MARBLE FALLS
Independent School District

Meeting Date: 8/18/2025 **Date Submitted:** 7/25/2025

Meeting Type: Regular Meeting **Agenda Placement:** Presentation/Discussion Items

Subject:
HLES Driveway and Pond Improvements

Executive Summary:

The following is a summary of LCRA Water Quality BMP Improvements that have been required for previous and current development on the Highland Lakes Elementary School Site. Note that current LCRA requirements significantly exceed BMP designs provided for previous development on the site. Refer to Attachments A-C for plans previously approved by LCRA. During review of the currently proposed site improvements, LCRA also required additional levels of design detail with direct cost implications. Refer to Attachments D-F for design progression through LCRA review. Refer to Attachment G for LCRA Comment Response Letters. Refer to Attachment H for Additional Required LCRA Permit Documentation. Some requests from LCRA, including an underdrain system in Pond 2, were waived through coordination during site review.
2025 Approved LCRA Plans
o ~24,300 Natural Vegetated Filter Strips
o ~9,800 Engineered Vegetated Filter Strips
o ~11,800 SF of Bioretention Rehabilitation and Extension Grading 18" filtration media

This will be additional scope to American Constructors work at Highland Lakes Elementary driveway per LCRA.

Fiscal Impact:	Funding Source:	Fiscal Year:	Amendment Required?
One-Time	Bond Funds	2025-2026	NO

Administration's Recommendation:

I move that the board approve $251,766.00 for American Constructors to make improvement to Highland Lakes Elementary School for the added scope required from LCRA.

Submitted By: Mackie Price

Presenter: Stan Whittle

Board Approval Required: YES

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

LEGEND

- PROPOSED IMPROVEMENTS
- VEGETATIVE STRIP
- BIORETENTION POND

Impervious Cover		
Existing	28.50%	138,957 SF
Proposed	35.90%	173,369 SF
Difference	7.40%	34,413 SF

Highland Lakes Elementary Proposed BMP Improvements

Granite Shoals, Texas
December 12, 2024

Kimley»Horn
6800 Burleson Road, Building 312, Suite 150
AUSTIN, TX 78744
512-646-2237
STATE OF TEXAS REGISTRATION NO. F-928

PROPOSAL

Date: 07/09/25

Owner: Marble Falls ISD
1800 Colt Circle
Marble Falls, Texas 78654

Contractor: American Constructors
11900 West Parmer Lane
Cedar Park, Texas 78613

Project: Highland Lakes ES Drive Lane Pond Improvements

Scope of Work Includes:

1. Expand biorention pond and create additional pond per LCRA revisions

List of Plans / Specifications:

Permit set issued July 2025

Exclusions / Clarifications

1. Relocation or repair of underground utilities that are not shown
2. All work during normal business hours
3. Rock that is not rippable
4. Damage to existing paving caused by normal construction traffic

Total Amount of Proposal **$251,766**

Proposal is valid for 30 days from the date listed. Proposal assumes all areas will be available so work can proceed, uninterrupted to completion. All work to be done during normal hours unless otherwise noted in the proposal.

Accepted by:

Signature _____ Date _____

Printed name _____ Title _____

Item	Description	Amount
1	**Engineering and Permitting for Pond**	**$14,700**
2	**Ponds and pond internals**	**$162,000**
3	**Pond Rip Rap**	**$38,400**
4	**Gabion wall**	**$4,400**
5	**Splash pad for gabion wall**	**$3,300**
6	**Traffic Control**	**$2,500**
7	**Surveying**	**$4,653**
8	**Supervision**	**$0**
	Subtotal	$229,953
	Fee	$11,498
	Subtotal	$241,451
	Bonds & Insurance	$10,315
	Total	**$251,766**

July 10, 2025

Mackie Price
Marble Falls Independent School District
1800 Colt Circle
Marble Falls, TX 78654

RE: Highland Lakes Elementary School
LCRA Required Water Quality BMP Improvements
APPLICATION #2025-5809

Mr. Price,

We've prepared the following summary of LCRA Water Quality BMP Improvements that have been required for previous and current development on the Highland Lakes Elementary School Site. Note that current LCRA requirements significantly exceed BMP designs provided for previous development on the site. Refer to Attachments A-C for plans previously approved by LCRA. During review of the currently proposed site improvements, LCRA also required additional levels of design detail with direct cost implications. Refer to Attachments D-F for design progression through LCRA review. Refer to Attachment G for LCRA Comment Response Letters. Refer to Attachment H for Additional Required LCRA Permit Documentation. Some requests from LCRA, including an underdrain system in Pond 2, were waived through coordination during site review.

Changes to scope and level of design:

- 1997 Existing Conditions
  - Pond section included only final grade design to provide water quality volume, no filter media.
- 2018 Improvements
  - Additional impervious cover did not require any improvements to the existing pond.
- 2019 Improvements
  - Expanded natural vegetated filter strips provided for increase in impervious cover.
- 2024 Concept Plan
  - ~ 35,000 SF Natural Vegetated Filter Strips
  - ~10,400 SF Bioretention rehabilitation and extension
- 2025 Initial LCRA Submittal
  - ~34,000 SF Natural Vegetated Filter Strips
  - ~11,800 SF of Bioretention Rehabilitation and Extension
    - Grading
    - 2 ft of filter media
- 2025 Approved LCRA Plans
  - ~24,300 Natural Vegetated Filter Strips
  - ~9,800 Engineered Vegetated Filter Strips
  - ~11,800 SF of Bioretention Rehabilitation and Extension
    - Grading
    - 18" filtration media

- 6” sand
- Underdrain section
    - 625 LF 6” PVC
    - (8) 6” Cleanouts
    - Filter fabric
    - River gravel aggregate
    - Threaded cap with orifice
- 3000 SF Rip Rap Protection
- 92 LF Rock Berm with steel cage and Concrete Splash Pad

Should you have any questions or require additional information, please do not hesitate to contact me at (512) 518-6529 or Lexie.England@kimley-horn.com.

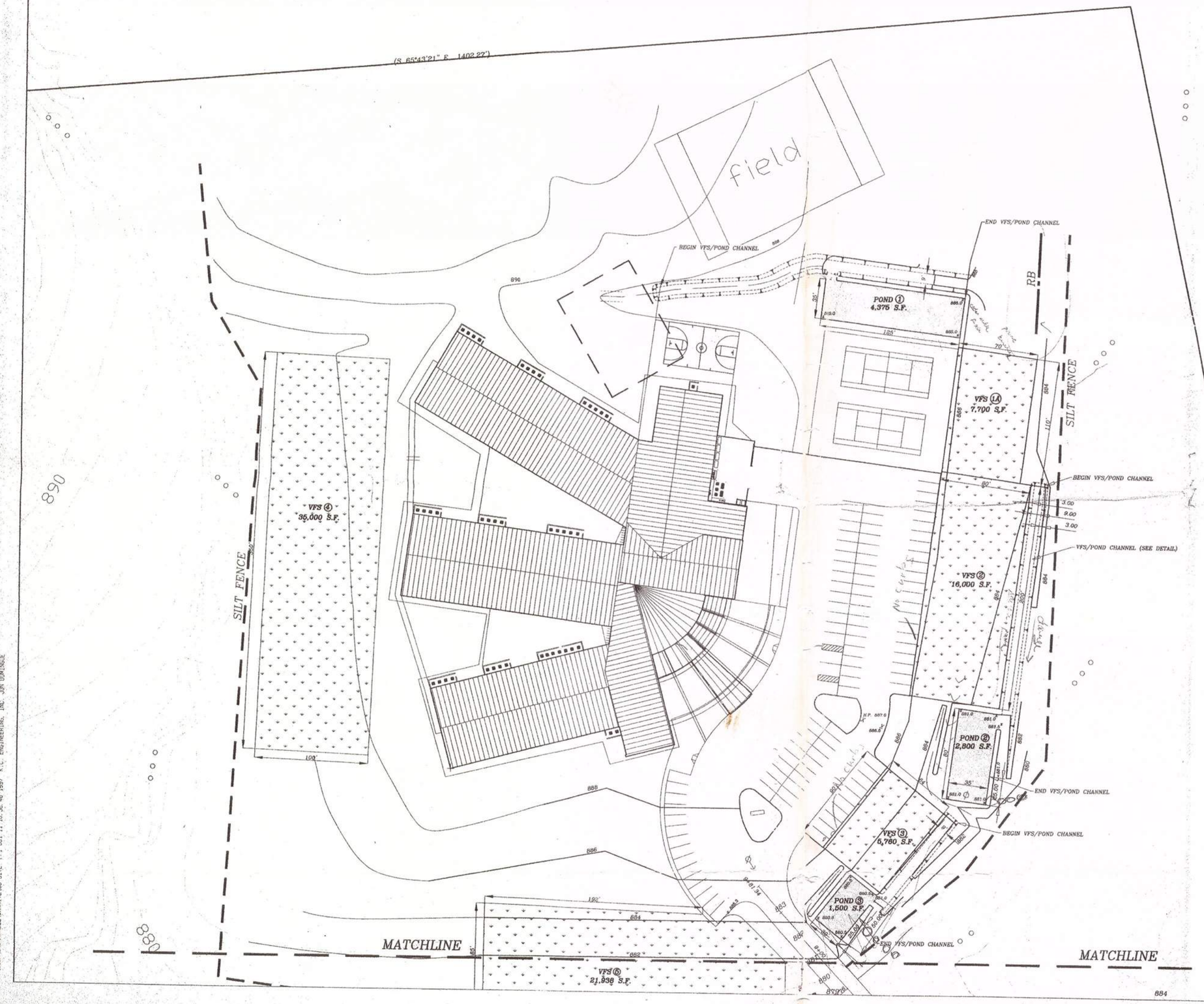
Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Lexie England, P.E.
Associate

Attachment A: 1997 Pond Plan with Existing Pond Level of Design
Attachment B: 2018 Drainage Area Map
Attachment C: 2019 Drainage Area Map
Attachment D: LCRA Approved BMP Concept Plan
Attachment E: Initial LCRA Submittal BMP Plans
Attachment F: Approved LCRA BMP Plans
Attachment G: LCRA Comment Response Letters
Attachment H: Additional Required LCRA Permit Documentation

ATTACHMENT A



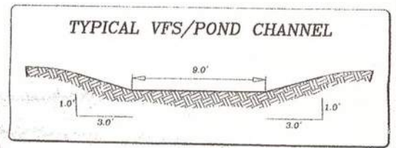
GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

CONSTRUCTION SEQUENCING

1. INSTALL TEMPORARY EROSION CONTROLS PRIOR TO ANY CLEARING OR GRUBBING.
2. BEGIN CLEARING AND GRUBBING OPERATIONS.
3. EXCAVATE FOR BIORETENTION PONDS.
4. INSTALL WATER AND WASTEWATER LINES, AND THEIR APPURTENANCES, AND OTHER UTILITIES.
5. POND CONSTRUCTION CAN PROCEED CONCURRENTLY WITH OTHER CONSTRUCTION ACTIVITY.
6. REGRADE PARKING AREAS TO SUBGRADE.
7. LAY FIRST COURSE OF BASE MATERIAL ON ALL PARKING AREAS.
8. INSTALL CURB AND GUTTER.
9. LAY PAVING.
10. COMPLETE PERMANENT EROSION CONTROL AND RESTORATION OF THE SITE.
11. REMOVE AND DISPOSE OF TEMPORARY EROSION CONTROLS.
12. ANY FINAL DRESS UP OF AREA DISTURBED BY ITEM 11.

