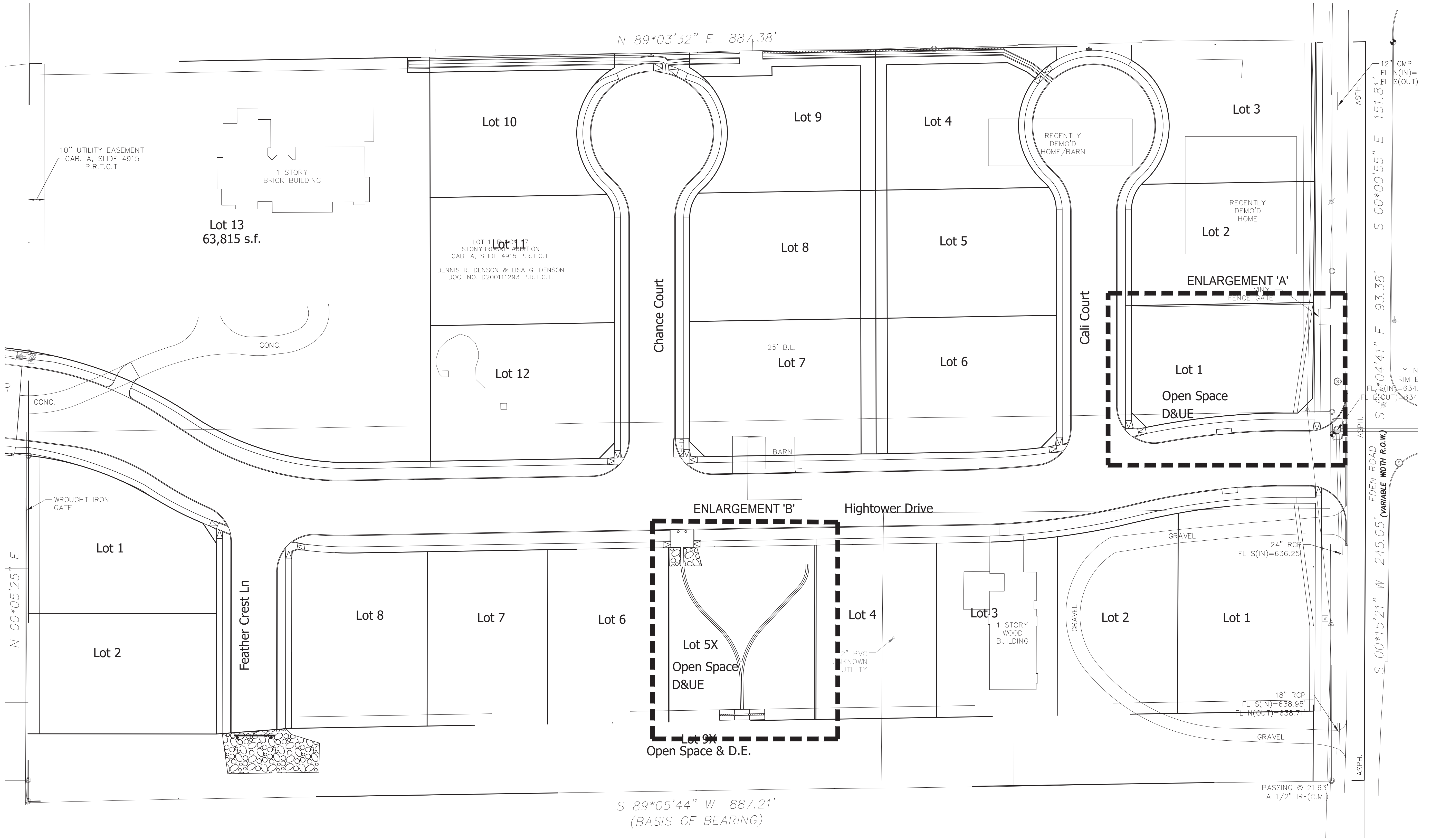
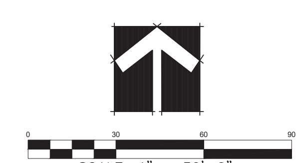




BEFORE YOU DIG
Texas 811

CAUTION!!!
UNDERGROUND UTILITIES ARE LOCATED IN THIS AREA. 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, CONTACT LINE LOCATES FOR FRANCHISE UTILITY INFO.
CALL BEFORE YOU DIG:
TEXAS EXCAVATION SAFETY SYSTEM (TESS)
1-800-344-8377
TEXAS ONE CALL SYSTEMS
1-800-245-4545
LONE STAR NOTIFICATION CENTER
1-800-669-8344 EXT. 5
BEFORE YOU DIG...

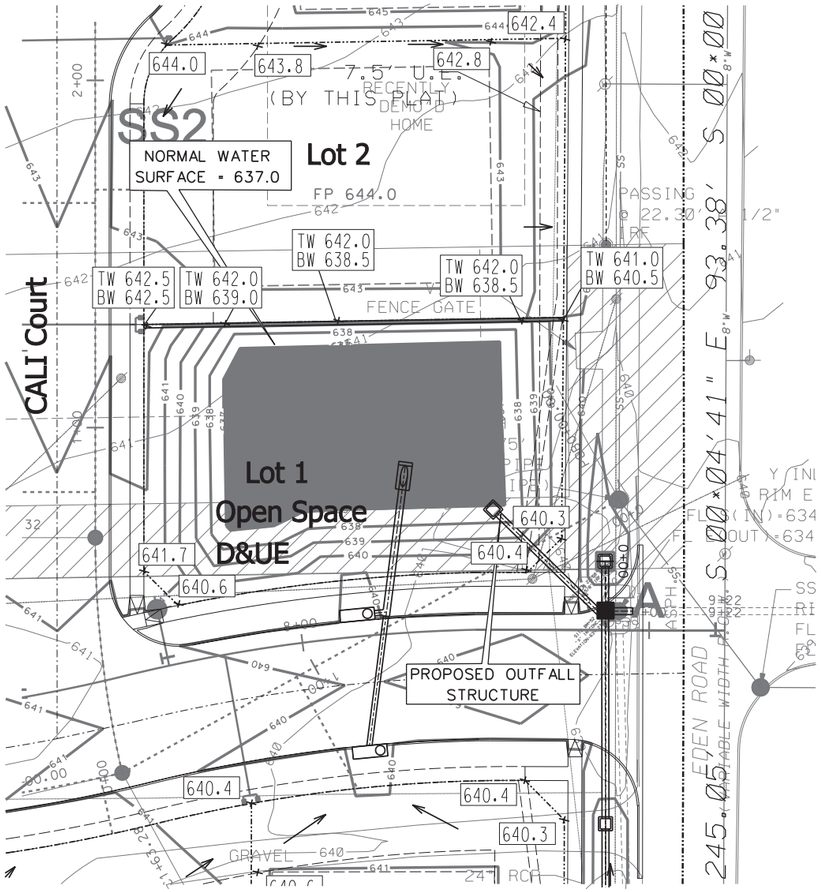
URBAN FORESTRY PLAN - PHASE 2
METHOD A

Date AUG 9, 2019
Drawn By GAC
Checked By GAC
Revisions

FAIN • CUPPETT
LANDSCAPE ARCHITECTS, LLC
8233 Mid Cities Blvd. Suite B
North Richland Hills, TX 76182-4761
817-479-0730
PARKS AND OPEN SPACE PLANNING • LANDSCAPE ARCHITECTURE • IRRIGATION DESIGN

EDEN ESTATES
HIGHTOWER DRIVE
NORTH RICHLAND HILLS, TX

Sheet No.
UF-2



DETENTION POND A

DETENTION POND DESIGN (2 YR EVENT)

DETENTION TO BE PROVIDED SUCH THAT PRE-DEVELOPED FLOWS ARE MAINTAINED TO THE EAST.

Q2(PRE) = 16.0 CFS
Q2(BYPASS) = 12.3 CFS
Q2(ALLOWABLE) = QPRE-QBYPASS = 16.0 - 12.3 = **3.7 CFS**

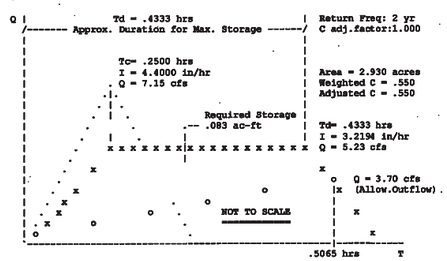
Q2 TO POND:

AREA = O3+A3+A4 = 2.93 ACRES
TC = 15 MIN
C = 0.55
Q2 = 7.1 CFS

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

* RETURN FREQUENCY: 2 yr	Allowable Outflow: 3.70 cfs *
* 'C' Adjustment: 1.000	Required Storage: .083 ac-ft *
* Peak Inflow: 5.23 cfs	*
* .HYG File: 2 yr	*



LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Users\Keith\Documents\
Inflow HYG file = work_pad.hyg - POND 10 IN 2 yr
Outflow HYG file = work_pad.hyg - POND 10 OUT 2 yr

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	637.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout=		.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	5.23 cfs	at	.2500 hrs
Peak Outflow	=	2.89 cfs	at	.5500 hrs
Peak Elevation	=	638.08 ft		
Peak Storage =		.112 ac-ft		

DETENTION POND DESIGN (100 YR EVENT)

DETENTION TO BE PROVIDED SUCH THAT PRE-DEVELOPED FLOWS ARE MAINTAINED TO THE EAST.

