.9	4944.50	0.11	105.08
4.67	243.6	4.67	238.2	0.00	0.00	105.08
4.75	247.1	4.75	228.0	0.00	0.00	105.08
4.83	250.4	4.83	218.2	0.00	0.00	105.08
4.92	253.4	4.92	208.9	0.00	0.00	105.08
5.00	256.2	5.00	199.9	0.00	0.00	105.08
5.08	258.7	5.08	191.3	0.00	0.00	105.08
5.17	261.0	5.17	183.1	0.00	0.00	105.08
5.25	263.1	5.25	175.2	0.00	0.00	105.08
5.33	264.8	5.33	167.7	0.00	0.00	105.08
5.42	266.4	5.42	160.5	0.00	0.00	105.08
5.50	267.6	5.50	153.6	0.00	0.00	105.08

HCFD criteria (6) Chart 1

Peak Flow (cfs)

Time (hrs)

Existing condition
Proposed Conditions

Page 1
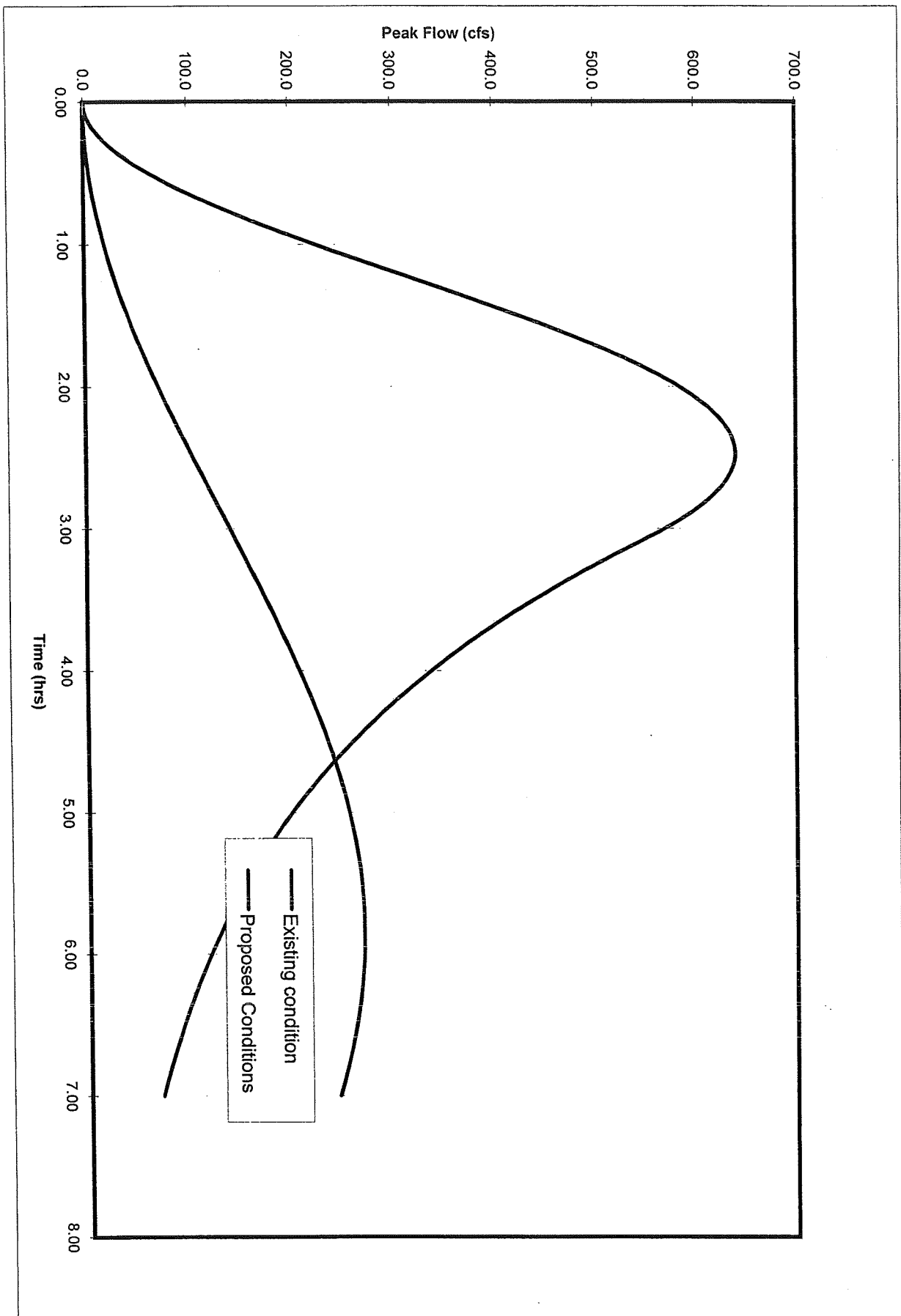
MALCOMS METHOD HYDROGRAPH
Site Run Off Curve

100 - Year Event

	Existing Conditions	Proposed Conditions
Drainage Area (Acres)	304.40	304.40
Percent Impervious	0.00	55.00
Excess rainfall volume	9.70	9.70
Peak Flow Rate (cfs) :	380	900
Computed Tp (hrs) :	5.64	2.38
Tlime Increment (hrs)	0.08	0.08