TYPICAL VFS/POND CHANNEL



K.C. ENGINEERING, INC.
CONSULTING ENGINEERS AND SURVEYORS
4601 SOUTH LAMAR BLVD., SUITE 230 AUSTIN, TEXAS 78745
OFFICE: (512) 892-5585 FAX (512) 892-5586

GRANITE SHOALS ELEMENTARY
MARBLE FALLS ISD
EROSION/SEDIMENTATION CONTROL

The seal appearing on this document was authorized by Lawrence M. Hanrahan on JULY 10, 1997

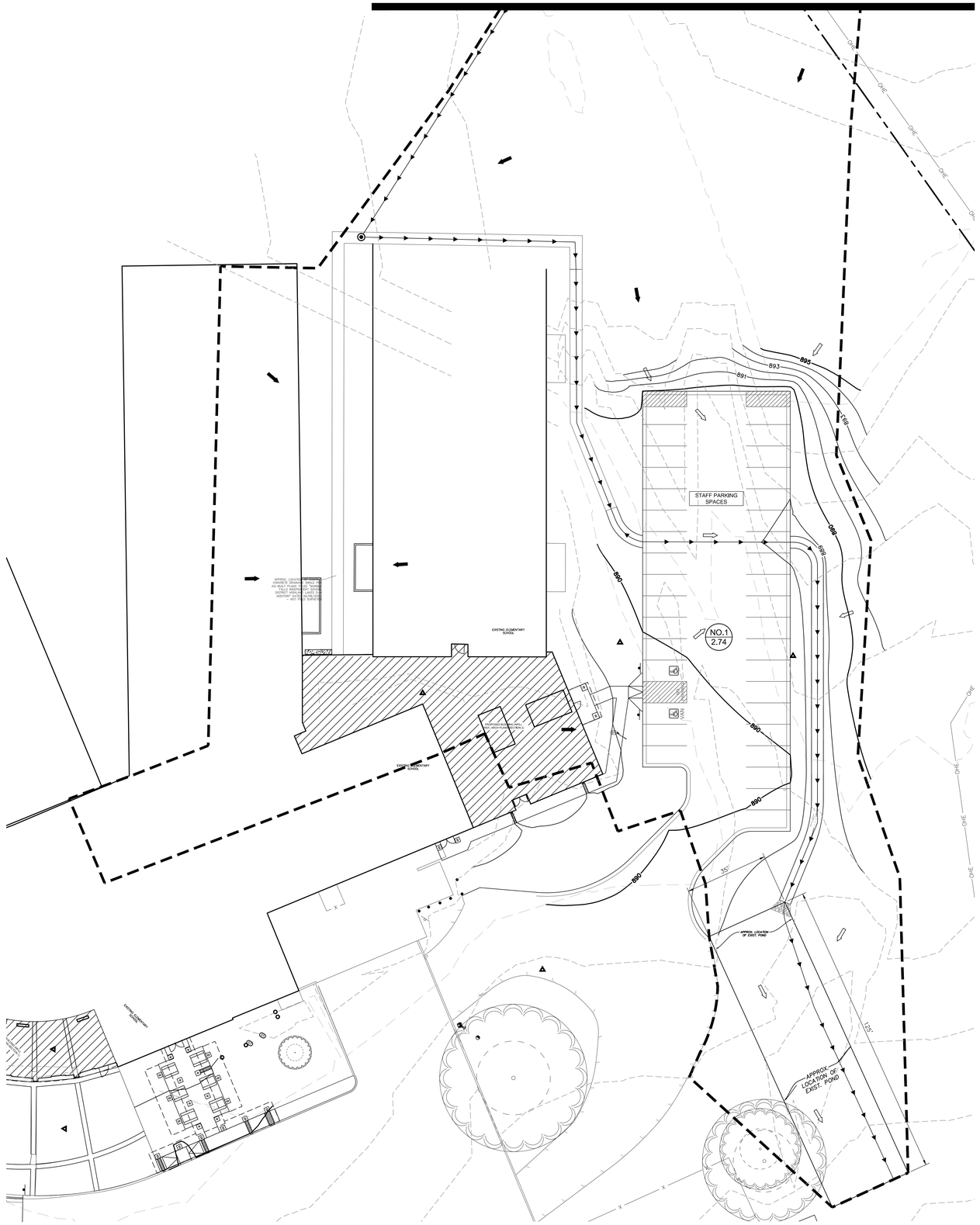
STATE OF TEXAS
LAWRENCE M. HANRAHAN
58474
REGISTERED PROFESSIONAL ENGINEER

File: N:\SDSK\ENG\MARBLE\GRANITE\05-SITE	
Job No. 416-97004	Field Book No. 000 Pg.0
Scale (Hor.): 1"=40'	SCALE (Vert.): 1"=4'
Issue Date: 07/10/97	Checked By: LH Drawn By: JD
Revision No. Date	Remarks
1	
2	
3	
4	

SHEET
01 of 03

ATTACHMENT B

SEE MATCHLINE THIS SHEET



SEE MATCHLINE THIS SHEET

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

LEGEND

885	EXISTING CONTOURS
885	PROPOSED CONTOURS
	DRAINAGE BOUNDARY
	TIME OF CONCENTRATION
	EXISTING FLOW DIRECTION
	PROPOSED FLOW DIRECTION
NO.3 0.79	DRAINAGE BASIN NAME DRAINAGE BASIN AREA

PROPOSED IMPERVIOUS COVER PERCENTAGE

BASIN	AREA (ACRES)	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS) (ACRES)	PERVIOUS (GRASS: FAIR CONDITION 2-7%) (ACRES)	IMPERVIOUS COVER % (IC%)
No. 1	2.74	0.92	1.82	33.6%

CAUTION!!

EXISTING UNDERGROUND UTILITIES IN THE AREA. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS TO EXISTING UTILITIES DUE TO DAMAGE INCURRED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES ON THE PLANS.

811
Know what's **below.**
Call before you dig.

BENCHMARK LIST

BM #50 X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV.=890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

Project:
ADDITION AND RENOVATION
TO
HIGHLAND LAKES ELEMENTARY SCHOOL
MARBLE FALLS I.S.D.
GRANITE SHOALS, TEXAS

Kimley»Horn
© 2019 KIMLEY-HORN AND ASSOCIATES, INC.
601 NW LOOP 410, SUITE 350, SAN ANTONIO, TX 78216
PHONE: 210-541-9166 FAX: 210-541-8699
WWW.KIMLEY-HORN.COM TBPE FIRM NO. 928

STATE OF TEXAS
RICHARD UNDERWOOD
117843
REGISTERED
PROFESSIONAL
ENGINEER
8/16/2019

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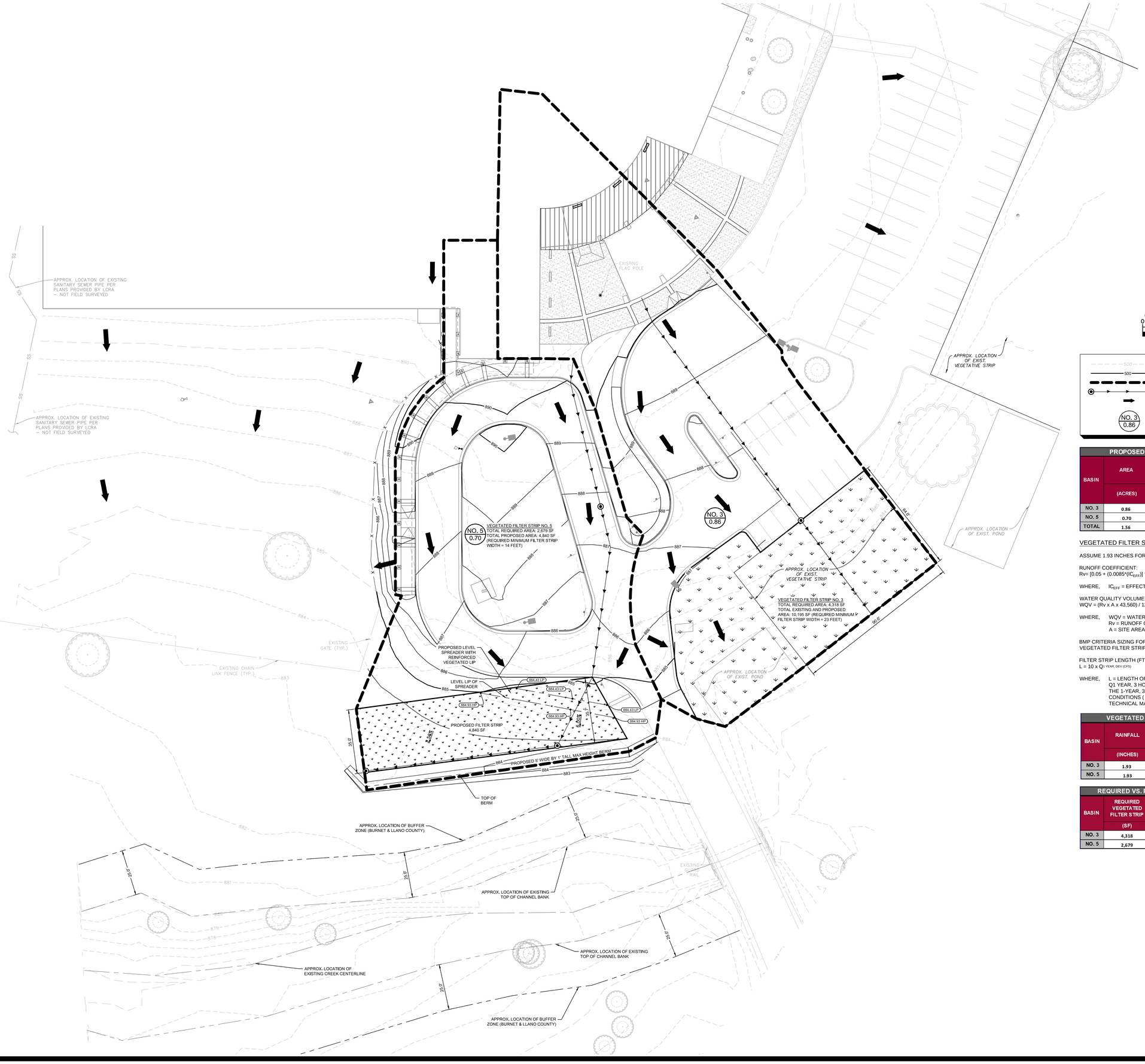
800.687229