Q100(PRE) = 34.9 CFS
Q100(BYPASS) = 26.9 CFS
Q100(ALLOWABLE) = QPRE-QBYPASS = 34.9 - 26.9 = **8.0 CFS**

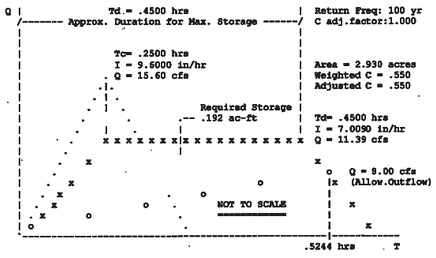
Q100 TO POND:

AREA = O3+A3+A4 = 2.93 ACRES
TC = 15 MIN
C = 0.55
Q100 = 15.5 CFS

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----
Method I

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

* RETURN FREQUENCY: 100 yr	Allowable Outflow: 8.00 cfs *
* 'C' Adjustment: 1.000	Required Storage: .192 ac-ft *
* Peak Inflow: 11.39 cfs	*
* .HYG File: 100 yr	*



LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\Users\Keith\Documents\
Inflow HYG file = work_pad.hyg - POND 10 IN 100 yr
Outflow HYG file = work_pad.hyg - POND 10 OUT 100 yr

Pond Node Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

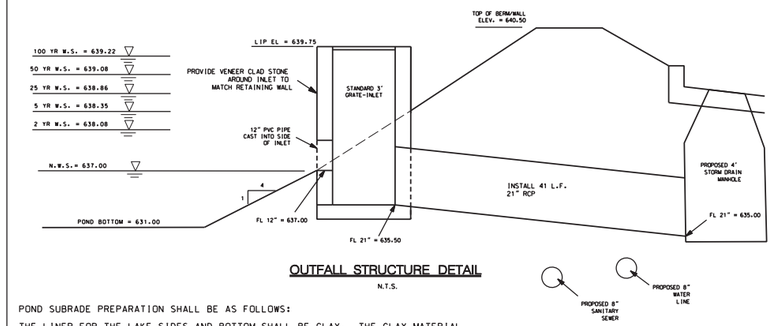
No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	637.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout=		.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	11.39 cfs	at	.2500 hrs
Peak Outflow	=	5.03 cfs	at	.6000 hrs
Peak Elevation	=	639.22 ft		
Peak Storage =		.265 ac-ft		



OUTFALL STRUCTURE DETAIL

N.T.S.

POND SUBRADE PREPARATION SHALL BE AS FOLLOWS:

THE LINER FOR THE LAKE SIDES AND BOTTOM SHALL BE CLAY. THE CLAY MATERIAL UTILIZED FOR THE IMPERVIOUS POND LINER SHALL BE CONSTRUCTED OF CL OR CH SOILS. ALL MATERIAL SHALL HAVE A PLASTICITY INDEX (PI) OF GREATER THAN 20 AND A LIQUID LIMIT (LL) OF GREATER THAN 50. ALL CLAYS MUST BE APPROVED BY THE PROJECT SOILS ENGINEER. CLAY MUST CONSIST OF ON-SITE MATERIAL OR OFF-SITE MATERIAL IF NO CLAY IS AVAILABLE OR IF ON-SITE MATERIAL IS NOT SUFFICIENT.

CONTRACTOR SHALL EXCAVATE TO SUBGRADE AND SUBGRADE SHALL BE FREE OF ROCKS OR OTHER FOREIGN DEBRIS. ANY AREAS THAT ARE PREDOMINANTLY SAND OR GRAVEL SHOULD BE OVER-EXCAVATED BY A MINIMUM OF TWO FEET AND REPLACED WITH AN APPROVED CLAY SOIL AS DESCRIBED ABOVE.

AFTER COMPACTION OF THE SUBGRADE THE CONTRACTOR SHALL SPREAD THE SELECTED CLAY SEAL. THE IMPERVIOUS LINER SHALL BE A MINIMUM OF 2 FEET IN COMPACTED THICKNESS AND SHALL BE CONSTRUCTED IN LAYERS NOT TO EXCEED EIGHT (8) INCHES IN COMPACTED THICKNESS. COMPACTION SHALL BE A MINIMUM OF 95% OF ASTM D698 AND THE MOISTURE CONTENT OF THE MATERIAL SHALL BE 0-3% ABOVE OPTIMUM.

WHEN CONSTRUCTION OF THE IMPERVIOUS POND LINER IS COMPLETE, THE POND SHALL BE FILLED WITH WATER AND KEPT FULL FOR AT LEAST 48 HOURS PRIOR TO MAKING THE TEST OF IMPERVIOUSNESS.

NOTES:

EARTHEN SIDE SLOPES FOR DETENTION POND ARE TYPICALLY 4:1 (5:1 ABOVE NORMAL POOL LEVEL FOR WET PONDS).

POND TO HAVE A CONSTANT WATER SURFACE AND SHALL BE SUPPLEMENTED WITH CITY METERED WATER TO MAINTAIN THAT LEVEL. POND SHALL ALSO BE AERATED BY USE OF FOUNTAIN OR BUBBLER.

SITE GRADING LEGEND

FF = FINISHED FLOOR
TP = TOP PAVEMENT
TI = TOP INLET
TG = TOP GRATE INLET
TC = TOP CURB
GT = GUTTER
FG = FINISHED GRADE
TW = TOP WALL
BW = BOTTOM WALL
FL = FLOW LINE
➡ FLOW DIRECTION

—690— EXISTING ELEVATION CONTOUR

—690— PROPOSED ELEVATION CONTOUR

TREE PROTECTION -
PLACE ORANGE VINYL FENCING ALONG TREE CANOPY/DRIP LINE*

*GRADING AROUND PROTECTED TREES SHALL BE LIMITED TO OUTSIDE OF TREE PROTECTION - NO GRADING INSIDE OF PROTECTIVE FENCING

NOTES:

EARTHEN SIDE SLOPES FOR DETENTION POND ARE TYPICALLY 5:1

!!!IMPORTANT!!!
CONTOURS REPRESENT FINISHED GRADES. ALL PAVING SHALL BE EXCAVATED TO SUBGRADE PER TYPICAL PAVING SECTIONS.

UTILITY RELOCATION NOTE:

IF ANY EXISTING UTILITY POLES, POWER POLES, GUY WIRES, TELEPHONE UTILITIES, ETC. ARE FOUND TO BE IN CONFLICT WITH THESE CONSTRUCTION PLANS, THE CONTRACTOR SHALL CONTACT THE APPROPRIATE UTILITY COMPANY AND COORDINATE THE RELOCATION OF ANY AND/OR ALL SUCH UTILITIES (NO SPECIAL PAY).

ALL EXCAVATION, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U.S. DEPARTMENT OF LABOR, OSHA, "CONST. SAFETY AND HEALTH REGULATIONS", VOL. 29, SUB PART P, PG. 128-137, AND ANY AMENDMENTS THERETO.

CONSTRUCTION NOTES:

THE TOP FOUR (4") INCHES OF TOP SOIL SHALL BE REMOVED FROM SITE AND STOCKPILED FOR LANDSCAPE USE. ALL CUT OR FILL SLOPES TO BE 4H:1V OR FLATTER UNLESS OTHERWISE NOTED.

AREAS WITHIN PUBLIC R.O.W. WILL BE HYDROMULCHED AND/OR CURLEX MATTED AFTER CONSTRUCTION AS DIRECTED BY ENGINEER.

!!! CRITICAL !!!
LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AND ARE BASED ON PUBLIC RECORDS. THE CONTRACTOR IS COMPLETELY RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES, BOTH HORIZONTALLY AND VERTICALLY, BEFORE THE COMMENCEMENT OF ANY CONSTRUCTION.

N

SCALE 1" = 20'
0 10 20 40

HAMILTON DUFFY, PC
CONSULTING ENGINEERS
CIVIL & ENVIRONMENTAL ENGINEERS - PLANNERS - CONSTRUCTION MANAGERS
8241 MID-CITIES BLVD., SUITE 100 - NORTH RICHLAND HILLS, TEXAS 76182
PHONE (817) 268-8488 FAX (817) 284-8488