Required Storage   142.38   ac-ft

Detention Analysis						
Existing Conditions		Proposed Conditions				
TIME (t$_i$)	Q	TIME	Q	Volume	Volume	Cum. Vol.
(hrs)	(cfs)	(hrs)	(cfs)	(cubic feet)	(acre-feet)	(acre-feet)
0.00	0.0	0.00	0.0			
0.08	0.2	0.08	2.7	377.26	0.01	0.01
0.17	0.8	0.17	10.8	1881.45	0.04	0.05
0.25	1.8	0.25	24.3	4870.42	0.11	0.16
0.33	3.3	0.33	42.9	9305.62	0.21	0.38
0.42	5.1	0.42	66.4	15129.77	0.35	0.72
0.50	7.3	0.50	94.5	22267.64	0.51	1.24
0.58	9.9	0.58	126.9	30626.89	0.70	1.94
0.67	13.0	0.67	163.3	40099.26	0.92	2.86
0.75	16.3	0.75	203.1	50561.86	1.16	4.02
0.83	20.1	0.83	245.9	61878.70	1.42	5.44
0.92	24.2	0.92	291.1	73902.31	1.70	7.14
1.00	28.7	1.00	338.3	86475.59	1.99	9.12
1.08	33.6	1.08	386.8	99433.72	2.28	11.41
1.17	38.7	1.17	436.1	112606.18	2.59	13.99
1.25	44.2	1.25	485.6	125818.84	2.89	16.88
1.33	50.0	1.33	534.6	138896.08	3.19	20.07
1.42	56.1	1.42	582.6	151662.98	3.48	23.55
1.50	62.6	1.50	629.0	163947.45	3.76	27.31
1.58	69.2	1.58	673.3	175582.34	4.03	31.34
1.67	76.2	1.67	714.8	186407.55	4.28	35.62
1.75	83.3	1.75	753.2	196271.92	4.51	40.13
1.83	90.8	1.83	787.8	205035.20	4.71	44.84
1.92	98.4	1.92	818.4	212569.70	4.88	49.72
2.00	106.2	2.00	844.6	218761.95	5.02	54.74
2.08	114.2	2.08	865.9	223514.07	5.13	59.87
2.17	122.4	2.17	882.3	226745.06	5.21	65.07
2.25	130.7	2.25	893.4	228391.76	5.24	70.32
2.33	139.1	2.33	899.1	228409.71	5.24	75.56
2.42	147.7	2.42	899.5	226773.74	5.21	80.77
2.50	156.3	2.50	894.4	223478.30	5.13	85.90
2.58	165.0	2.58	883.9	218537.63	5.02	90.91
2.67	173.8	2.67	868.2	211985.58	4.87	95.78
2.75	182.6	2.75	847.4	203875.31	4.68	100.46
2.83	191.4	2.83	821.8	194278.68	4.46	104.92
2.92	200.2	2.92	791.7	183285.43	4.21	109.13
3.00	209.0	3.00	758.7	171179.08	3.93	113.06
3.08	217.8	3.08	724.9	158529.34	3.64	116.70
3.17	226.5	3.17	692.7	146009.98	3.35	120.05
3.25	235.1	3.25	661.9	133952.02	3.08	123.12
3.33	243.6	3.33	632.4	122341.46	2.81	125.93
3.42	252.0	3.42	604.3	111165.10	2.55	128.49
3.50	260.3	3.50	577.4	100410.49	2.31	130.79
3.58	268.4	3.58	551.7	90065.93	2.07	132.86
3.67	276.3	3.67	527.1	80120.35	1.84	134.70
3.75	284.1	3.75	503.7	70563.34	1.62	136.32
3.83	291.6	3.83	481.3	61385.05	1.41	137.73
3.92	299.0	3.92	459.9	52576.16	1.21	138.93
4.00	306.1	4.00	439.4	44127.88	1.01	139.95
4.08	312.9	4.08	419.8	36031.84	0.83	140.77
4.17	319.5	4.17	401.2	28280.13	0.65	141.42
4.25	325.8	4.25	383.3	20865.19	0.48	141.90
4.33	331.9	4.33	366.3	13779.86	0.32	142.22
4.42	337.6	4.42	350.0	7017.25	0.16	142.38
4.50	343.0	4.50	334.4	0.00	0.00	142.38
4.58	348.0	4.58	319.5	0.00	0.00	142.38
4.67	352.8	4.67	305.3	0.00	0.00	142.38
4.75	357.1	4.75	291.7	0.00	0.00	142.38
4.83	361.1	4.83	278.7	0.00	0.00	142.38
4.92	364.8	4.92	266.3	0.00	0.00	142.38
5.00	368.1	5.00	254.5	0.00	0.00	142.38
5.08	370.9	5.08	243.1	0.00	0.00	142.38
5.17	373.4	5.17	232.3	0.00	0.00	142.38
5.25	375.5	5.25	222.0	0.00	0.00	142.38
5.33	377.2	5.33	212.1	0.00	0.00	142.38