PROPOSED DRAINAGE AREA MAP
PACKAGE 2

Job No. 01795-02-05	Sheet No. C5.3
Drawn By: BE	
Date: 08/16/2019	

1/15/2018 12:13:36 PM

ATTACHMENT C



NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- DRAINAGE BOUNDARY
- TIME OF CONCENTRATION FLOW DIRECTION
- NO. 3 / 0.86 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA

PROPOSED IMPERVIOUS COVER PERCENTAGE

BASIN	AREA (ACRES)	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS) (ACRES)	PERVIOUS (GRASS: FAIR CONDITION 2-7%) (ACRES)	IMPERVIOUS COVER % (IC%)
NO. 3	0.86	0.58	0.28	67.4%
NO. 5	0.70	0.35	0.35	50.0%
TOTAL	1.56	0.93	0.63	59.6%

VEGETATED FILTER STRIP CALCULATIONS:

ASSUME 1.93 INCHES FOR 1 YEAR, 3 HOUR RAINFALL

RUNOFF COEFFICIENT:
$Rv = [0.05 + (0.0085*(IC_{EFF})] * 1.93$

WHERE, IC_{EFF} = EFFECTIVE IMPERVIOUS COVER PERCENTAGE

WATER QUALITY VOLUME:
WQV = (Rv x A x 43,560) / 12

WHERE, WQV = WATER QUALITY VOLUME
Rv = RUNOFF COEFFICIENT
A = SITE AREA TO BMP

BMP CRITERIA SIZING FOR 10 TOTAL ACRES OR LESS:
VEGETATED FILTER STRIPS: WQV *1.15

FILTER STRIP LENGTH (FT):
L = 10 x Q_1 YEAR, DEV (CFS)

WHERE, L = LENGTH OF FILTER STRIP IN DIRECTION OF FLOW
Q1 YEAR, 3 HOUR DEVELOPED = PEAK DISCHARGE FOR THE 1-YEAR, 3 HOUR STORM EVEVNT UNDER PROPOSED CONDITIONS (CFS, SEE LCRA WATER QUALITY TECHNICAL MANUAL FOR RAINFALL DATA)

VEGETATED FILTER STRIPS CALCS

BASIN	RAINFALL (INCHES)	RUNOFF COEFFICIENT (Rv) (INCHES)	REQUIRED WATER QUALITY VOLUME (WQV) (CUBIC FT)
NO. 3	1.93	1.20	3,755
NO. 5	1.93	0.92	2,329

REQUIRED VS. PROPOSED VEGETATED FILTER STRIPS

BASIN	REQUIRED VEGETATED FILTER STRIP ($F)	PROPOSED VEGETATED FILTER STRIP ($F)	MINIMUM REQUIRED FILTER STRIP WIDTH (L) (FT)	MINIMUM PROPOSED FILTER STRIP WIDTH (L) (FT)
NO. 3	4,318	5,760	25	64
NO. 5	2,679	4,840	13	35

CAUTION!!
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ELEV.=890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION.

REVISION	DATE	
1	06/05/2019	ADDENDUM 1
2	06/18/2019	REVISED PER LCRA COMMENTS
3	06/26/2019	REVISED PER LCRA COMMENTS

Project:
HIGHLAND LAKES ELEMENTARY SCHOOL
PARKING AND DRIVES FOR
MARBLE FALLS I.S.D.
GRANITE SHOALS, TEXAS

Kimley»Horn
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STATE OF TEXAS
RICHARD UNDERWOOD
117843
REGISTERED
PROFESSIONAL
ENGINEER
06/26/2019

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PROPOSED DRAINAGE AREA MAP

PACKAGE 1A VOLUME

Job No. 017950-01-05	Sheet No. C5.2
Drawn By: SCM	
Date: 06/05/2019	

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ATTACHMENT D

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

LEGEND

- PROPOSED IMPROVEMENTS
- VEGETATIVE STRIP
- BIORETENTION POND

Impervious Cover		
Existing	28.50%	138,957 SF
Proposed	35.90%	173,369 SF
Difference	7.40%	34,413 SF

Highland Lakes Elementary Proposed BMP Improvements

Granite Shoals, Texas
December 12, 2024

DWG NAME K:\EAU_CIVIL\065002301 - HIGHLAND LAKES ELEMENTARY SCHOOL\CAD\EXHIBITS\PLANSHEETS\PROPOSED SITE IMPROVEMENTS.DWG
LAST SAVED 12/12/2024 12:16 PM

Kimley»Horn
6800 Burleson Road, Building 312, Suite 150
AUSTIN, TX 78744
512-646-2237
STATE OF TEXAS REGISTRATION NO. F-928

ATTACHMENT E

N
W E
S

0 60' 120'
GRAPHIC SCALE 60'

LEGEND

X-1 / 9.9 ac / 5.5 cfs	AREA DESIGNATOR / AREA IN ACRES / Q100 FLOW IN CFS
	PROPERTY LINE
	EXISTING STORM DRAIN LINE
	EXISTING DRAINAGE DIVIDE
	EXISTING STORM DRAIN INLET
	EXISTING STORM DRAIN MANHOLE
	EXISTING STORM DRAIN HEADWALL
	EXISTING FLOW DIRECTION
555	EXISTING CONTOUR
	BIORETENTION POND
	NATURAL VEGETATED FILTER STRIPS
	PROPOSED PAVEMENT

STEP 1: USE THE IC & RUNOFF WORKSHEET TO INPUT DRAINAGE AREA AND IMPERVIOUS COVER

Project	Highland Lakes							
Drainage Area	ID	No.	PR-1	PR-2	PR-3	PR-4	PR-5	PR-6	Total
	Area	Acres	4.35	3.06	1.66	0.61	0.89	0.70	11.27
Impervious Cover Type									
Street/Parking		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Lots		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buildings		ac	0.00	0.66	0.22	0.08	0.12	0.09	1.16
Parking Lots		ac	0.33	0.55	0.77	0.29	0.50	0.28	2.72
	Total IC	ac	0.33	1.21	0.99	0.37	0.61	0.37	3.88
	Impervious Cover	%	**7.7**	**39.4**	**59.7**	**60.4**	**68.7**	**52.9**	**34.4**

STEP 2: DETERMINE STORMWATER CREDITS TO REDUCE IMPERVIOUS COVER

Stormwater Credit Type			PR1	PR2	PR3	PR4	PR5	PR6	Total
Porous Pavement	porous area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavers	paver area	ac							
	open space	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainwater Harvesting	roof area to barrel	sf	1	1	1	1	1	1	
	rain barrel volume	cf							
	barrel vol/roof area	sf	0.00	0.00	0.00	0.00	0.00	0.00	
	% IC reduction	%	0	0	0	0	0	0	
	# roofs	#	10	10	10	10	10	10	
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roof-top Disconnection	roof area	sf							
	# roofs	#							
	IC reduction	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soil Amendment and Conservation	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conservation Landscaping	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**Total IC reduction**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Effective Impervious Cover		ac	**0.33**	**1.21**	**0.99**	**0.37**	**0.61**	**0.37**	**3.88**
		%	**7.7**	**39.4**	**59.7**	**60.4**	**68.7**	**52.9**	**34.4**
Natural Area Preservation Credit	nat area preserved	ac							
Effective Drainage Area		ac	**4.35**	**3.06**	**1.66**	**0.61**	**0.89**	**0.70**	

STEP 3: WATER QUALITY BMP DESIGN

		PR1	PR2	PR3	PR4	PR5	PR6
1-year, 3-hour rainfall =	in	1.93	1.93	1.93	1.93	1.93	1.93
Compute Runoff Volume for the 1-year storm =	in	0.22	0.74	1.08	1.09	1.22	0.96
Compute Water Quality Volume (WQV) =	cf	3,510	8,251	6,483	2,409	3,951	2,451

Primary BMP (stand-alone BMP)			PR1	PR2	PR3	PR4	PR5	PR6
Bioretention Basin	Volume	cf	3,686	8,664	6,808	2,530	4,149	2,573
Biofiltration Basin	Volume	cf	3,686	8,664	6,808	2,530	4,149	2,573
Retention/Irrigation Basin	Volume	cf	5,441	12,790	10,049	3,735	6,125	3,799
Wet Pond/Stormwater Wetlands	Volume	cf	6,494	15,265	11,994	4,458	7,310	4,534
Infiltration bench area	Area	sf	597	1,403	1,102	410	672	417
Natural Vegitative Filter Strip	Area	sf	7,968	18,731	14,717	5,470	8,970	5,563
Engineered Vegitative Filter Strip	Area	sf	4,037	9,489	7,456	2,771	4,544	2,818

Know what's **below.**
Call before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1 X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV.= 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150,
AUSTIN, TEXAS 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM

TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
05/23/2025

KHA PROJECT 065002301			
DATE: MAY 2025	SCALE: AS SHOWN	DESIGNED BY: LBE	DRAWN BY: GAZ	CHECKED BY: LBE

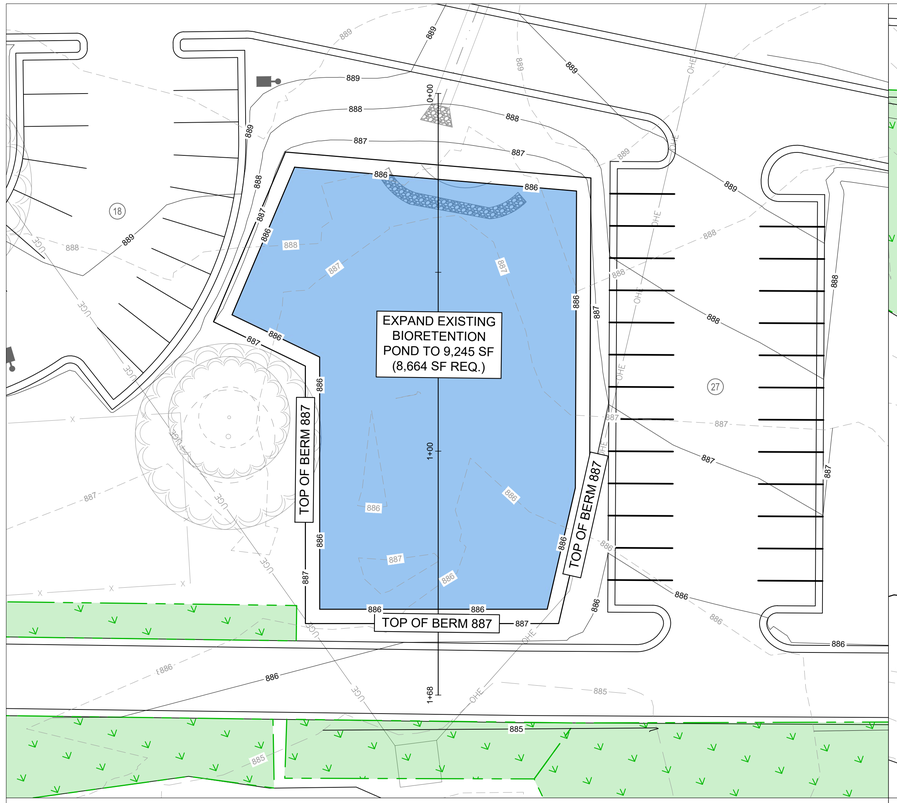
WATER QUALITY PLAN

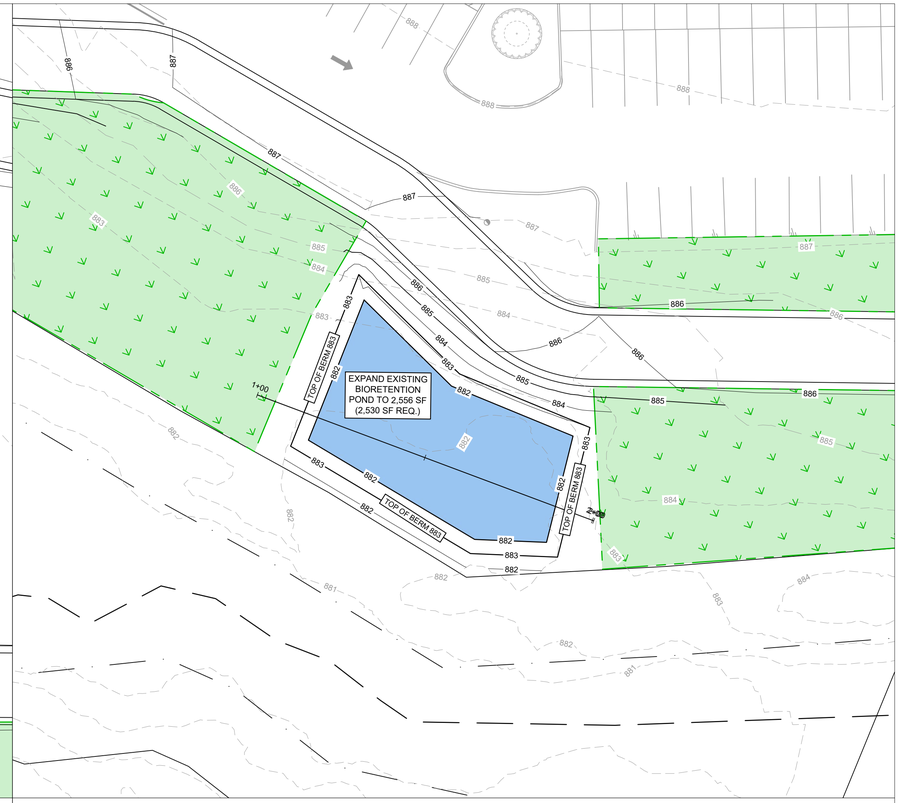
HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

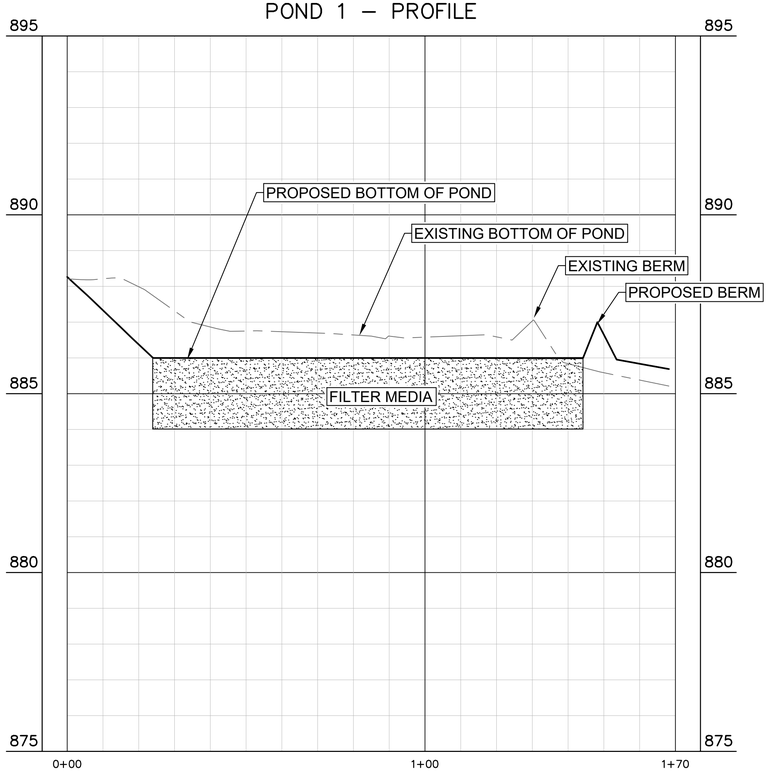
SHEET NUMBER
11 OF 14

SP-XXXX-XXXX

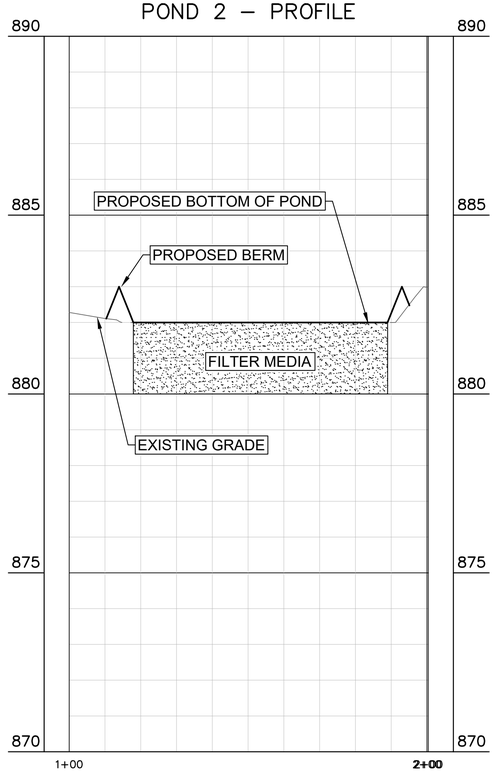




POND 1 – PROFILE



POND 2 – PROFILE



LEGEND

- PROPERTY LINE
- PROPOSED WASTEWATER LINE
- PROPOSED WATER LINE
- PROPOSED WASTEWATER MANHOLE
- PROPOSED FIRE HYDRANT
- PROPOSED STORM DRAIN LINE
- PROPOSED STORM DRAIN INLET
- EXISTING OVERHEAD POWER LINE
- EXISTING WATER LINE
- EXISTING WASTEWATER LINE
- EXISTING STORM SEWER LINE
- EXISTING POWER POLE
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- EXISTING WASTEWATER MANHOLE

Know what's **below.** **Call** before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV.= 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150,
AUSTIN, TEXAS 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM

TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
05/23/2025

KHA PROJECT	065002301
DATE	MAY 2025
SCALE:	AS SHOWN
DESIGNED BY:	LBE
DRAWN BY:	GAZ
CHECKED BY:	LBE

POND PLANS & PROFILES

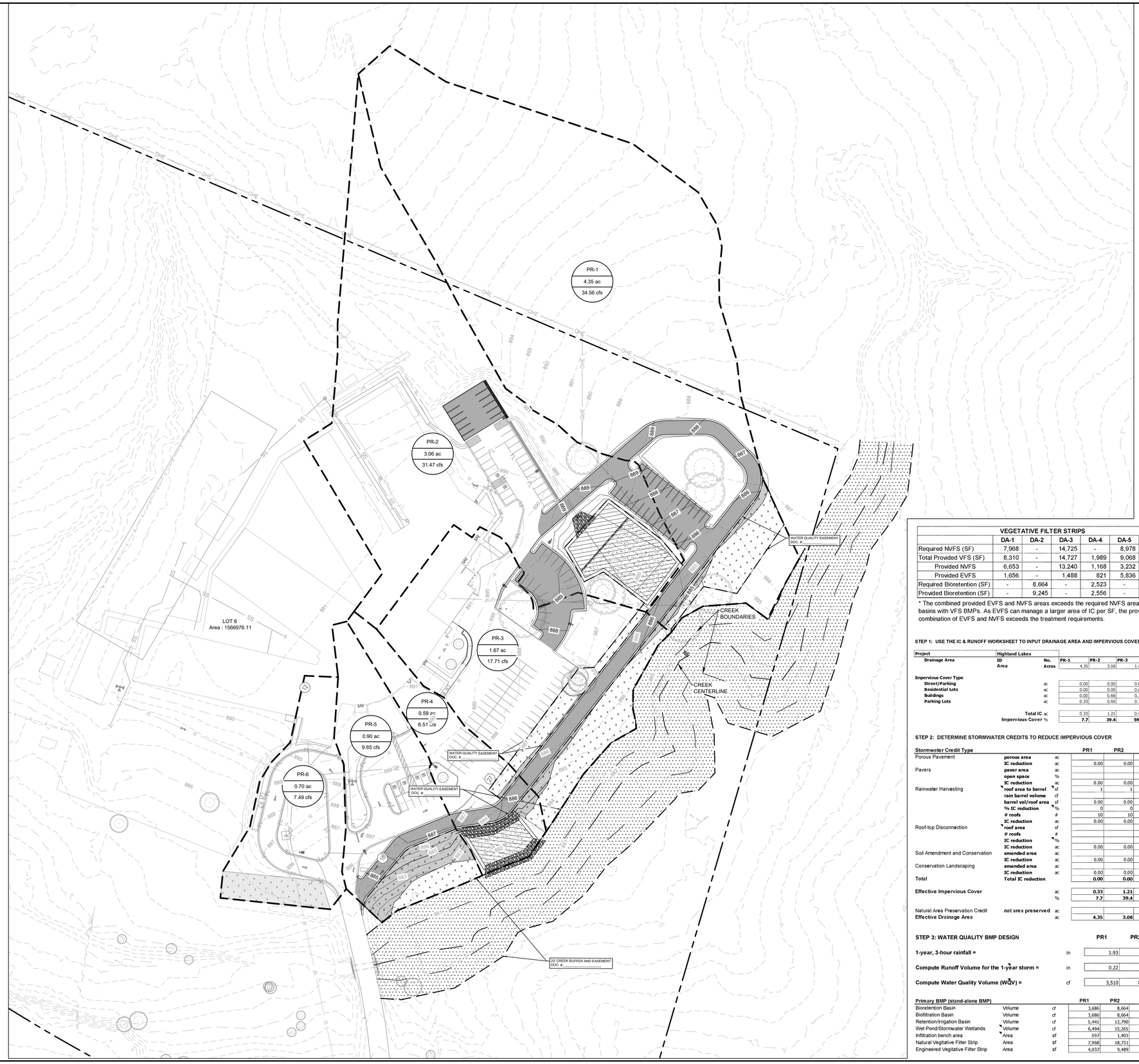
HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
12 OF 14