SITE CONSTRUCTION PLANS

CITY OF NORTH RICHLAND HILLS, TEXAS

EDEN ESTATES

DETENTION POND A

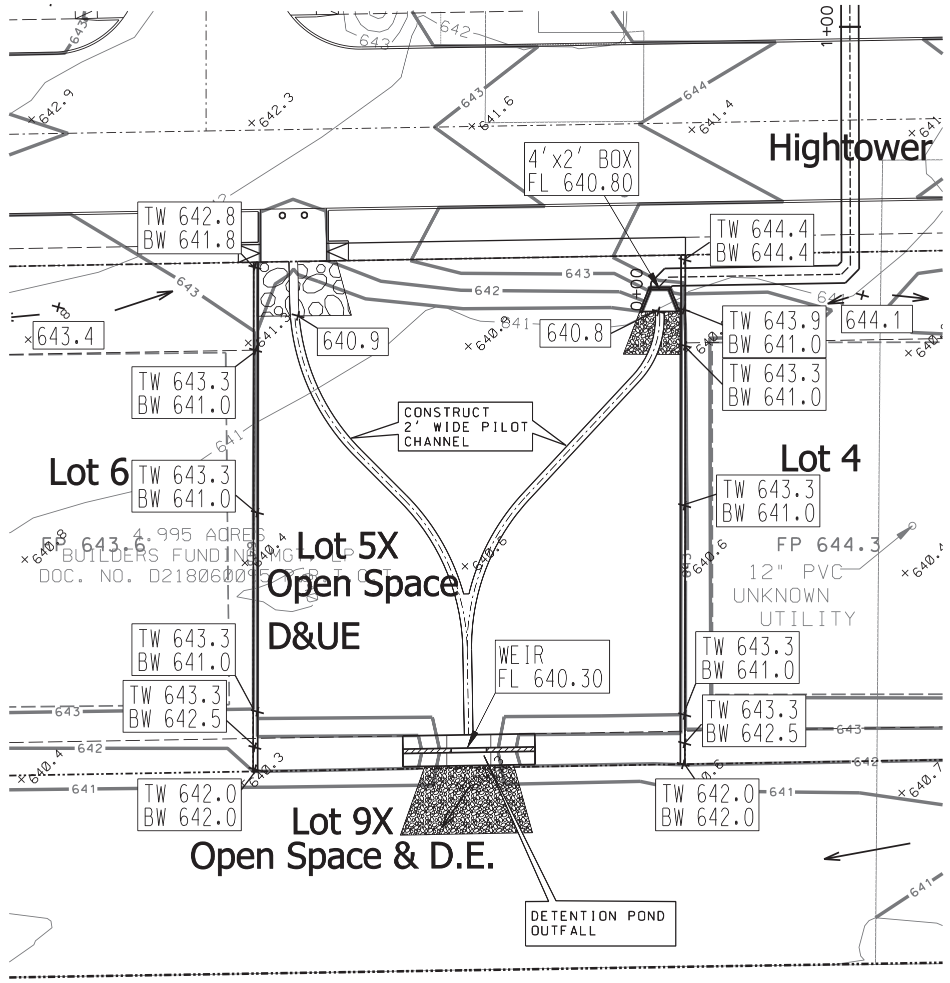
PRELIMINARY
FOR REVIEW ONLY
THESE DOCUMENTS ARE FOR DESIGN REVIEW ONLY AND NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:
KEITH M. HAMILTON 87384 $DATE$ DATE
PE NO.

JOB	345-002
DATE	6-6-19
DESIGNED	K.M.H.
DRAWN	J.B.E.
CHECKED	K.M.H.

TEXAS REGISTERED ENGINEERING FIRM NUMBER F-3260

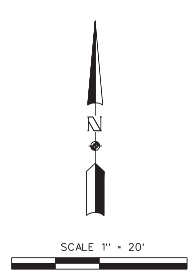
NO.	REVISION	BY	DATE

SHEET
C1.01D



S 89°05'44" W 887.21'

DETENTION POND B



SITE GRADING LEGEND

FF = FINISHED FLOOR
TP = TOP PAVEMENT
TI = TOP INLET
TG = TOP GRATE INLET
TC = TOP CURB
GT = GUTTER
FG = FINISHED GRADE
TW = TOP WALL
BW = BOTTOM WALL
FL = FLOW LINE
FLOW DIRECTION

690 EXISTING ELEVATION CONTOUR

690 PROPOSED ELEVATION CONTOUR

TREE PROTECTION -

PLACE ORANGE VINYL FENCING ALONG TREE CANOPY/DRIP LINE*

*GRADING AROUND PROTECTED TREES SHALL BE LIMITED TO OUTSIDE OF TREE PROTECTION - NO GRADING INSIDE OF PROTECTIVE FENCING

!!! CRITICAL !!!

LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AND ARE BASED ON PUBLIC RECORDS. THE CONTRACTOR IS COMPLETELY RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES, BOTH HORIZONTALLY AND VERTICALLY, BEFORE THE COMMENCEMENT OF ANY CONSTRUCTION.

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ALL EXCAVATION, TRENCHING AND SHORING OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE U.S. DEPARTMENT OF LABOR, OSHA, "CONST. SAFETY AND HEALTH REGULATIONS", VOL. 29, SUB PART P, PG. 128-137, AND ANY AMENDMENTS THERETO.

CONSTRUCTION NOTES:

THE TOP FOUR (4") INCHES OF TOP SOIL SHALL BE REMOVED FROM SITE AND STOCKPILED FOR LANDSCAPE USE. ALL CUT OR FILL SLOPES TO BE 4H:1V OR FLATTER UNLESS OTHERWISE NOTED.

AREAS WITHIN PUBLIC R.O.W. WILL BE HYDROMULCHED AND/OR CURLEX MATTED AFTER CONSTRUCTION AS DIRECTED BY ENGINEER.

DETENTION POND DESIGN (2 YR EVENT)

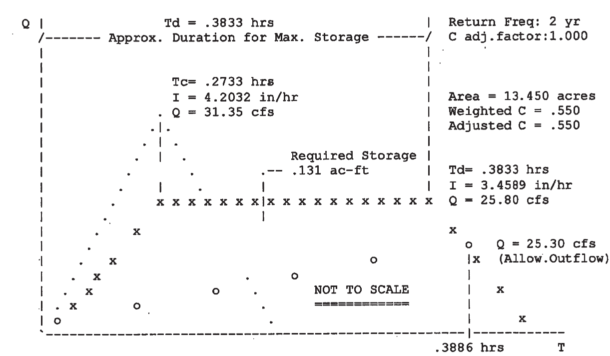
DETENTION TO BE PROVIDED SUCH THAT PRE-DEVELOPED FLOWS ARE MAINTAINED TO THE SOUTH.

Q2(PRE) = 31.4 CFS
Q2(BYPASS) = 6.1 CFS
Q2(ALLOWABLE) = QPRE-QBYPASS = 31.4 - 6.1 = **25.3 CFS**

Q2 TO POND:

AREA = O4+O5+O6+B1+B2+O7 = 13.45 ACRES
TC = 16.4 MIN
C = 0.55
Q2 = 30.3 CFS

```
                    MODIFIED RATIONAL METHOD
      ---- Graphical Summary for Maximum Required Storage ----
                           Method I

  Q = CiA * Units Conversion;  Where Conversion = 43560 / (12 * 3600)

 **********************************************************************
 *  RETURN FREQUENCY: 2 yr       |  Allowable Outflow: 25.30 cfs      *
 *  'C' Adjustment: 1.000        |  Required Storage: .131 ac-ft      *
 *--------------------------------------------------------------------*
 *  Peak Inflow: 25.80 cfs                                            *
 * .HYG File:   2 yr                                                  *
 **********************************************************************
```




```
                    LEVEL POOL ROUTING SUMMARY

HYG Dir           = C:\Users\Keith\Documents\
Inflow  HYG file = work_pad.hyg - POND 30      IN  2 yr
Outflow HYG file = work_pad.hyg - POND 30      OUT 2 yr

Pond Node   Data = POND 30
Pond Volume Data = POND 30
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS
---------------------------------
Starting WS Elev    =   640.30 ft
Starting Volume     =     .000 ac-ft
Starting Outflow    =      .00 cfs
Starting Infiltr.   =      .00 cfs
Starting Total Qout=       .00 cfs
Time Increment      =    .0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
====================================================
Peak Inflow       =    25.80 cfs    at     .3000 hrs
Peak Outflow      =    24.39 cfs    at     .4000 hrs
----------------------------------------------------
Peak Elevation    =   641.29 ft
Peak Storage =           .135 ac-ft
====================================================
```

DETENTION POND DESIGN (100 YR EVENT)

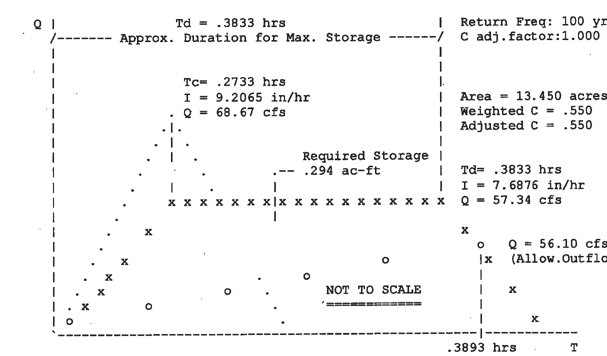
DETENTION TO BE PROVIDED SUCH THAT PRE-DEVELOPED FLOWS ARE MAINTAINED TO THE SOUTH.