HCFD criteria (6) Chart 1

Page 1

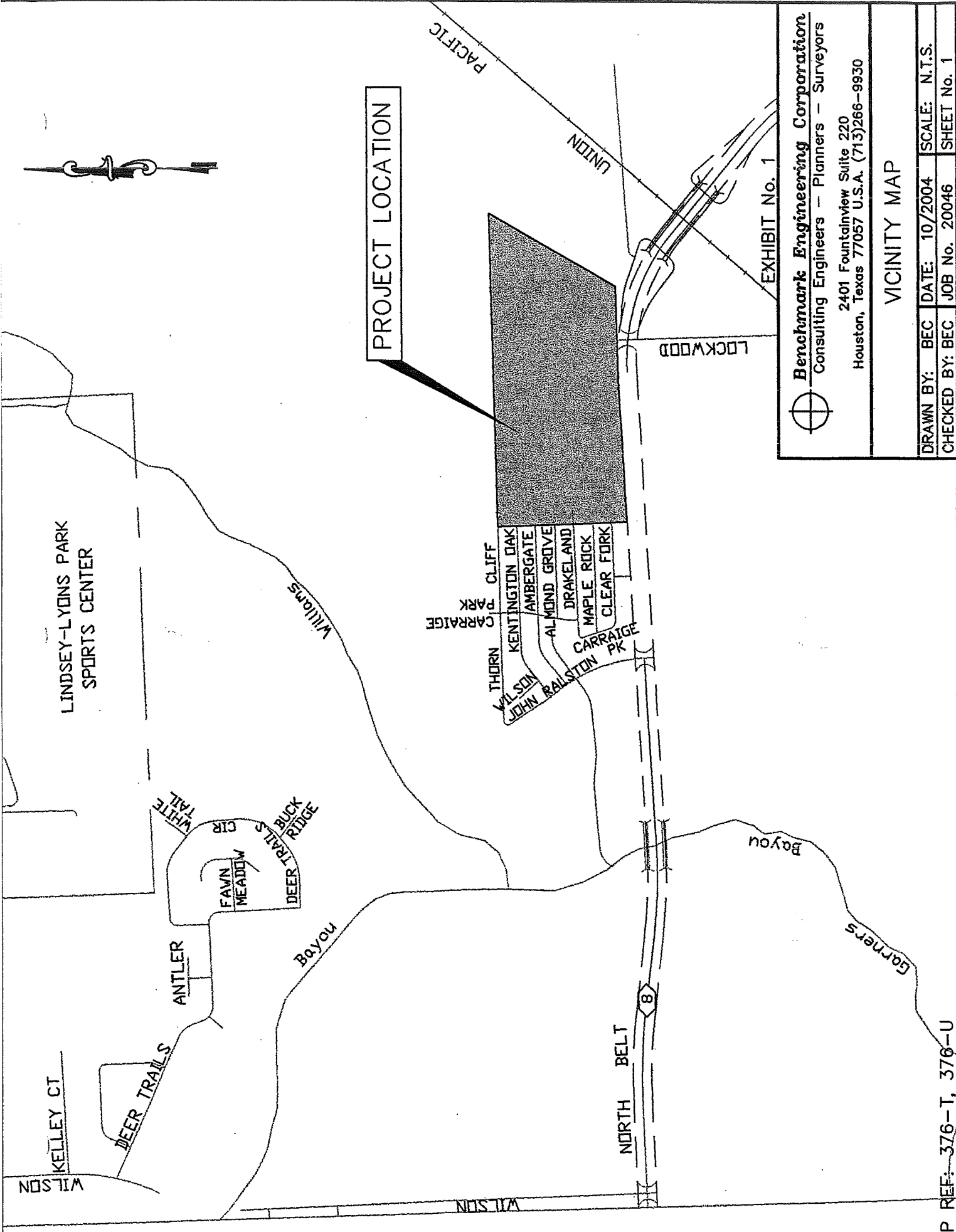PROJECT LOCATION

PACIFIC

UNION

LOCKWOOD
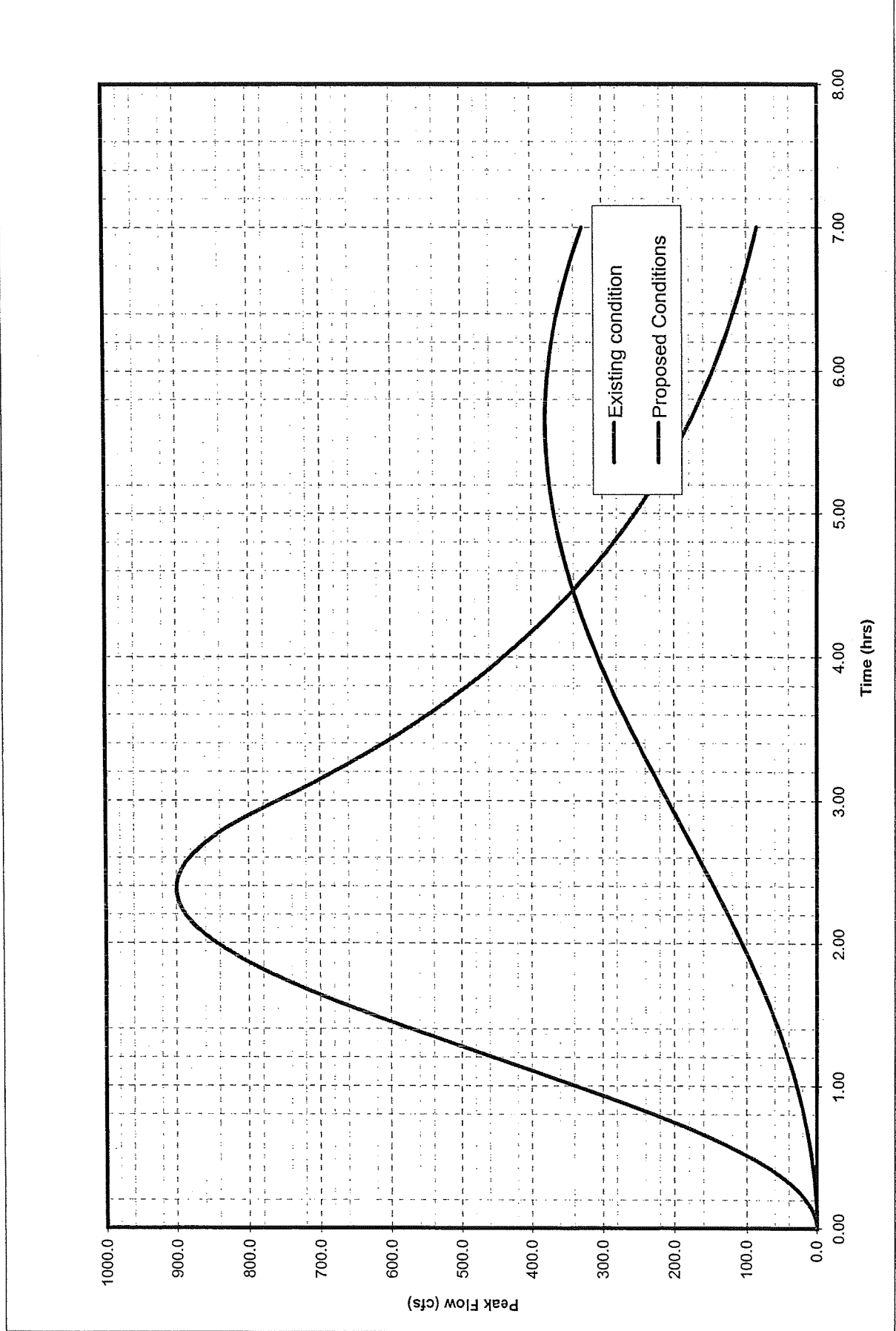
EXHIBIT No. 1

Benchmark Engineering Corporation
Consulting Engineers — Planners — Surveyors
2401 Fountainview Suite 220
Houston, Texas 77057 U.S.A. (713)266-9930

VICINITY MAP

| DRAWN BY: BEC | DATE: 10/2004 | SCALE: N.T.S. |
| CHECKED BY: BEC | JOB No. 20046 | SHEET No. 1 |

LINDSEY-LYONS PARK
SPORTS CENTER

Williams

THORN CLIFF
CARRAIGE PARK
KENTINGTON OAK
WILSON
AMBERGATE
ALMOND GROVE
JOHN RAILSTON
DRAKELAND
MAPLE ROCK
CLEAR FORK
CARRAIGE PK