SP-XXXX-XXXX

ATTACHMENT F



N

W E

S

GRAPHIC SCALE IN FEET
0 30 60 120

LEGEND

- X-1 / 9.9 ac / 5.5 cfs — AREA DESIGNATOR; AREA IN ACRES; Q100 FLOW IN CFS
- PROPERTY LINE
- WATER QUALITY & CREEK BUFFER EASEMENT
- EXISTING STORM DRAIN LINE
- EXISTING DRAINAGE DIVIDE
- EXISTING STORM DRAIN INLET
- EXISTING STORM DRAIN MANHOLE
- EXISTING STORM DRAIN HEADWALL
- EXISTING FLOW DIRECTION
- EXISTING CONTOUR (555)
- BIORETENTION POND
- NATURAL VEGETATED FILTER STRIPS
- ENGINEERED VEGETATED FILTER STRIPS
- PROPOSED PAVEMENT
- CREEK BUFFER ZONE

NOTES:

1. BUFFER ZONES SHALL REMAIN UNDISTURBED EXCEPT FOR CROSSINGS SHOWN ON THESE PLANS. ENCROACHMENT INTO A BUFFER ZONE OR DAMAGE TO BUFFER ZONE AREAS WILL BE CONSIDERED A PRIORITY VIOLATION AND WILL RESULT IN A STOP WORK ORDER AND POSSIBLE FINES. REFER TO CREEK CROSSING DETAILS AND NOTES FOR CONSTRUCTION IN CREEKS.
2. IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.B OF THE HLWQ TECHNICAL MANUAL.
3. BUFFER ZONE AND NATIVE VEGETATIVE FILTER STRIP BOUNDARIES SHALL BE STAKED IN THE FIELD. ONCE STAKING HAS BEEN COMPLETED, CONTACT THE LCRA INSPECTOR AT LEAST 48- HOURS BEFORE SCHEDULED PRECONSTRUCTION MEETING TO CONDUCT INSPECTION.
4. THE PROJECT ENGINEER OR HIS DESIGNEE SHALL CERTIFY THE BIORETENTION POND MEDIA BY PROVIDING:
   - A LABORATORY REPORT LESS THAN 6 MONTHS OLD WITH THE USDA SOIL CLASSIFICATION AND ORGANIC MATTER CONTENT BY LOSS OF IGNITION.
   - THE SAMPLE ID ON THE LAB REPORT WILL INDICATE THE PRODUCT NAME OF THE MEDIA.
   - THE CERTIFICATION WILL ALSO INCLUDE THE DELIVERY TICKET(S) TO THE SITE OF THE MEDIA AND SHALL SPECIFY THE MEDIA PRODUCT NAME THAT APPEARS ON THE LABORATORY REPORT.

VEGETATIVE FILTER STRIPS

	DA-1	DA-2	DA-3	DA-4	DA-5	DA-6
Required NVFS (SF)	7,968	-	14,725	-	8,978	5,563
Total Provided VFS (SF)	8,310	-	14,727	1,989	9,068	5,839
Provided NVFS	6,653	-	13,240	1,168	3,232	5,839
Provided EVFS	1,656	-	1,488	821	5,836	-
Required Bioretention (SF)	-	8,664	-	2,523	-	-
Provided Bioretention (SF)	-	9,245	-	2,556	-	-

* The combined provided EVFS and NVFS areas exceeds the required NVFS area for all basins with VFS BMPs. As EVFS can manage a larger area of IC per SF, the provided combination of EVFS and NVFS exceeds the treatment requirements.

STEP 1: USE THE IC & RUNOFF WORKSHEET TO INPUT DRAINAGE AREA AND IMPERVIOUS COVER

Project	Highland Lakes							
Drainage Area	ID	No.	PR-1	PR-2	PR-3	PR-4	PR-5	PR-6	Total
	Area	Acres	4.35	3.06	1.67	0.59	0.90	0.70	11.27
Impervious Cover Type									
Street/Parking		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Lots		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buildings		ac	0.00	0.66	0.22	0.08	0.12	0.09	1.16
Parking Lots		ac	0.33	0.55	0.77	0.29	0.50	0.28	2.72
	Total IC	ac	0.33	1.21	0.99	0.37	0.61	0.37	3.88
	Impervious Cover	%	7.7	39.4	59.3	62.5	67.9	52.9	34.4

STEP 2: DETERMINE STORMWATER CREDITS TO REDUCE IMPERVIOUS COVER

Stormwater Credit Type			PR1	PR2	PR3	PR4	PR5	PR6	Total
Porous Pavement	porous area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavers	paver area	ac							
	open space	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainwater Harvesting	roof area to barrel	sf	1	1	1	1	1	1	
	rain barrel volume	cf							
	barrel vol/roof area	sf	0.00	0.00	0.00	0.00	0.00	0.00	
	% IC reduction	%	0	0	0	0	0	0	
	# roofs	#	10	10	10	10	10	10	
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roof-top Disconnection	roof area	sf							
	# roofs	#							
	IC reduction	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soil Amendment and Conservation	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conservation Landscaping	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	Total IC reduction		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Effective Impervious Cover		ac	0.33	1.21	0.99	0.37	0.61	0.37	3.88
		%	7.7	39.4	59.3	62.5	67.9	52.9	34.4
Natural Area Preservation Credit	nat area preserved	ac							
Effective Drainage Area		ac	4.35	3.06	1.67	0.59	0.90	0.70	

STEP 3: WATER QUALITY BMP DESIGN

		PR1	PR2	PR3	PR4	PR5	PR6
1-year, 3-hour rainfall =	in	1.93	1.93	1.93	1.93	1.93	1.93
Compute Runoff Volume for the 1-year storm =	in	0.22	0.74	1.07	1.12	1.21	0.96
Compute Water Quality Volume ($WQ\bar{V}$) =	cf	3,510	8,251	6,487	2,402	3,955	2,451

Primary BMP (stand-alone BMP)			PR1	PR2	PR3	PR4	PR5	PR6
Bioretention Basin	Volume	cf	3,686	8,664	6,811	2,523	4,153	2,573
Biofiltration Basin	Volume	cf	3,686	8,664	6,811	2,523	4,153	2,573
Retention/Irrigation Basin	Volume	cf	5,441	12,790	10,055	3,724	6,130	3,799
Wet Pond/Stormwater Wetlands	Volume	cf	6,494	15,265	12,001	4,445	7,317	4,534
Infiltration bench	Area	sf	597	1,403	1,103	408	672	417
Natural Vegitative Filter Strip	Area	sf	7,968	18,731	14,725	5,454	8,978	5,563
Engineered Vegitative Filter Strip	Area	sf	4,037	9,489	7,460	2,763	4,548	2,818

Know what's **below.** **Call** before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT.
ELEV = 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
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STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
07/02/2025

KHA PROJECT 065002301
DATE JULY 2025
SCALE: AS SHOWN
DESIGNED BY: LBE
DRAWN BY: GAZ
CHECKED BY: LBE

WATER QUALITY PLAN

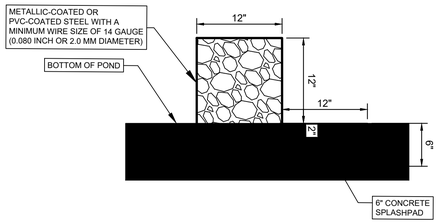
HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