Q100(PRE) = 69.4 CFS
Q100(BYPASS) = 13.3 CFS
Q100(ALLOWABLE) = QPRE-QBYPASS = 69.4 - 13.3 = **56.1 CFS**

Q100 TO POND:

AREA = O4+O5+O6+B1+B2+O7 = 13.45 ACRES
TC = 16.4 MIN
C = 0.55
Q100 = 67.3 CFS

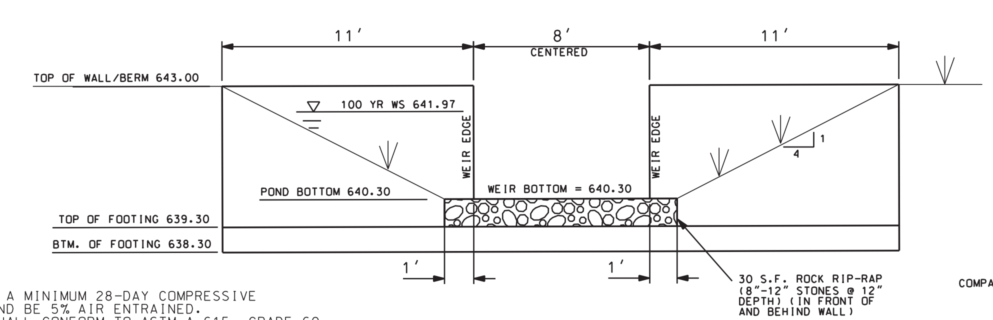
```
                    MODIFIED RATIONAL METHOD
      ---- Graphical Summary for Maximum Required Storage ----
                           Method I

  Q = CiA * Units Conversion;  Where Conversion = 43560 / (12 * 3600)

 **********************************************************************
 *  RETURN FREQUENCY: 100 yr     |  Allowable Outflow: 56.10 cfs      *
 *  'C' Adjustment: 1.000        |  Required Storage: .294 ac-ft      *
 *--------------------------------------------------------------------*
 *  Peak Inflow: 57.34 cfs                                            *
 * .HYG File:   100 yr                                                *
 **********************************************************************
```




```
                    LEVEL POOL ROUTING SUMMARY

HYG Dir           = C:\Users\Keith\Documents\
Inflow  HYG file = work_pad.hyg - POND 30      IN  100 yr
Outflow HYG file = work_pad.hyg - POND 30      OUT 100 yr

Pond Node   Data = POND 30
Pond Volume Data = POND 30
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS
---------------------------------
Starting WS Elev    =   640.30 ft
Starting Volume     =     .000 ac-ft
Starting Outflow    =      .00 cfs
Starting Infiltr.   =      .00 cfs
Starting Total Qout=       .00 cfs
Time Increment      =    .0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY
====================================================
Peak Inflow       =    57.34 cfs    at     .3000 hrs
Peak Outflow      =    54.00 cfs    at     .4000 hrs
----------------------------------------------------
Peak Elevation    =   641.97 ft
Peak Storage =           .285 ac-ft
====================================================
```

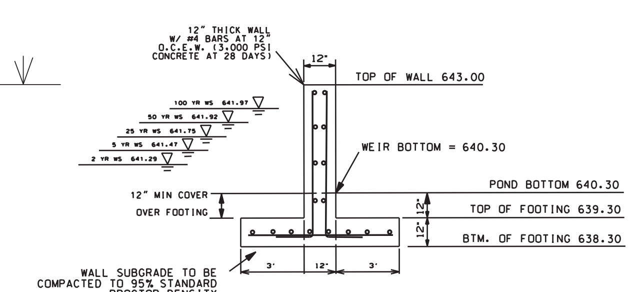
CONCRETE WALL NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,000 PSI AND BE 5% AIR ENTRAINED.
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60.
3. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH ACI 318 & DETAILED IN ACCORDANCE WITH ACI 315.
4. REINFORCING SPLICES SHALL NOT BE LESS THAN 36 BAR DIAMETERS.
5. ALL REINFORCING STEEL SHALL HAVE MIN. 2" COVER FROM FORMS/GROUND.
6. CONCRETE SHALL BE IN PLACE SEVEN DAYS MINIMUM PRIOR TO BACKFILLING.
7. CHAMFER ALL EXPOSED EDGES 3/4" UNLESS NOTED OTHERWISE.



OUTFALL WEIR DETAIL

NOT TO SCALE



OUTFALL WEIR SECTION

NOT TO SCALE

HAMILTON DUFFY, PC
C O N S U L T I N G
CIVIL & ENVIRONMENTAL ENGINEERS · PLANNERS · CONSTRUCTION MANAGERS
8241 MID-CITIES BLVD., SUITE 100 · NORTH RICHLAND HILLS, TEXAS 76182
PHONE (817) 268-0408 FAX (817) 284-8408

SITE CONSTRUCTION PLANS

EDEN ESTATES
CITY OF NORTH RICHLAND HILLS, TEXAS

DETENTON POND B

PRELIMINARY
FOR REVIEW ONLY
THESE DOCUMENTS ARE FOR DESIGN REVIEW AND NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSES. THEY WERE PREPARED BY, OR UNDER SUPERVISION OF:
KEITH M. HAMILTON 87384 $DATE$
PE NO. DATE

NO.	REVISION	BY	DATE

JOB	345-002
DATE	6-6-19
DESIGNED	K.M.H.
DRAWN	J.B.E.
CHECKED	K.M.H.

TEXAS REGISTERED ENGINEERING FIRM NUMBER F-5260

SHEET
C1.01F

N

SCALE 1" = 100'

0 50 100 200

I, Keith M. Hamilton, a Professional Engineer registered in the State of Texas, have prepared this drainage study in compliance with the latest published requirements and criteria of the City of North Richland Hills, and have verified that the topographic information used in this study is in compliance with said requirements and is otherwise suitable for developing theis workable Plan of Drainage which can be implemented through proper subsequent detailed construction planning.

Signature _____, P.E. # 87384

DRAINAGE AREA COMPUTATIONS

BASIS:

Q = CIA (Rational Method)
Q = Storm discharge (cubic feet per second)
C = runoff coefficient, based on land use
I = average rainfall intensity for time of concentration (inches per hour) (per Technical Paper No. 40)
A = area contributing runoff (acres)

RUNOFF COEFFICIENT:

C = 0.30 Parks and Open Areas
C = 0.55 Single Family Residential
C = 1.00 Roofs/Paved Areas

STORM FREQUENCY:

5 Years - Enclosed Pipe System
100 Years - Combined Enclosed Pipe System + Street + R.O.W.

TIME OF CONCENTRATION:

Combination of inlet time and time of flow in the drain being the time for water to flow over the surface of the ground to the storm drain inlet (onsite + offsite, if applicable)

MINIMUM INLET TIME OF CONCENTRATION:

Undeveloped, Park Areas	20 minutes
Residential, Single Family	15 minutes
Commercial, Business	10 minutes

TIME OF CONCENTRATION DETERMINATION:
(AREA B1)

CHANNELIZED FLOW n = 0.030 (short grass)

500' @ 1.3% time = 4.4 min.

Tc = 15 + 4.4 = 19.4 minutes)
(Tc used to determine rainfall intensity "I")

LEGEND

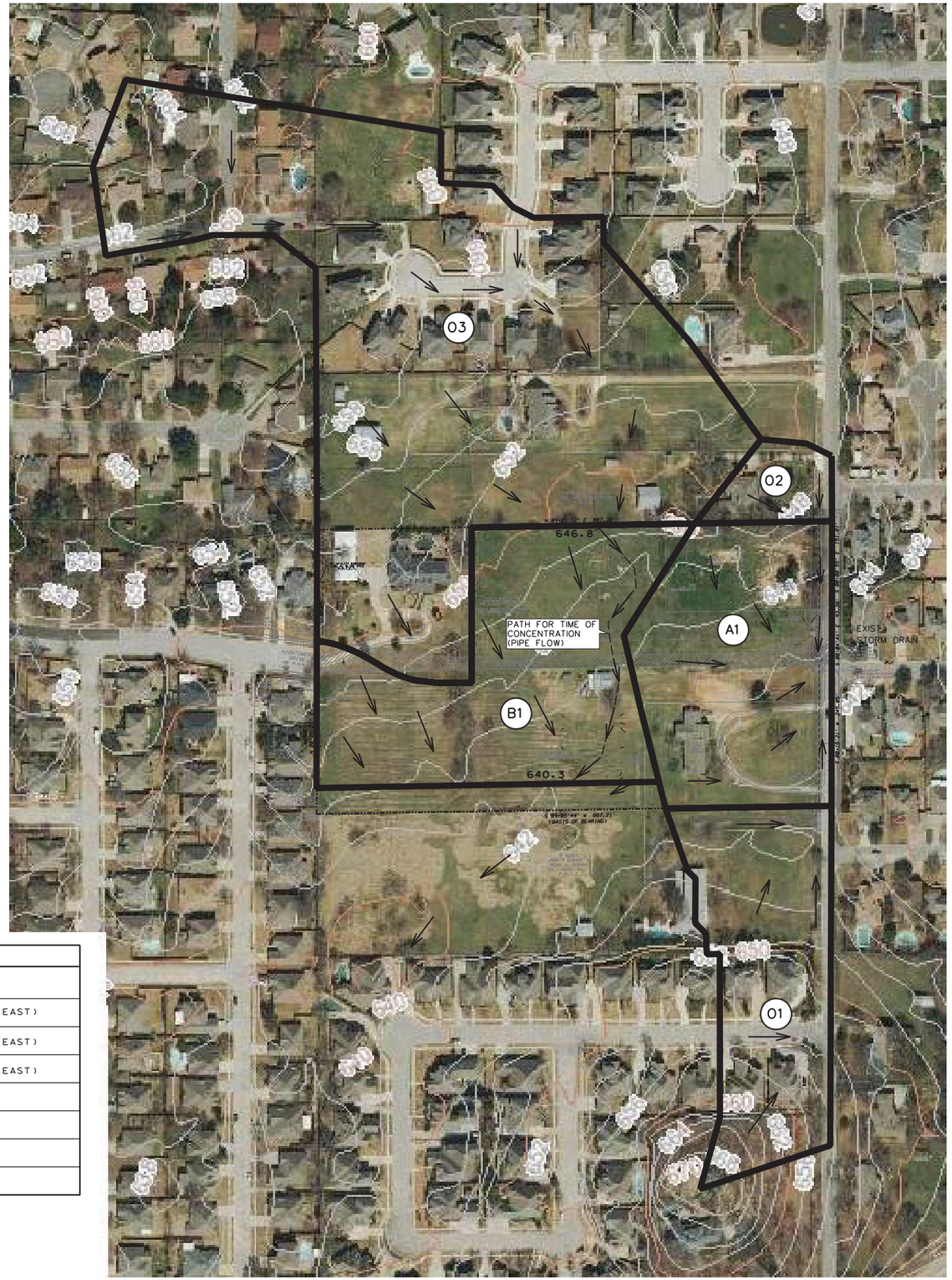
A1 DRAINAGE AREA

DRAINAGE DIVIDE

FLOW DIRECTION ARROW

DRAINAGE NOTES:

1. ALL DRAINAGE DESIGN IS IN ACCORDANCE WITH CITY OF NORTH RICHLAND HILLS DESIGN CRITERIA MANUAL.



PRE-DEVELOPED SITE DRAINAGE DATA

MARK	AREA (AC)	C	Tc (MIN.)	I_2 (IN/HR)	I_5 (IN/HR)	I_{25} (IN/HR)	I_{50} (IN/HR)	I_{100} (IN/HR)	Q_2 (CFS)	Q_5 (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	COMMENTS
O1	3.05	0.55	15	4.4	5.6	7.7	8.7	9.6	7.4	9.4	12.9	14.6	16.1	TO STORM DRAIN (EAST)
O2	0.56	0.55	15	4.4	5.6	7.7	8.7	9.6	1.4	1.7	2.4	2.7	3.0	TO STORM DRAIN (EAST)
A1	3.52	0.46[1]	15	4.4	5.6	7.7	8.7	9.6	7.1	9.1	12.5	14.1	15.5	TO STORM DRAIN (EAST)
O1+O2 +A1	7.13	0.51[2]	15	4.4	5.6	7.7	8.7	9.6	16.0	20.4	28.0	31.6	34.9	TOTAL TO EAST
OS3	12.49	0.55	15	4.4	5.6	7.7	8.7	9.6	30.2	38.5	52.9	59.8	65.9	TO B1
B1	4.37	0.30	15	4.4	5.6	7.7	8.7	9.6	5.8	7.3	10.1	11.4	12.6	TO SOUTH
OS3+B1	16.86	0.49[3]	19.4[4]	3.8	5.0	6.7	7.7	8.4	31.4	41.3	55.4	63.6	69.4	TOTAL TO SOUTH

NOTES:

1. WEIGHTED C = [2.23(0.55)+1.29(0.30)]/3.52 = 0.46
2. WEIGHTED C = [3.61(0.55)+3.52(0.46)]/7.13 = 0.32
3. WEIGHTED C = [12.49(0.55)+4.37(0.30)]/16.86 = 0.49
4. TC = 20 MIN (SEE CALCS THIS SHEET)

HAMILTON DUFFY, PC CONSULTING
CIVIL & ENVIRONMENTAL ENGINEERS - PLANNERS - CONSTRUCTION MANAGERS
8241 MID-CITIES BLVD. - SUITE 100 - NORTH RICHLAND HILLS, TEXAS 76182
PHONE (817) 268-8488 FAX (817) 284-8488

SITE CONSTRUCTION PLANS

EDEN ESTATES
CITY OF NORTH RICHLAND HILLS, TEXAS

PRE-DEVELOPED DRAINAGE AREA MAP

PRELIMINARY
FOR REVIEW ONLY

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KEITH M. HAMILTON 87384 $DATE$
PE NO. DATE

JOB	345-002
DATE	6-6-19
DESIGNED	K.M.H.
DRAWN	J.B.E.
CHECKED	K.M.H.

TEXAS REGISTERED ENGINEERING FIRM NUMBER F-3260

NO.	REVISION	BY	DATE

SHEET
C1.01A

I, Keith M. Hamilton, a Professional Engineer registered in the State of Texas, have prepared this drainage study in compliance with the latest published requirements and criteria of the City of North Richland Hills, and have verified that the topographic information used in this study is in compliance with said requirements and is otherwise suitable for developing theis workable Plan of Drainage which can be implemented through proper subsequent detailed construction planning.

Signature _____, P.E. # 87384

N

SCALE 1" = 60'

0 30 60 120

DRAINAGE AREA COMPUTATIONS

BASIS:

Q = CIA (Rational Method)
Q = Storm discharge (cubic feet per second)
C = runoff coefficient, based on land use
I = average rainfall intensity for time of concentration (inches per hour) (per Technical Paper No. 40)
A = area contributing runoff (acres)

RUNOFF COEFFICIENT:

C = 0.30 Parks and Open Areas
C = 0.55 Single Family Residential
C = 1.00 Roofs/Paved Areas

STORM FREQUENCY:

5 Years - Enclosed Pipe System
100 Years - Combined Enclosed Pipe System + Street + R.O.W.

TIME OF CONCENTRATION:

Combination of inlet time and time of flow in the drain being the time for water to flow over the surface of the ground to the storm drain inlet (onsite + offsite, if applicable)

MINIMUM INLET TIME OF CONCENTRATION:

Undeveloped, Park Areas	20 minutes
Residential, Single Family	15 minutes
Commercial, Business	10 minutes

LEGEND

- A1 — DRAINAGE AREA
- DRAINAGE DIVIDE
- FLOW DIRECTION ARROW

DRAINAGE NOTES:

1. TYPICAL STREET SECTION SHALL BE 31' B-B W/ 6" CURB AND GUTTER (STRAIGHT CROWN AND NOT PARABOLIC)
   Q(STREET) = 584.77*S*0.5 (GUTTER + ½ STREET CAPACITY)
   Q(STREET AT 0.65% MIN. GRADE) = 47.1 CFS
2. ALL DRAINAGE DESIGN IS IN ACCORDANCE WITH CITY OF NORTH RICHLAND HILLS DESIGN CRITERIA MANUAL.

INLET CAPACITY CALCULATIONS

CURB OPENING INLET IN SUMP: $Q/L = 3.0\ Y^{3/2}$

Where:

Q = Storm Drainage Discharge (cfs)
L = Length of Inlet Opening (ft)
Y = (Depth of flow at Opening) (ft)

For 10' Curb Inlet in sump:

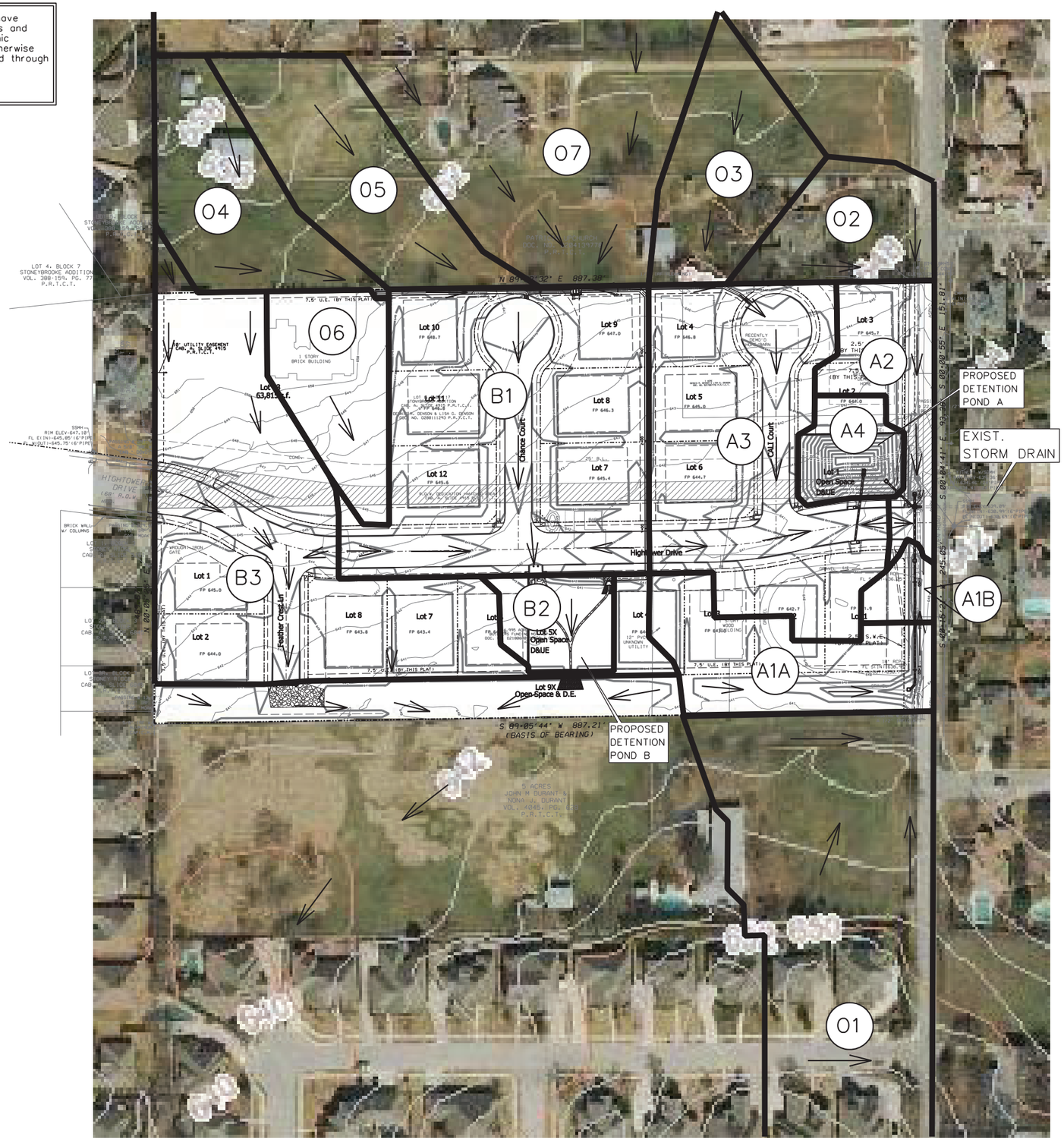
6" Depth (curb depth): Qcap = 10.6 cfs
8" Depth (ROW depth): Qcap = 16.3 cfs

For 3' Drop Inlet:

6" Depth: Qcap = 12.7 cfs
9" Depth: Qcap = 23.4 cfs

For 6' Drop Inlet:

6" Depth: Qcap = 25.5 cfs
9" Depth: Qcap = 46.8 cfs



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POST-DEVELOPED DRAINAGE AREA MAP

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CHECKED	K.M.H.