WHITE TAIL
CIR
BUCK RIDGE
DEER TRAIL
FAWN MEADOW
ANTLER
DEER TRAILS
KELLEY CT
WILSON

Bayou

Bayou

Garners
Bayou

NORTH BELT
8
WILSON

MAP REF: 376-T, 376-U

MEADOW

ZONE AE

HARRIS COUNTY
UNINCORPORATED AREAS
480287

DEER TRAILS CIRCLE

BUCK RIDGE

Gully

ZONE X

RM343

ZONE X

ZONE X

CARRAIGE PARK DRIVE

THORNCLIFF   DRIVE

KENTINGTON   OAK   DRIVE

WILSON PARK COURT

AMBERGATE   DRIVE

ALMOND GROVE
DRAKELAND   DRIVE

MAPLE ROCK

CLEAR FORK   DRIVE

SITE

UNION

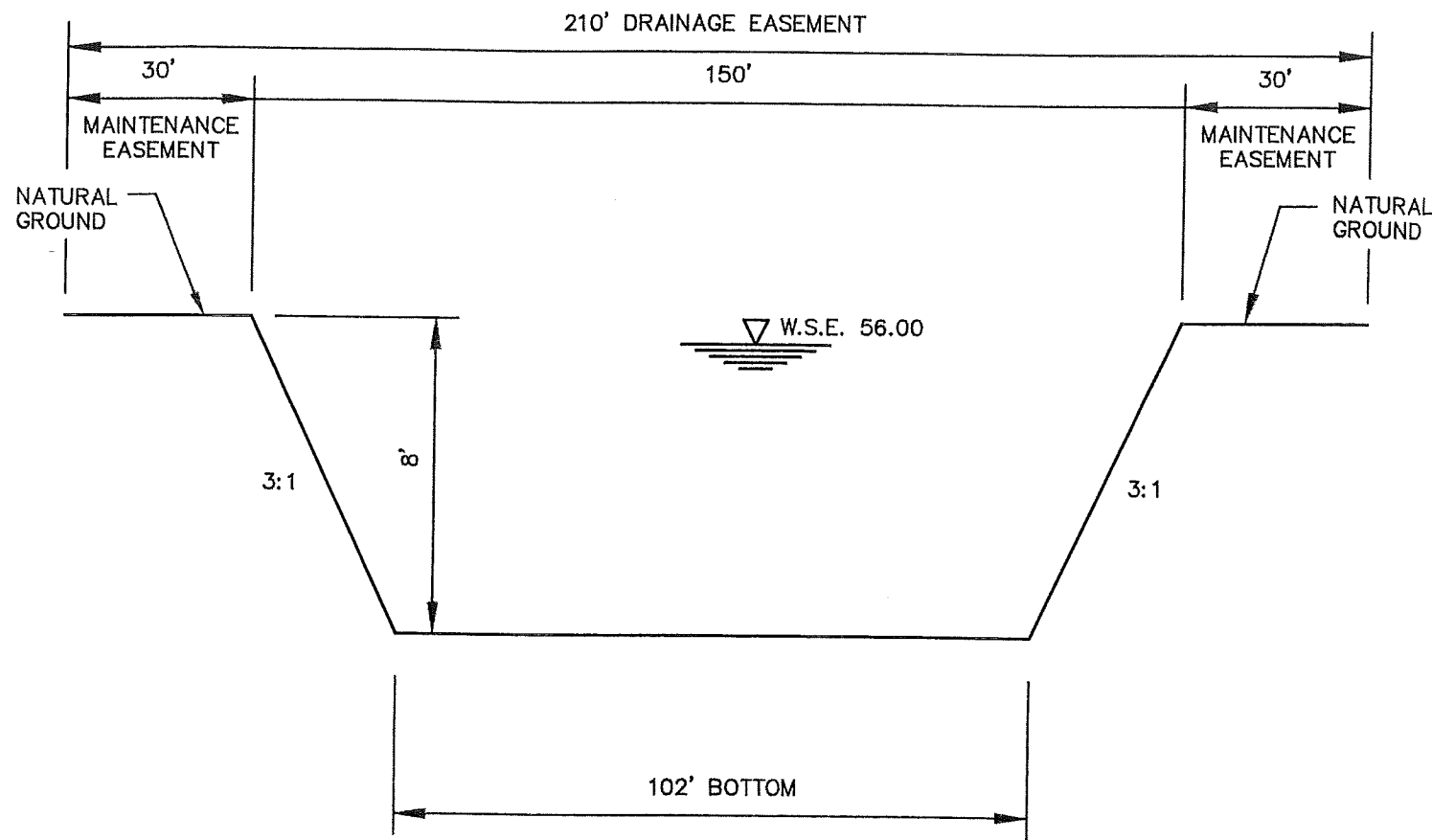RM344   NORTH BELT   DRIVE
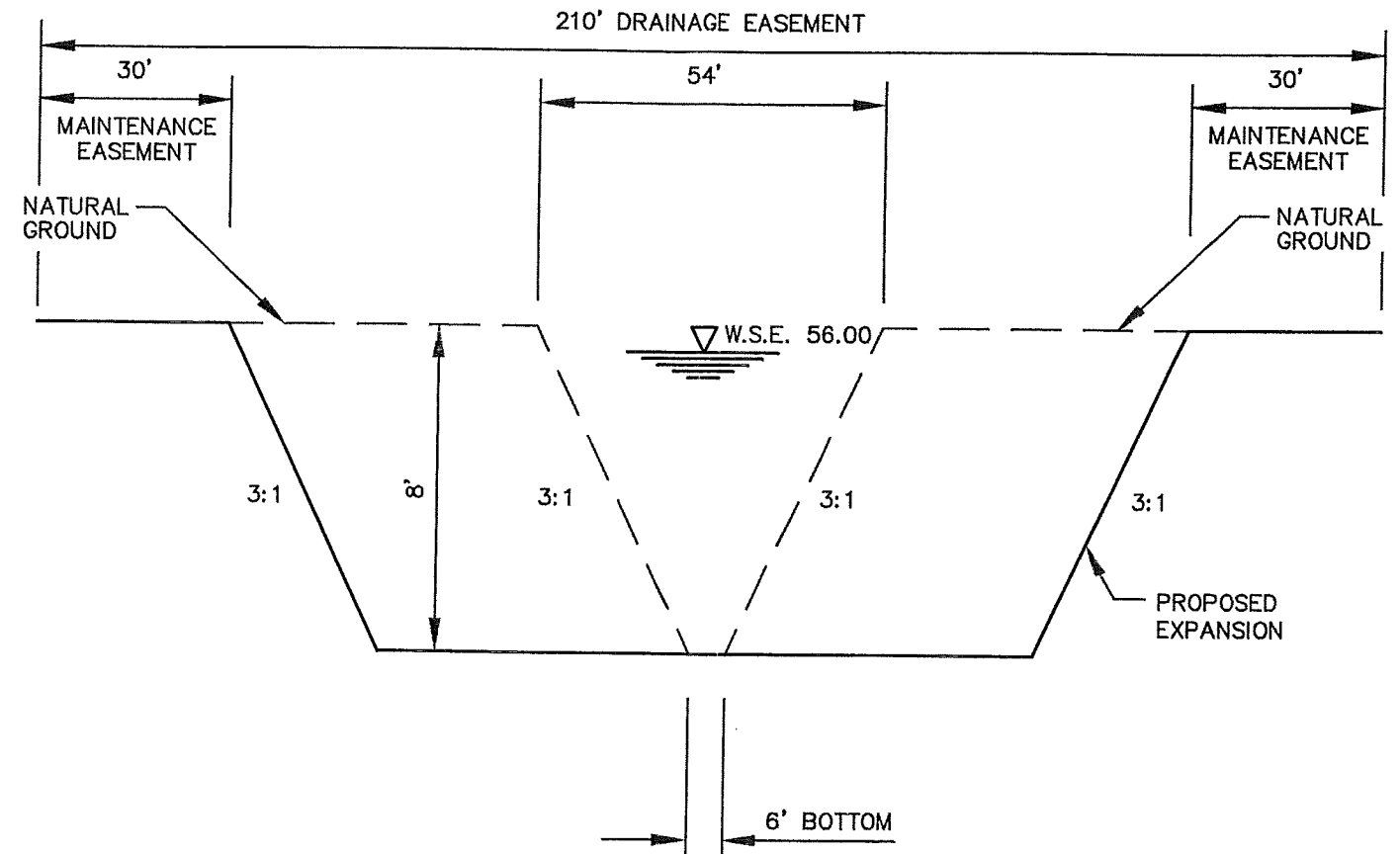
RM349