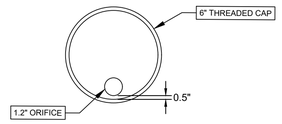
SHEET NUMBER
11 OF 16

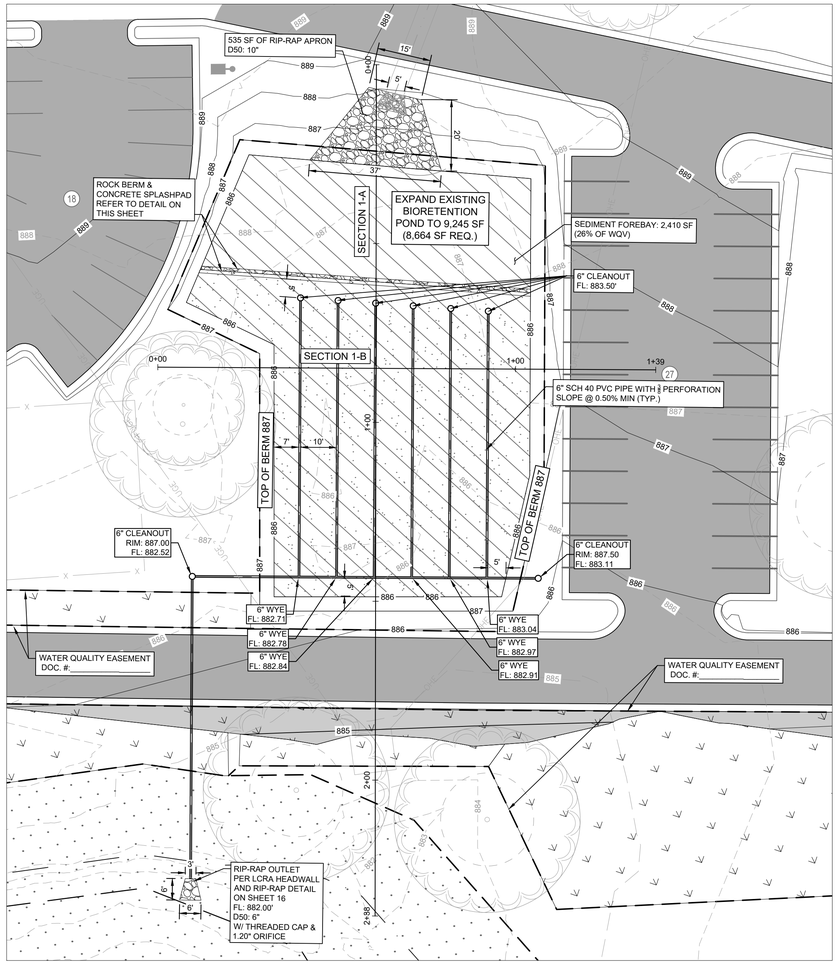
2025-5809

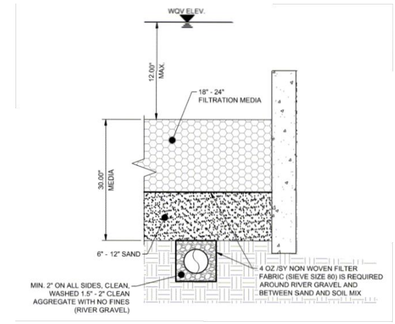
ROCK BERM DETAIL

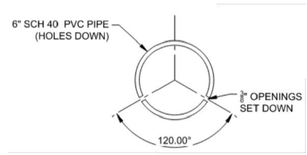


THREADED CAP DETAIL









GRAPHIC SCALE IN FEET
0 10 20 40

LEGEND

- PROPERTY LINE
- WATER QUALITY & CREEK BUFFER EASEMENT
- PROPOSED STORM DRAIN LINE
- UGE — EXISTING UNDERGROUND ELECTRIC
- OHE — EXISTING OVERHEAD ELECTRIC
- X — EXISTING FENCE
- CREEK BUFFER ZONE

NOTES:

1. BUFFER ZONES SHALL REMAIN UNDISTURBED EXCEPT FOR CROSSINGS SHOWN ON THESE PLANS. ENCROACHMENT INTO A BUFFER ZONE OR DAMAGE TO BUFFER ZONE AREAS WILL BE CONSIDERED A PRIORITY VIOLATION AND WILL RESULT IN A STOP WORK ORDER AND POSSIBLE FINES. REFER TO CREEK CROSSING DETAILS AND NOTES FOR CONSTRUCTION IN CREEKS.
2. IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.8 OF THE HLWO TECHNICAL MANUAL.
3. CONTACT LCRA TO SCHEDULE THE FOLLOWING MILESTONE INSPECTION(S) FOR THE WATER QUALITY STRUCTURES WITH AT LEAST A 48-HOUR NOTICE:
- INSPECTION OF BIORETENTION MEDIA PRIOR TO INSTALLING.
- INSPECTION OF PLANTINGS PRIOR TO INSTALLING IN THE POND.
- COMPLETION OF CONSTRUCTION OF WATER QUALITY STRUCTURE(S)

RIP-RAP CALCULATIONS (POND 1 FLOW ENTRANCE)	
100-YR Peak Flow Entering Rip-Rap (cfs)	31.47
Flow Width (ft)	5
100-YR Flow Depth (in)	9.2
100-YR Velocity Entering Rip-Rap (fps)	8.25
Minimum D_{50} (Median Rock Diameter In Inches)	9.73
Specified Minimum D_{50} (in)	10.00
Calculated Apron Length (La = 0.5V*D)	3.16
Provided Apron Length (Min. 6 ft)	20

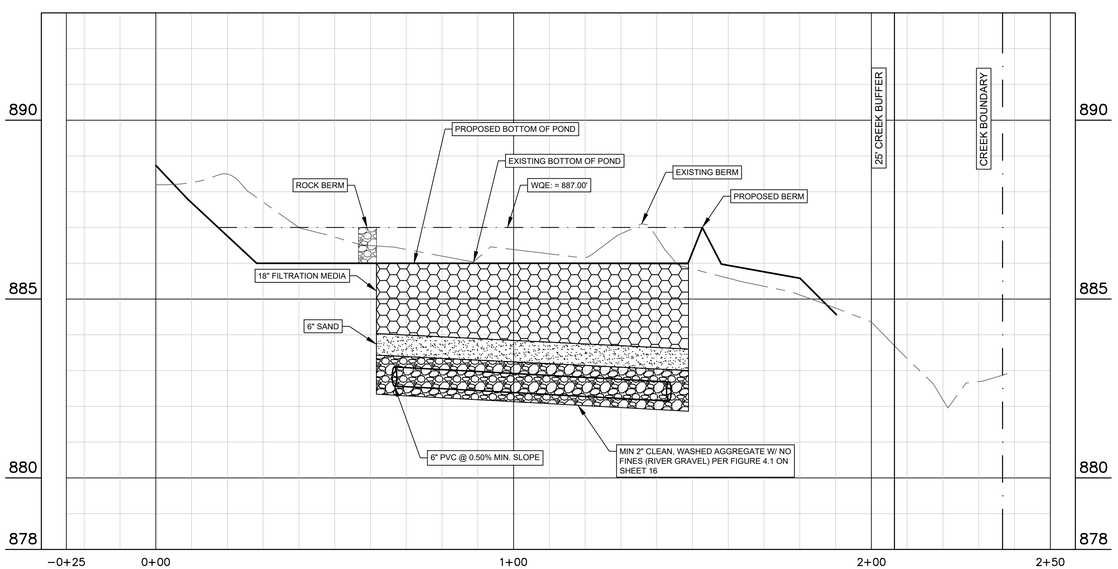
RIP-RAP CALCULATIONS (POND 1 WQ OUTFALL)	
Peak Flow Entering Rip-Rap (cfs)	0.05
Flow Diameter (in)	1.20
Velocity Entering Rip-Rap (fps)	6.37
Minimum D_{50} (Median Rock Diameter In Inches)	5.71
Specified Minimum D_{50} (in)	6.00
Calculated Apron Length (La = 0.5V*D)	0.32
Provided Apron Length (Min. 6 ft)	6

POND 1: ORIFICE CALCULATIONS								
	BMP Vol. (ft^3)	Orfice Coeffcient, C	Acceleration of Gravity, g (ft/s^2)	Ave. Hydraulic Head, H_{avg} (ft)	Total Hydraulic Head, H_T	Maximum Orifice Area, A_O (in)	Maximum Orifice Diameter (in)	True Orifice Diameter (in)
Pond 1	8664	0.62	32.2	2.38	4.75	1.13	1.20	1.20

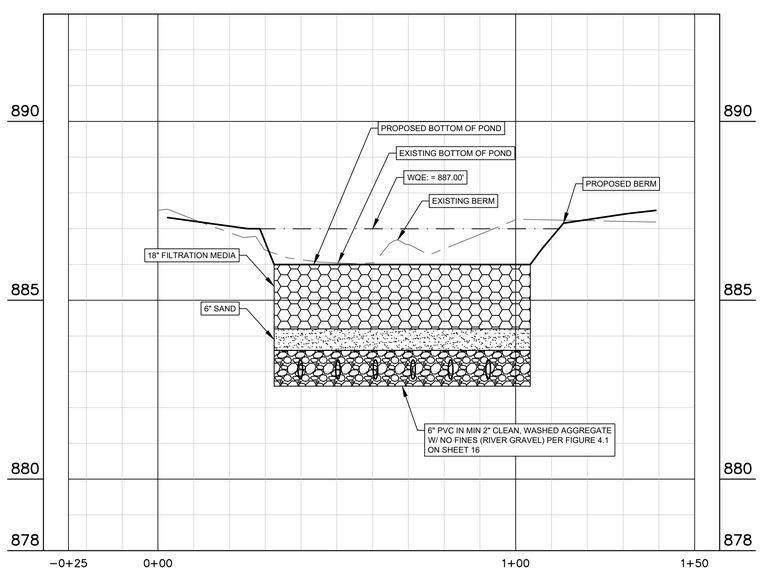
$$A_O = \frac{0.001 BMP\_Vol.}{C\sqrt{2gH_{avg}}}$$

A_O = maximum orifice area (square inches)
$BMP\ Vol.$ = required basin volume as calculated above (cubic feet)
C = orifice coefficient (Typical. 0.62)
g = acceleration of gravity (32.2 ft/s^2)
$H_{avg} = H_T/2$, average hydraulic head (ft)
H_T = total hydraulic head determined from difference between the WQ elev. and the center of orifice

POND 1–A



POND 1–B



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BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT.
ELEV. = 890.524' (NAVD '88).
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

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LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
07/02/2025

KHA PROJECT 065002301
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SCALE: AS SHOWN
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DRAWN BY: GAZ
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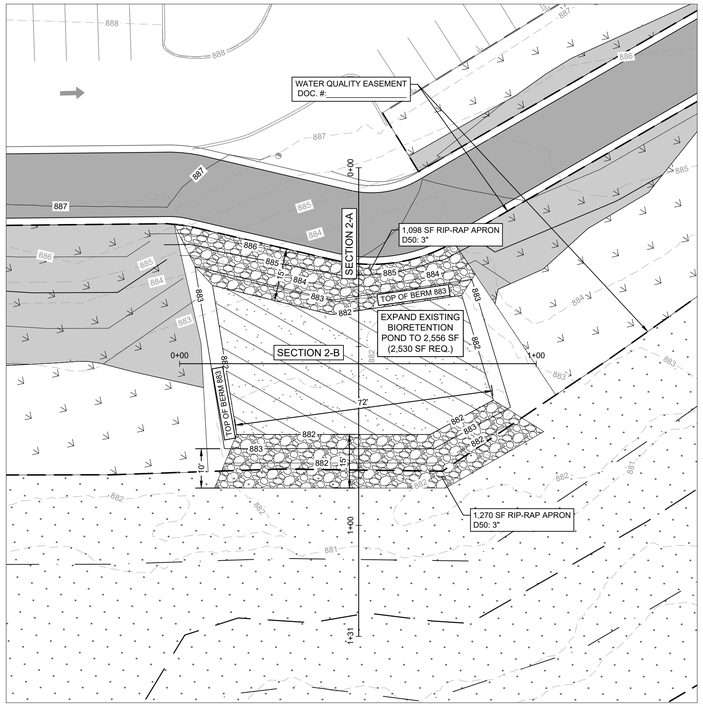
POND 1 PLAN & PROFILE