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NO.	REVISION	BY	DATE

SHEET
C1.01B

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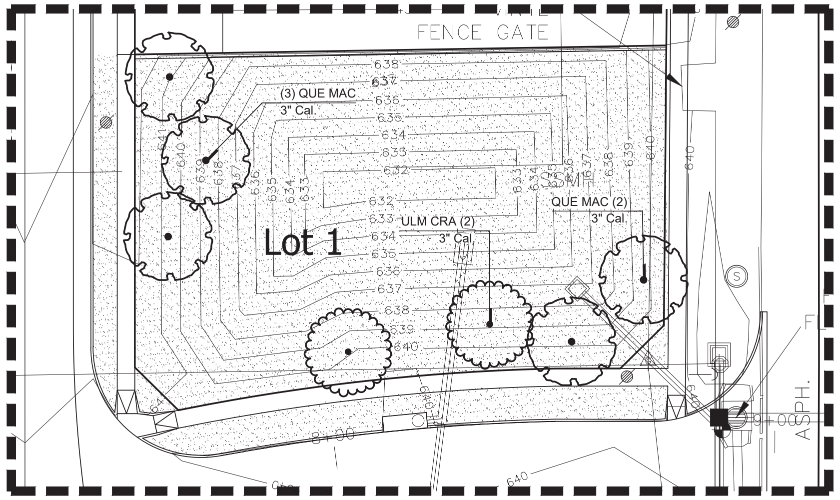
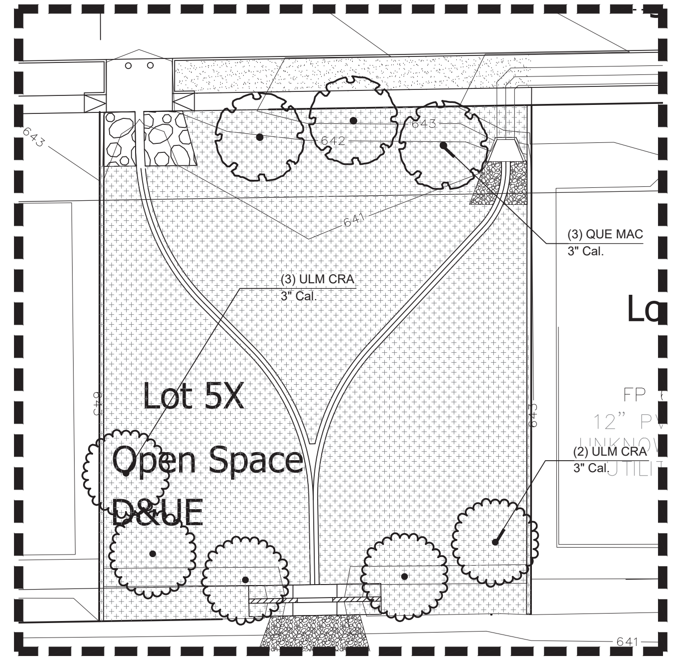
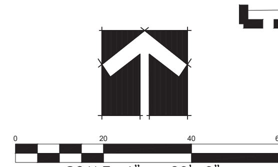
ENLARGEMENT 'A'



NOTE:
ALL LAWN AREA SHALL BE SOLID BERMUDA SOD.

ENLARGEMENT 'B'



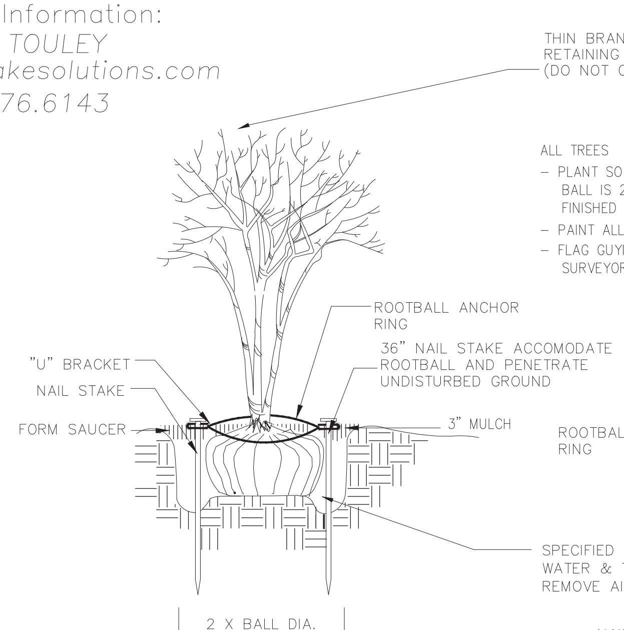


NOTE:
ALL DETENTION PONDS SHALL BE SEEDED WITH Tripsacum dactyloides (Eastern Gamagrass) AT A RATE OF 12 POUNDS PER ACRE. CONTRACTOR SHALL WATER UNTILL ESTABLISHED AND ACCEPTED BY OWNER.

NORTH RICHLAND HILLS LANDSCAPE REQUIREMENTS		
REQUIRED DETENTION POND LANDSCAPING	ONE TREE PER 50 PERIMETER FT.	
	REQUIRED	PROVIDED
	360 LF / 50 = 7 TREES	7 TREES

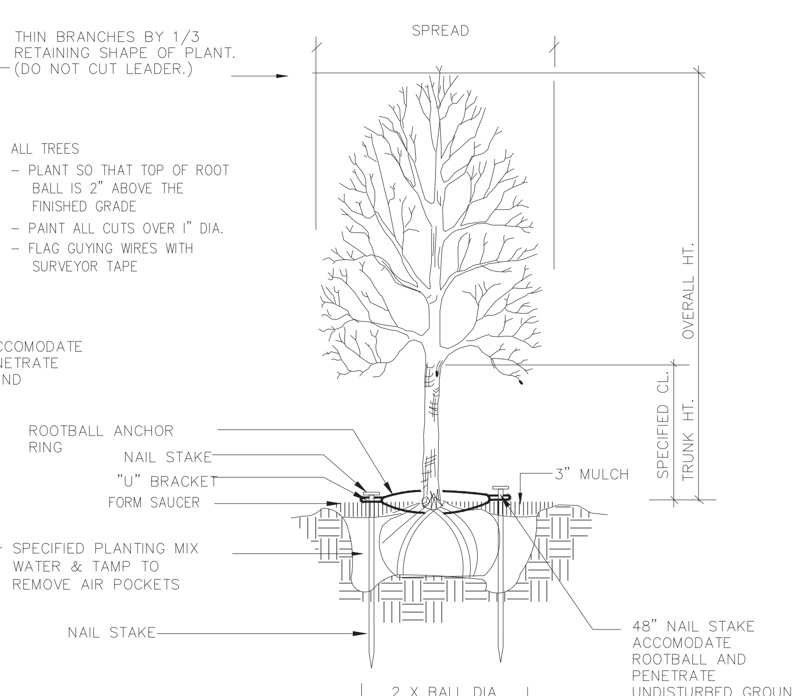
NORTH RICHLAND HILLS LANDSCAPE REQUIREMENTS		
REQUIRED DETENTION POND LANDSCAPING	ONE TREE PER 50 PERIMETER FT.	
	REQUIRED	PROVIDED
	395 LF / 50 = 8 TREES	8 TREES

Contact Information:
JEFF TOULEY
www.treestakesolutions.com
903.676.6143



STAKING FOR MULTI-TRUNK TREES & TREES 2" CAL. & UNDER

SCALE: NOT TO SCALE



SAFETY STAKE BY TREE STAKE SOLUTIONS

SCALE: NOT TO SCALE

PLANTING NOTES:

1. PLANT SIZE, TYPE, AND CONDITION SUBJECT TO APPROVAL OF OWNER'S REPRESENTATIVE.
2. ALL PLANT MATERIAL TO BE NURSERY GROWN STOCK.
3. CONTRACTOR RESPONSIBLE FOR MAINTENANCE OF ALL PLANT MATERIAL UNTIL PROJECT ACCEPTANCE.
4. ALL CONTAINER GROWN PLANTS TO HAVE FULL, VIGOROUS ROOT SYSTEM, COMPLETELY ENCOMPASSING CONTAINER.
5. ALL PLANTS WELL ROUNDED AND FULLY BRANCHED. ALL TREES WITH SPREAD 2/3 OF HEIGHT.
6. CONTRACTOR TO PROVIDE OWNER WITH PREFERRED MAINTENANCE SCHEDULE OF ALL PLANTS AND LAWNS.
7. MAINTAIN/PROTECT VISIBILITY TRIANGLE WITH PLANT MATERIAL PER CITY STANDARDS AT ALL ENTRANCES TO SITE.
8. PREP ENTIRE WIDTH OF ALL DEFINED PLANTING BEDS WITH MIX AS OUTLINED IN SPECS. WHERE SHRUBS ARE LOCATED ALONG CURB, SET SHRUBS BACK FROM CURB 3 FT.
9. SEE DETAIL SHEET FOLLOWING FOR PLANTING DETAILS.
10. CONTRACTOR RESPONSIBLE FOR LOCATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO TELEPHONE, TELECABLE, ELECTRIC, GAS, WATER AND SEWER. ANY DAMAGE TO UTILITIES TO BE REPAIRED BY CONTRACTOR AT NO COST TO OWNER.
11. IF EXISTING TREES ARE SHOWN TO REMAIN, CONTRACTOR SHALL PRUNE AS DIRECTED BY OWNER'S REPRESENTATIVE. WORK TO INCLUDE REMOVAL OF ALL SUCKER GROWTH; DEAD AND DISEASED BRANCHES AND LIMBS; VINES, BRIARS AND OTHER INVASIVE GROWTH; AND ALL INTERFERING BRANCHES. MAKE ALL CUTS FLUSH TO REMAINING LIMB. RETAIN NATURAL SHAPE OF PLANT. ALL WORK SUBJECT TO APPROVAL OF OWNER'S REPRESENTATIVE.
12. QUANTITIES ARE PROVIDED AS A COURTESY AND NOT INTENDED FOR BID PURPOSES. CONTRACTOR TO VERIFY PRIOR TO PRICING.
13. INSTALL EDGING BETWEEN LAWN AND PLANTING BEDS. REFER TO SPECIFICATIONS. FILE ALL CORNERS SMOOTH.
14. INSTALL CURLEX BLANKET (OR EQUAL) PER MANUFACTURES INSTRUCTIONS ON ALL GROUNDCOVER/SHRUB BEDS WITH A SLOPE OF 4;1 OR GREATER.
15. AT TIME OF PLAN PREPARATION, SEASONAL PLANT AVAILABILITY CANNOT BE DETERMINED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SECURE AND RESERVE ALL B&B PLANTS WHEN AVAILABLE IN CASE ACTUAL INSTALLATION OCCURS DURING THE OFF-SEASON. PURCHASE AND HOLD B&B PLANTS FOR LATE SEASON INSTALLATION.
16. CONTRACTOR SHALL STAKE ALL TREE LOCATIONS FOR OWNER APPROVAL PRIOR TO PLANTING.
16. BERM ALL PARKING LOT ISLANDS AS SHOWN ON ENCLOSED DETAIL SHEET. (BERMS MAY NOT BE SHOWN ON GRADING PLAN.)
17. NO PLANTINGS WITHIN 18" OF PARKING LOT CURBS.
18. CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING TREE AND SHRUB SIZES CONFORM TO CITY LANDSCAPE STANDARDS AND MITIGATION REQUIREMENTS.

PLANT SCHEDULE

TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	HEIGHT	SPACING		QTY	REMARKS
	QUE MAC	Quercus macrocarpa	Burr Oak	3" Cal.	12` Min Ht	As Shown		8	Single Straight Trunk
	ULM CRA	Ulmus crassifolia	Cedar Elm	3" Cal.	12` Min Ht	As Shown		8	Single Straight Trunk
GROUND COVERS	CODE	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING	SPACING	QTY	REMARKS
	CYN DAC	Cynodon dactylon	Bermuda Grass	---	Hydro-Mulch			11,023 sf	
	TRI FAK	Tripsacum dactyloides	Fakahatchee Grass	seed				10,400 sf	

TEMPORARY IRRIGATION WILL BE REQUIRED TO ESTABLISH TURF IN ALL DISTURBED AREAS WITHOUT A PERMANENT IRRIGATION SYSTEM. INSTALL SOD TO ESTABLISH TURF IN ALL DISTURBED AREAS AS IDENTIFIED ON GRADING AND EROSION CONTROL PLANS.

BEFORE YOU DIG
Texas 811

CAUTION!!!
UNDERGROUND UTILITIES ARE LOCATED IN THIS AREA. 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES, CONTACT LINE LOCATES FOR FRANCHISE UTILITY INFO.
CALL BEFORE YOU DIG:
TEXAS EXCAVATION SAFETY SYSTEM (TESS)
1-800-344-8377
TEXAS ONE CALL SYSTEMS
1-800-245-4545
LONE STAR NOTIFICATION CENTER
1-800-669-8344 EXT. 5

BEFORE YOU DIG...

LANDSCAPE PLAN

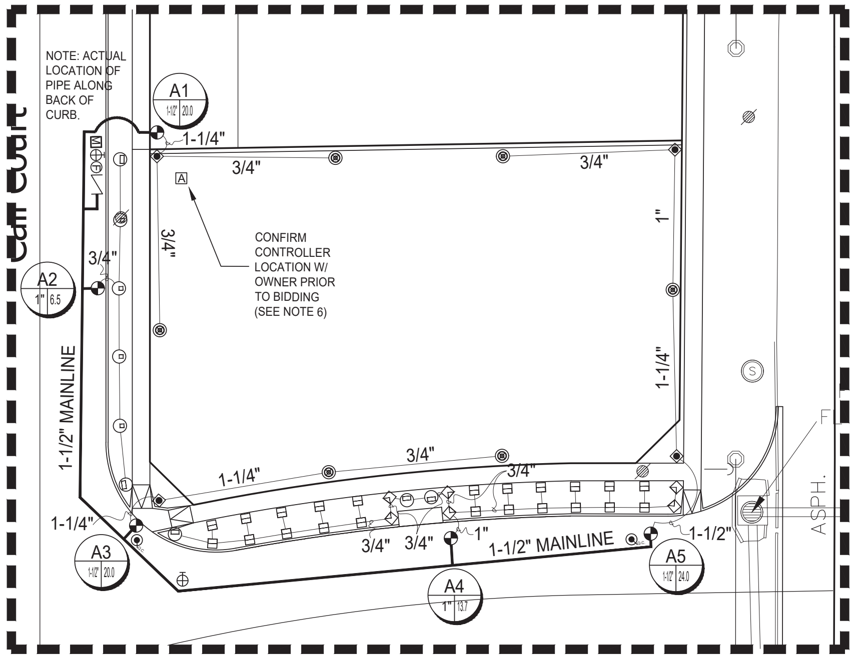
Date AUG 9, 2019
Drawn By GAC
Checked By GAC
Revisions

FAIN • CUPPETT
LANDSCAPE ARCHITECTS, LLC
8233 Mid Cities Blvd. Suite B
North Richland Hills, TX 76182-4761 817-479-0730
PARKS AND OPEN SPACE PLANNING • LANDSCAPE ARCHITECTURE • IRRIGATION DESIGN

EDEN ESTATES
HIGHTOWER DRIVE
NORTH RICHLAND HILLS, TX

Sheet No.
L-2

ENLARGEMENT 'A'



HYDRAULIC CALCULATIONS SPRAY ZONE A5

AVAILABLE PRESSURE 55 PSI (ESTIMATED)
24.0 GALLONS PER MINUTE

- *1" METER – 3.4 PSI*
- *1-1/2" DCVA – 6.1 PSI*
- *1-1/2" WYE – 0.2 PSI*
- *1-1/2" MAIN LINE LOSS (228') – 2.5 PSI*
- *ELECTRIC CONTROL VALVE – 1.5 PSI*
- *IN-LINE BALL VALVE – 0.5 PSI*
- *ZONE LOSS – 2.5 PSI*
- *ELEVATION CHANGE – 0.0 PSI*
- *FITTING ESTIMATE – 1.7 PSI*

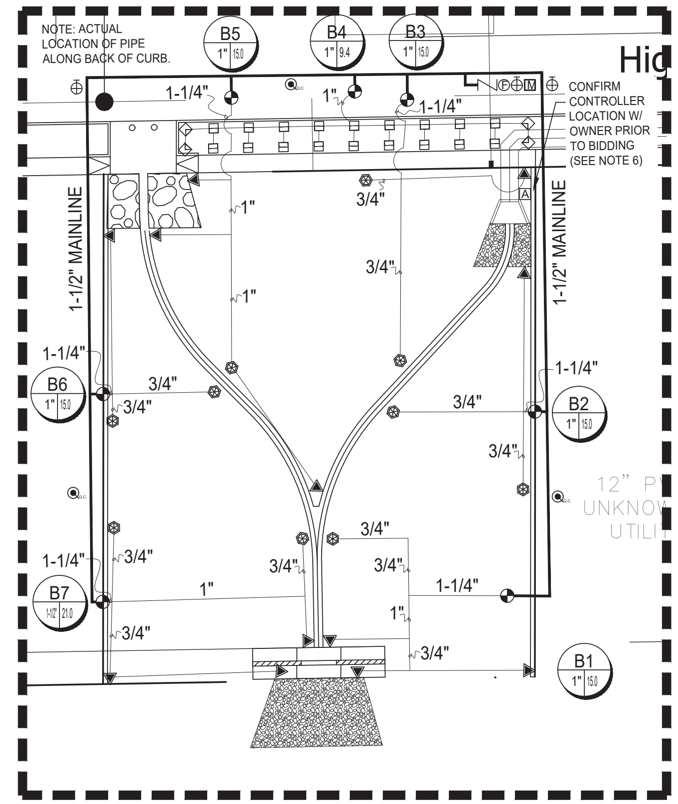
OPERATING PRESSURE – 31.6 PSI

Irrigation Equipment Table

Qty	Sym	Equipment
5		*HUNTER ICV (size as indicated) w/ACCUSYNC* • *LEMA1600HE Solenoid (Each Control Valve)* • *30-922 Adapter (Contractor to verify compatibility)*
1	A	*LEIT 4006 Solar Controller with* • *MCOL 4000 (32") Mounting Column* • *LEIT KEY Programer–Provide to owner* • *SKIT 8821-4 Sensor Interface* • *HUNTER Rain/Freeze CLIC*
1		*1-1/2" FEBCO Double Check/Gate*
1	F	*1-1/2" FEBCO 650A Wye Strainer*
2		*Inline Ball Valve size to match mainline*
1	M	*1" Meter*
2		*QUICK COUPLER VALVE*
6		*HUNTER PGP Ultra 12-CV Blue Standard 8.0 Nozzle ADJ*
4		*HUNTER PGP Ultra 12-CV Blue Standard 4.0 Nozzle ADJ*
5		*HUNTER Pro-Spray Strip Pattern LCS/RCS/ES – 515 EST*
4		*HUNTER Pro-Spray Strip Pattern SS-530 SST*
6		*HUNTER Pro-Spray 8' Nozzle 8 (Brown) 090*
22		*HUNTER Pro-Spray 8' Nozzle 8 (Brown) 180*