PACIFIC

UNION

ZONE X

RM350

EXHIBIT No. 2

Benchmark Engineering Corporatio
Consulting Engineers — Planners — Surveyors

2401 Fountainview Suite 220
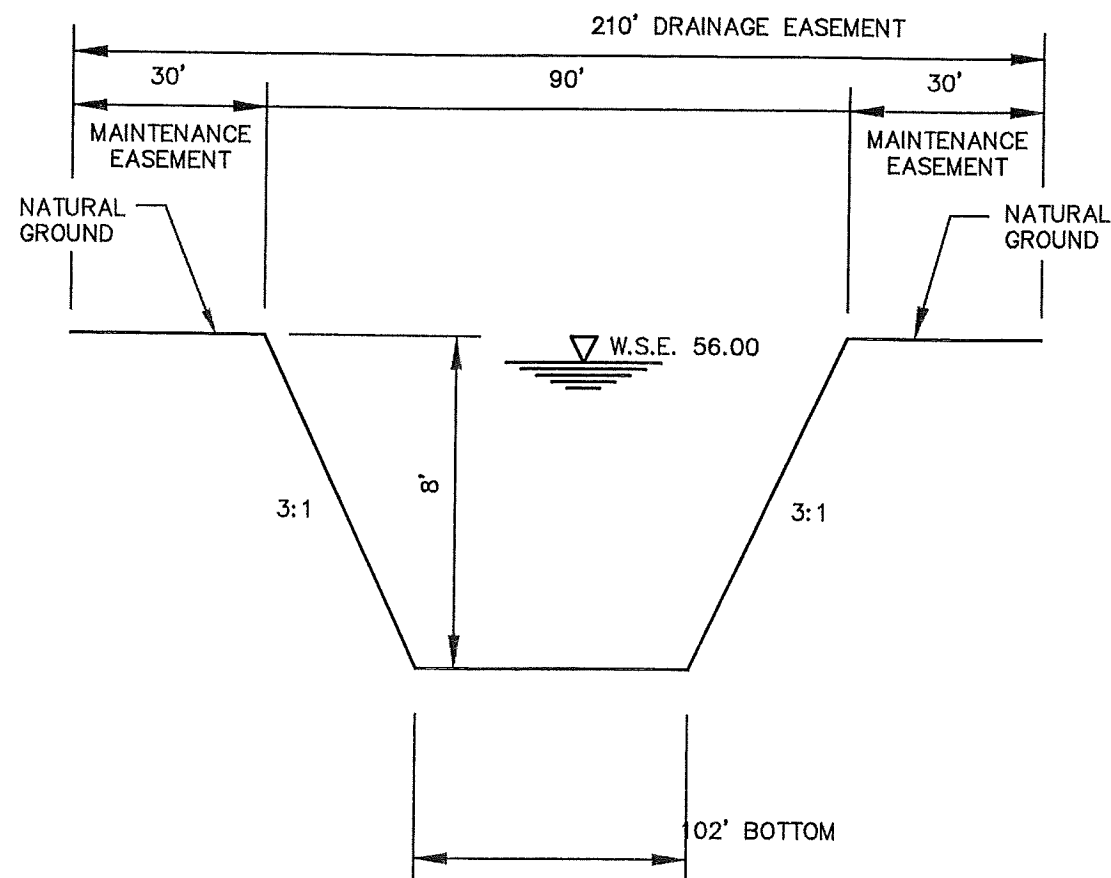Houston, Texas 77057 U.S.A. (713)266-9930

FEMA MAP WITH SITE LOCATION

TYPICAL CHANNEL CROSS-SECTION (A)