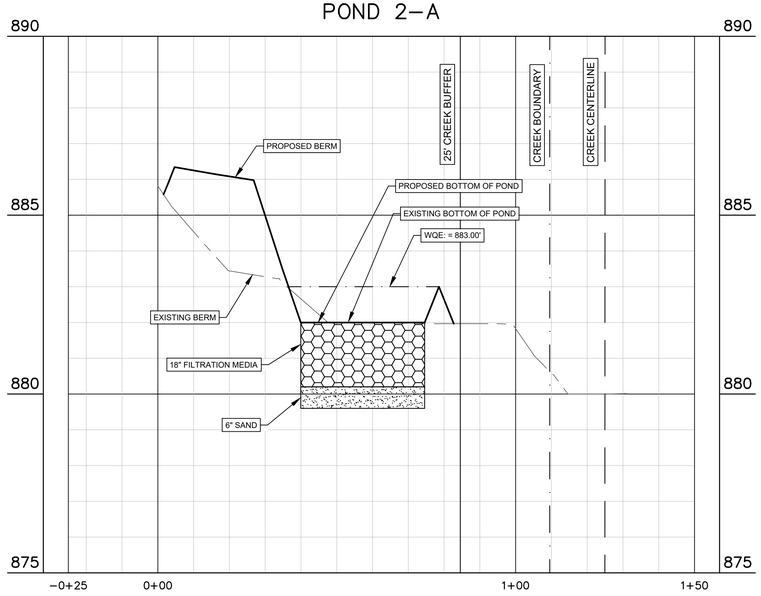
HIGHLAND LAKES ES
SITE IMPROVEMENTS
8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

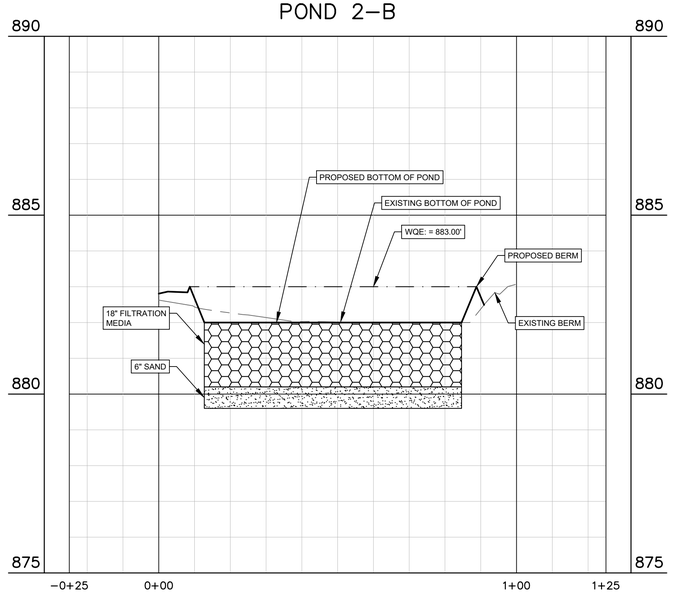
SHEET NUMBER
12 OF 16

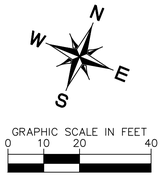
2025-5809



RIP-RAP CALCULATIONS (POND 2)	
100-YR Peak Flow Entering Rip-Rap (cfs)	6.51
Flow Width (ft)	80
100-YR Flow Depth (in)	0.6
100-YR Velocity Entering Rip-Rap (fps)	1.61
Minimum D_{50} (Median Rock Diameter In Inches)	0.34
Specified Minimum D_{50} (in)	3.00
Calculated Apron Length (La = 0.5V*D)	0.04
Provided Apron Length (Min. 6 ft)	10







LEGEND

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- PROPOSED STORM DRAIN LINE
- PROPOSED RIP-RAP APRON
- UGE — EXISTING UNDERGROUND ELECTRIC
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NOTES:

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- INSPECTION OF PLANTINGS PRIOR TO INSTALLING IN THE POND.
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© 2025 KIMLEY-HORN AND ASSOCIATES, INC.
TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
07/02/2025

KHA PROJECT	065002301
DATE:	JULY 2025
SCALE:	AS SHOWN
DESIGNED BY:	LBE
DRAWN BY:	GAZ
CHECKED BY:	LBE

POND 2 PLAN & PROFILE

HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
13 OF 16

2025-5809

DESIGN GUIDELINES: NATURAL VEGETATIVE FILTER STRIPS

1. UPPER BOUNDARY REQUIREMENTS: THE FILTER STRIP MUST RUN ALONG THE ENTIRE EDGE OF THE CONTRIBUTING AREA, NO COLLECTION OR ROUTING ALLOWED EXCEPT FOLLOWING A WATER QUALITY BASIN WITH FLOW ATTENUATION OR. DISCHARGE FROM A LEVEL SPREADER TO THE FILTER STRIPS THE SOIL ALONG THE UPPER BOUNDARY MUST BE REINFORCED WITH PROTECTIVE MATTING OR AN INFILTRATION TRENCH (PREFERRED) MAY BE USED. REFER TO FIGURE 4.14 BELOW.
2. VELOCITY RESTRICTIONS: VEGETATIVE FILTER STRIPS ARE SUSCEPTIBLE TO EROSION AND THE FORMATION OF RILLS; THEREFORE, MAY REQUIRE THE USE OF A FLOW SPREADER OR AN INFILTRATION TRENCH TO SPREAD FLOWS AND DISSIPATE EROSIVE VELOCITIES. THE RUNOFF FROM THE CONTRIBUTING AREA ENTERING THE UPPER BOUNDARY OF THE FILTER STRIP SHALL BE IN SHEET FLOW CONDITIONS. SHEET FLOW CONDITIONS MUST MEET THE FOLLOWING CONSTRAINTS DURING THE PEAK FLOW OF A 1-YR, 3-HR STORM EVENT UNDER FULLYDEVELOPED CONDITIONS:
   - 2.1. THE VELOCITY OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 1 FT/SEC.
   - 2.2. THE AVERAGE DEPTH OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 0.2 FEET FOR A VEGETATIVE FILTER STRIP USED IN COMBINATION WITH A WATER QUALITY BASIN.
     - 2.2.1. L = 5Q1 YEAR DEV
     - 2.2.2. L = MINIMUM WIDTH OF A FLOW SPREADER (FT) PERPENDICULAR TO FLOW
     - 2.2.3. Q1 YEAR DEV = PEAK FLOW RATE FROM THE 1-YR, 3-HR STORM EVENT (SEE APP. 2.4)
   - 2.3. THE AVERAGE DEPTH OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 0.1 FEET FOR A VEGETATIVE FILTER STRIP USED AS A STAND ALONE BMP.
     - 2.3.1. L = 10Q1 YEAR DEV
     - 2.3.2. L = MINIMUM WIDTH OF A FLOW SPREADER (FT) PERPENDICULAR TO FLOW
     - 2.3.3. Q1 YEAR DEV = PEAK FLOW RATE FROM THE 1-YR, 3-HR STORM EVENT (SEE APP. 2.4)
3. SURFACE CHARACTERISTICS: THE FILTER AREA MUST BE FREE OF GULLIES, RILLS AND FLOW CONCENTRATIONS AND HAVE 70% VEGETATIVE COVER.

DESIGN GUIDELINES: ENGINEERED VEGETATIVE FILTER STRIPS

1. UPPER BOUNDARY REQUIREMENTS: THE FILTER STRIP MUST RUN ALONG THE ENTIRE EDGE OF THE CONTRIBUTING AREA, NO COLLECTION OR ROUTING ALLOWED EXCEPT FOLLOWING A WATER QUALITY BASIN WITH FLOW ATTENUATION OR DISCHARGE FROM A LEVEL SPREADER TO THE FILTER STRIPS. THE SOIL ALONG THE UPPER BOUNDARY MUST BE REINFORCED WITH PROTECTIVE MATTING OR AN INFILTRATION TRENCH (PREFERRED). REFER TO FIGURE 4.15 BELOW.
2. VELOCITY RESTRICTIONS: VEGETATIVE FILTER STRIPS ARE SUSCEPTIBLE TO EROSION AND THE FORMATION OF RILLS, THEREFORE, MAY REQUIRE THE USE OF A FLOW SPREADER OR AN INFILTRATION TRENCH TO SPREAD FLOWS AND DISSIPATE EROSIVE VELOCITIES. THE RUNOFF FROM THE CONTRIBUTING AREA ENTERING THE UPPER BOUNDARY OF THE FILTER STRIP SHALL BE IN SHEET FLOW CONDITIONS. SHEET FLOW CONDITIONS MUST MEET THE FOLLOWING TWO CONSTRAINTS DURING THE PEAK FLOW OF A 1-YR, 3-HR STORM EVENT UNDER FULLY-DEVELOPED CONDITIONS:
   - 2.1. THE VELOCITY OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 1 FT/SEC.
   - 2.2. THE AVERAGE DEPTH OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 0.2 FEET FOR A VEGETATIVE FILTER STRIP USED IN COMBINATION WITH A WATER QUALITY BASIN.
     - 2.2.1. L = 5Q1 YEAR DEV
     - 2.2.2. L = MINIMUM WIDTH OF A FLOW SPREADER (FT) PERPENDICULAR TO FLOW
     - 2.2.3. Q1 YEAR DEV = PEAK FLOW RATE FROM THE 1-YR, 3-HR STORM EVENT (SEE APP. 2.4)
   - 2.3. THE AVERAGE DEPTH OF FLOW ACROSS THE FILTER STRIP MUST NOT EXCEED 0.1 FEET FOR A VEGETATIVE FILTER STRIP USED AS A STAND ALONE BMP.
     - 2.3.1. L = 10Q1 YEAR DEV
     - 2.3.2. L = MINIMUM WIDTH OF A FLOW SPREADER (FT) PERPENDICULAR TO FLOW
     - 2.3.3. Q1 YEAR DEV = PEAK FLOW-RATE FROM THE 1-YR, 3-HR STORM EVENT (SEE APP. 2.4)
3. SURFACE CHARACTERISTICS: THE FILTER AREA, AFTER FINAL GRADING, SHOULD HAVE A UNIFORM AND EVEN SLOPE AND BE CAPABLE OF MAINTAINING AN EVEN SHEET FLOW ACROSS THE ENTIRE FILTER SURFACE. THE FILTER AREA MUST BE FREE OF GULLIES, RILLS AND FLOW CONCENTRATIONS. THE STRIP MUST BE SODDED OR IF SEED IS USED IT MUST BE ACCOMPANIED BY THE APPROPRIATE SOIL BLANKET OR MATTING PER 3.2.11.