ALL HEADS SHALL BE EQUIPPED WITH CHECK VALVES

ENLARGEMENT 'B'



HYDRAULIC CALCULATIONS SPRAY ZONE B7

AVAILABLE PRESSURE 55 PSI (ESTIMATED)
21.0 GALLONS PER MINUTE

- *1" METER – 2.8 PSI*
- *1-1/2" DCVA – 6.1 PSI*
- *1-1/2" WYE – 0.2 PSI*
- *1-1/2" MAIN LINE LOSS (187') – 1.7 PSI*
- *ELECTRIC CONTROL VALVE – 1.5 PSI*
- *IN-LINE BALL VALVE – 0.5 PSI*
- *ZONE LOSS – 3.0 PSI*
- *ELEVATION CHANGE – 0.0 PSI*
- *FITTING ESTIMATE – 1.6 PSI*

OPERATING PRESSURE – 37.6 PSI

Irrigation Equipment Table

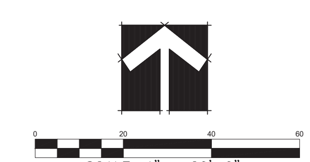
Qty	Sym	Equipment
7		*HUNTER ICV (size as indicated) w/ACCUSYNC* • *LEMA1600HE Solenoid (Each Control Valve)* • *30-922 Adapter (Contractor to verify compatibility)*
1	A	*LEIT 4008 Solar Controller with* • *MCOL 4000 (32") Mounting Column* • *LEIT KEY Programer–Provide to owner* • *SKIT 8821-4 Sensor Interface* • *HUNTER Rain/Freeze CLIC*
1		*1-1/2" FEBCO Double Check/Gate*
1	F	*1-1/2" FEBCO 650A Wye Strainer*
3		*Inline Ball Valve size to match mainline*
1	M	*1" Meter*
3		*QUICK COUPLER VALVE*
4		*HUNTER Pro-Spray 8' Nozzle 8 (Brown) 090*
18		*HUNTER Pro-Spray 8' Nozzle 8 (Brown) 180*
12		*HUNTER PGP Ultra 12-CV Blue Standard 3.0 Nozzle ADJ*
10		*HUNTER PGP Ultra 12-CV Blue Standard 6.0 Nozzle ADJ*

ALL HEADS SHALL BE EQUIPPED WITH CHECK VALVES

IRRIGATION NOTES:

1. IRRIGATION LINES ARE SOMETIMES SHOWN OUTSIDE PLANTING BEDS FOR GRAPHIC CLARITY ONLY. ADJUST INSIDE BEDS ON SITE.
2. AVOID TRENCHING WITHIN DRIP LINE OF EXISTING TREES. WHERE NECESSARY, TRENCH RADIALLY, RATHER THAN ACROSS THE ROOT SYSTEM.
3. MAIN LINE TO BE 1-1/2".
4. ALL SLEEVES UNDER PAVING TO EXTEND 12" PAST EDGE OF PAVING. COORDINATE WORK WITH GENERAL AND PAVING SUBCONTRACTOR.
5. ALL HEADS TO BE 4" POPS IN LAWNS. ALL HEADS WITH CHECK VALVES.
6. COORDINATE SLEEVE SIZE AND LOCATION FOR FREEZE SENSOR, RAIN GAUGE AND CONTROLLER WITH GENERAL CONTRACTOR. SEAL ALL BUILDING PENETRATIONS WATER TIGHT.
7. SEE FOLLOWING DETAIL SHEET FOR IRRIGATION DETAILS.
8. PRESSURE ESTIMATED AT 55 PSI; MINIMUM 50 GPM AS PROVIDED BY CITY. VERIFY ON SITE AND REPORT TO LANDSCAPE ARCHITECT PRIOR TO BEGINNING ANY WORK.
9. CONTRACTOR RESPONSIBLE FOR LOCATION OF ALL UTILITIES INCLUDING BUT NOT LIMITED TO TELEPHONE, TELECABLE, ELECTRIC, GAS, WATER, AND SEWER. ANY DAMAGE TO UTILITIES TO BE REPAIRED BY CONTRACTOR AT NO COST TO OWNER. REFER TO SITE/UTILITY PLANS.
10. VERIFY 100% COVERAGE OF SYSTEM OVER ALL PLANTING & LAWN AREAS AS SHOWN ON DRAWINGS.
11. IF PEDESTAL MOUNTED CONTROLLER IS SPECIFIED, MOUNT ON 4"X3'X3' CONCRETE SLAB WITH (4) #4'S EACH WAY. SLEEVE THROUGH SLAB FOR CONTROLLER WIRING AS REQUIRED.
12. UNLESS NOTED OTHERWISE, THERE ARE NO EXISTING SLEEVES. IRRIGATION CONTRACTOR TO SIZE AND COORDINATE SLEEVE INSTALLATION AS NEEDED IN ALL LOCATIONS UNDER PAVEMENT.
13. QUANTITES ARE PROVIDED AS A COURTESY AND ARE NOT INTENDED FOR BID PURPOSES. CONTRACTOR TO VERIFY ALL QUANTITIES PRIOR TO BIDDING.
14. IF DOUBLE CHECK IS PROHIBITED BY LOCAL CODE/ORDINANCE, SUBSTITUTE WITH APPROVED BACKFLOW PREVENTION DEVICE.
15. ALL WORK IN ACCORDANCE WITH LOCAL, STATE, & NATIONAL CODES & ORDINANCES.
16. CONTRACTOR TO SIZE CONTROL SIZE WIRE AS NECESSARY. HOWEVER, MINIMUM SIZE TO BE 14 GAUGE PER NATIONAL ELECTRICAL CODE. ALL SPLICES WITH APPROVED MANUFACTURED CONNECTOR IN VALVE BOX.
17. DO NOT LOCATE VALVE BOXES IN SWALES, LOW AREAS, OR ANY OTHER LOCATIONS THAT MAY COLLECT WATER.
18. CONTROLLER TO BE WIRED ON DEDICATED 110 VOLT CIRCUIT AND GROUNDED W/"GROUNDING SPIKE" PER MANUFACTURER'S INSTRUCTIONS.
19. ADJUST HEADS TO AVOID OVERSPRAY ONTO STREETS, ROADWAYS, BUILDINGS AND ELECTRICAL EQUIPMENT.
20. INCLUDE ONE SPARE WIRE FROM CONTROLLER TO EACH CONTROL VALVE. EACH WIRE TO BE VARYING COLOR.
21. CONTRACTOR IS RESPONSIBLE FOR ADJUSTING FLOW CONTROL AND/OR PRESSURE REGULATOR AT EACH CONTROL VALVE AS NECESSARY TO MAKE SYSTEM OPERATE AS INTENDED.
22. DRIP IRRIGATION IS INTENDED TO MAINTAIN ESTABLISHED PLANT MATERIAL. CONTRACTOR SHALL HAND WATER AND MAINTAIN NEW PLANTINGS AS REQUIRED UNTIL ESTABLISHMENT AND ACCEPTANCE.

NOTE: INCLUDE (2) TORO SB-90-PC2 STREAM BUBBLERS TO EACH NEW TREE. ATTACH EACH BUBBLER TO TORO 570-6" POPUP. LOCATE BUBBLERS INSIDE TREE WELL OF EACH TREE ON OPPOSITE SIDES OF THE ROOT BALL. ALL BUBBLERS TO BE ZONED SEPARATELY FROM OTHER HEADS. CONTRACTOR RESPONSIBLE FOR PIPE SIZING, SLEEVING, ETC. AND ALL OTHER REQUIREMENTS TO MAKE CIRCUIT(S) OPERABLE. TOTAL COUNT FOR BUBBLERS AND VALVE(S) NOT SHOWN IN IRRIGATION KEY. IF TREE IS LOCATED IN DRIP ZONE, IN LIEU OF BUBBLER USE (2) RAIN BIRD SXB-180-025 XERI-BUBBLERS W/SXB-180-SPYK SPIKE TIED INTO EMITTER TUBING.



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IRRIGATION PLAN

Date AUG 9, 2019
Drawn By GAC
Checked By GAC
Revisions

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8233 Mid Cities Blvd. Suite B
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PARKS AND OPEN SPACE PLANNING • LANDSCAPE ARCHITECTURE • IRRIGATION DESIGN

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