210' DRAINAGE EASEMENT

30' MAINTENANCE EASEMENT | 150' | 30' MAINTENANCE EASEMENT

NATURAL GROUND

▽ W.S.E. 56.00

3:1   8'   3:1

102' BOTTOM

TYPICAL CHANNEL CROSS-SECTION (B)

210' DRAINAGE EASEMENT

30' MAINTENANCE EASEMENT | 54' | 30' MAINTENANCE EASEMENT

NATURAL GROUND

▽ W.S.E. 56.00

3:1   8'   3:1   3:1   3:1

PROPOSED EXPANSION

6' BOTTOM

TYPICAL CHANNEL CROSS-SECTION (C)

210' DRAINAGE EASEMENT

30' MAINTENANCE EASEMENT | 90' | 30' MAINTENANCE EASEMENT

NATURAL GROUND

▽ W.S.E. 56.00

3:1   8'   3:1

102' BOTTOM

(FUTURE)
EAST SIDE
SECTION THREE
15.59 AC.

(EXISTING)
EAST SIDE
SECTION TWO
13.86 AC.

(FUTURE)
EAST SIDE SECTIONS
FOUR, FIVE, SIX AND SEVEN
186.515 AC.

(EXISTING)
EAST SIDE
SECTION ONE
66.09 AC.

200' TRANSITION

200' TRANSITION

210' DE

210' DE

2' BOTTOM

"A"

102' BOTTOM

"A"

"A"

210' DE

6' BOTTOM

6' BOTTOM

"B"

"A"

"A"

210' DE

(PROPOSED)
SECTION TWO
UNRESTRICTED
COMMERCIAL TRACT
13.45 AC.

"B"

"B"

CTION ONE
RESTRICTED
ERCIAL TRACT
5.40 AC.

SECTION ONE
UNRESTRICTED
COMMERCIAL TRACT
5.48 AC.

"C"

"C"

"C"

"C"

"B"

"B"

5'x5' RESTRICTOR PIPE
& 5'x5' BOX CULVERT
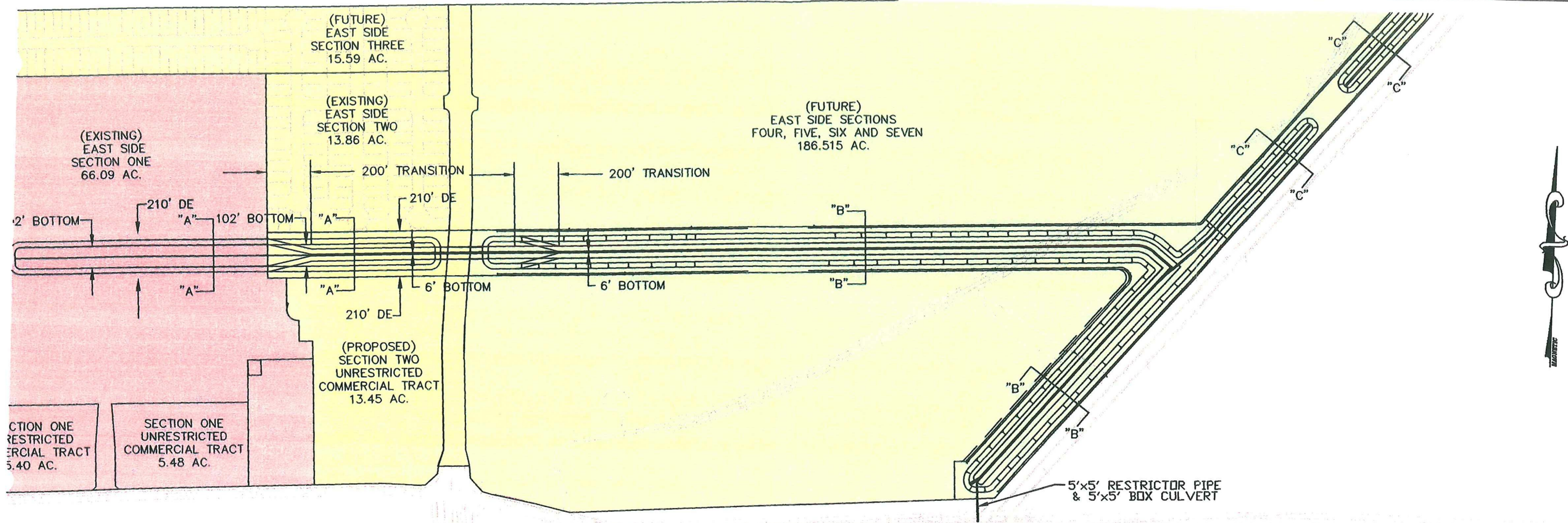
NORTH BELT

H.C.F.C.D. UNIT No. G103-15-00

EXISTING EAST SIDE SECTION I PHASE I
DRAINAGE AREA IMPROVEMENT TO G103-15-00

EXISTING PHASE II DRAINAGE AREA IMPROVEMENT
TO G103-15-00

PROPOSED PHASE III DRAINAGE AREA IMPROVEMENT
G103-15-00

EXHIBIT No. 4

Benchmark Engineering Corporation
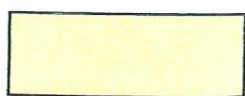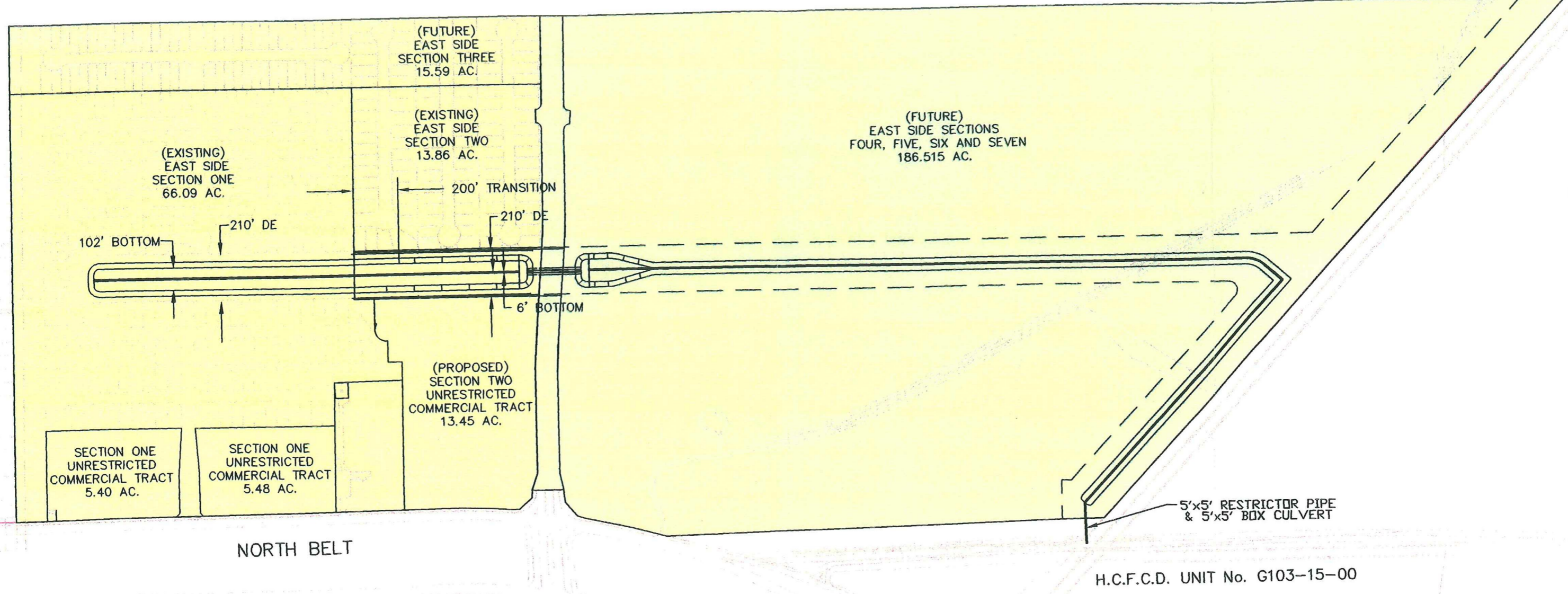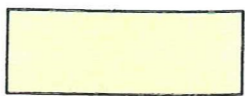Consulting Engineers — Planners — Surveyors

2401 Fountainview Suite 220
Houston, Texas 77057 U.S.A. (713)266-9930

PROPOSED DRAINAGE CONDITIONS

DRAWN BY: BEC	DATE: APRIL 2005	SCALE: 1"= 300'
CHECKED BY: BEC		

(FUTURE)
EAST SIDE
SECTION THREE
15.59 AC.

(EXISTING)
EAST SIDE
SECTION TWO
13.86 AC.

(FUTURE)
EAST SIDE SECTIONS
FOUR, FIVE, SIX AND SEVEN
186.515 AC.

(EXISTING)
EAST SIDE
SECTION ONE
66.09 AC.

200' TRANSITION

210' DE

210' DE

102' BOTTOM

6' BOTTOM

(PROPOSED)
SECTION TWO
UNRESTRICTED
COMMERCIAL TRACT
13.45 AC.

SECTION ONE
UNRESTRICTED
COMMERCIAL TRACT
5.40 AC.

SECTION ONE
UNRESTRICTED
COMMERCIAL TRACT
5.48 AC.

5'x5' RESTRICTOR PIPE
& 5'x5' BOX CULVERT

NORTH BELT

H.C.F.C.D. UNIT No. G103-15-00

EXISTING PHASE I DRAINAGE AREA TO
EXISTING PHASE II DRAINAGE AREA TO
G103-15-00

PROPOSED PHASE III DRAINAGE AREA IMPROVEMENT
TO G103-15-00

EXHIBIT No. 3

Benchmark Engineering Corporation
Consulting Engineers – Planners – Surveyors

2401 Fountainview Suite 220
Houston, Texas 77057 U.S.A. (713)266-9930

EXISTING DRAINAGE CONDITIONS

| DRAWN BY: BEC | DATE: APRIL 2005 | SCALE: 1"= 300' |