NOTE FOR SEDIMENT FOREBAY SOILS AND VEGETATION:

TO ENHANCE INFILTRATION AND WATER STORAGE IN THE BASIN, TOPSOIL MUST BE PLACED ON THE SEDIMENTATION AREA FLOOR AFTER THE EXCAVATED BOTTOM IS SCARIFIED TO A DEPTH OF 2 TO 3 INCHES. THE TOPSOIL MUST BE 6 TO 8 INCHES DEEP AND COMPOSED OF A SOIL MIXTURE OF 30-40% SAND OR GRANITE SAND AND 60-70% TOPSOIL BY VOLUME. THE TOPSOIL MUST HAVE A CLAY CONTENT LESS THAN 20% AND BE FREE OF STONES, STUMPS, ROOTS, OR OTHER SIMILAR OBJECTS LARGER THAN 1 INCH. DO NOT USE CALICHE OR INFERTILE SOILS. TOPSOIL PLACEMENT MAY BE OMITTED IF EXISTING SOILS DEMONSTRATE AN INFILTRATION RATE OF 0.5 INCHES PER HOUR AFTER EXCAVATION AND CERTIFIED BY THE DESIGN ENGINEER. THE TOPSOIL SHOULD BE VEGETATED WITH NATIVE SEED MIX OR NATIVE PLANTINGS TO STABILIZE THE AREA AND IRRIGATED TO ESTABLISH VEGETATION.

NOTE FOR BIORETENTION POND MEDIA AND VEGETATION:

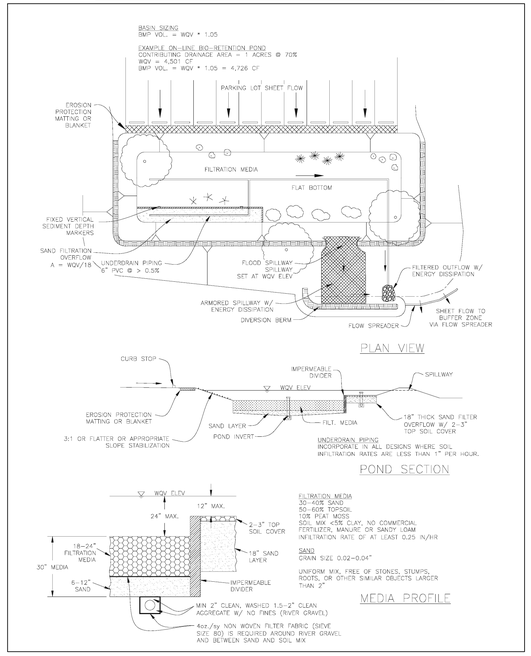
1. THE MEDIA SHALL HAVE A MINIMUM THICKNESS OF 30" WITH 18-24" OF SOIL MIXTURE OVER 6-12" OF SAND. THE SOIL MIXTURE SHOULD BE 30-40% SAND OR GRANITE SAND AND 50-60% TOPSOIL AND 10% ORGANICS. THE SOIL MIX SHOULD HAVE LESS THAN 5% CLAY WITH NO COMMERCIAL FERTILIZERS, MANURE, OR SANDY LOAM. PROVIDE CLEAN SAND, FREE OF DELETERIOUS MATERIALS. SAND SHOULD BE ASTM C-33 WITH GRAIN SIZE OF 0.02-0.04 INCHES (SAME AS SAND FILTER). THE SOIL SHOULD BE A UNIFORM MIX, FREE OF STONES, STUMPS, ROOTS, OR OTHER SIMILAR OBJECTS LARGER THAN ONE INCH. THE 10% ORGANICS, CANNOT BE DERIVED FROM ANIMAL/HUMAN SOURCES OR UNSTABLE FORMS OF ORGANIC MATTER. NATIVE TOPSOIL, HUMUS. COIR FIBER, PEAT, AND MATURE PLANT DERIVED COMPOSTS WITH AN ESTABLISHED FUNGAL COMPONENT ARE SUITABLE.
2. OVERALL VEGETATION DENSITY MUST BE GREATER THAN 80% WITH NO LARGE BARE AREAS.
3. RE-VEGETATE THE BASIN BOTTOM WITH NATIVE GRASSES ALONGSIDE WITH THE FOLLOWING RECOMMENDED PLANTINGS.
4. PROVIDE A MINIMUM OF THREE (3) SPECIES FROM EACH CATEGORY LISTED BELOW:

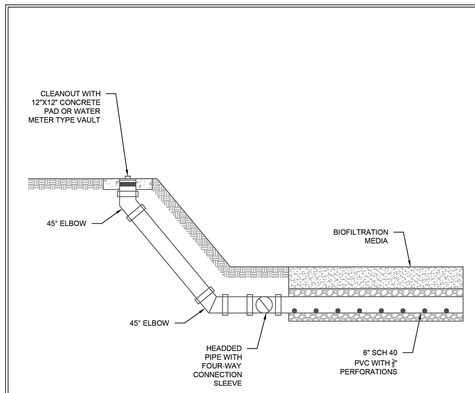
A ONE-YEAR VEGETATION WARRANTY IS REQUIRED ON ALL PLANTS.

GROUND COVER	SHRUBS
SWITCH GRASS	AMERICAN BEAUTY BERRY
GREEN SPRANGLETOP	CHERRY LAUREL
INDIAN GRASS	POSSUMHAW HOLLY
EASTERN GAMMA	BUTTERFLY BUSH
MUHLY	CORAL BERRY
	PALMETTO
	OBEDIENT PLANT (FALL)

LCRA WATER QUALITY MANAGEMENT TECHNICAL MANUAL

FIGURE 4-1: BIORETENTION BASIN WITH SAND OVERFLOW SCHEMATIC

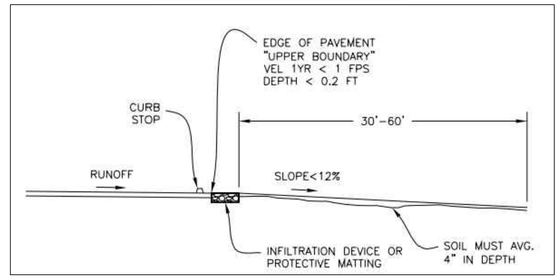




LOWER COLORADO RIVER AUTHORITY		
CLEANOUT DETAIL	DATE: 03-2023	SHEET: 1 OF 1

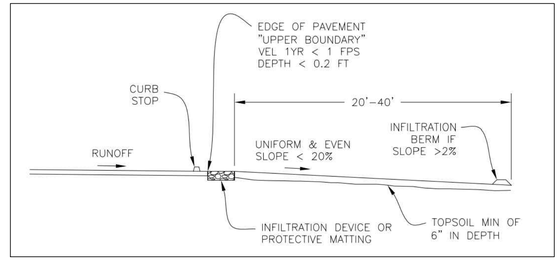
LCRA WATER QUALITY MANAGEMENT TECHNICAL MANUAL

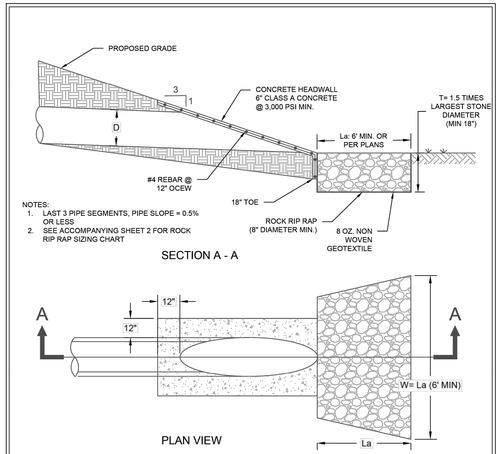
FIGURE 4-14: NATURAL VEGETATIVE FILTER STRIP



LCRA WATER QUALITY MANAGEMENT TECHNICAL MANUAL

FIGURE 4-15: ENGINEERED VEGETATIVE FILTRATION STRIP





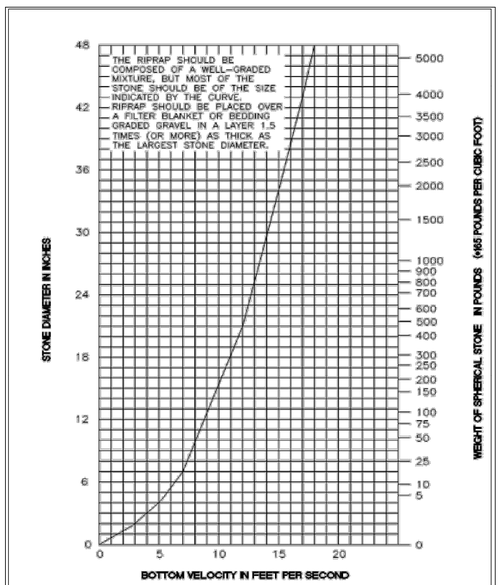
RIP RAP APRON SIZING:

La = 0.5V * D

La = LENGTH OF RIP RAP APRON, FT
V = CULVERT DISCHARGE VELOCITY, FT/S
D = DIAMETER OR HEIGHT OF CULVERT, FT

* MIN. APRON LENGTH IS 6 FT

LOWER COLORADO RIVER AUTHORITY		
HEADWALL AND RIP RAP DETAIL	DATE: 03-2023	SHEET: 1 OF 2



RIP RAP SIZE SELECTION

LOWER COLORADO RIVER AUTHORITY		
HEADWALL AND RIP RAP DETAIL	DATE: 03-2023	SHEET: 2 OF 2

NO.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150, AUSTIN, TX 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM

TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
07/02/2025

KHA PROJECT 065002301
DATE: JULY 2025
SCALE: AS SHOWN
DESIGNED BY: LBE
DRAWN BY: GAZ
CHECKED BY: LBE

WATER QUALITY DETAILS & NOTES

HIGHLAND LAKES ES
SITE IMPROVEMENTS
8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
16 OF 16

2025-5809

ATTACHMENT G

June 6th, 2025

LCRA
3700 Lake Austin Blvd.
Austin, TX 78703

RE: Highland Lakes ES Site Improvements
8200 RM 1431,
Granite Shoals, Tx 78654

To whom it may concern,

Please accept this comment response letter for the above-referenced project. This report has been created in regard to your comments provided on May 30, 2025. A copy of each comment has been provided below followed by their respective responses.

GENERAL ADMINSTRATIVE REVIEW

1. The application form is missing the Applicant signature on application. Also please and update the Applicant to be owner not the engineer.
   Response: The application has been updated with the missing signature and applicant information has been updated on the online application.

2. For the engineering report please provide the following:
   - A vegetation Map
   - Data and calculations for water quality BMPs sizing and associated drainage facilities, including drainage area, impervious cover area, time of concentration, runoff coefficients and discharge for 1 year and 25-year storm events, used to size the vegetative filter strip width.
   - Add a section for water quality within the engineering report describing the BMP's to be implemented.

   Response: Additional data and calculations have been added to the engineering report, including the BMPs implemented.

3. For the ESC sheet please update/provide the following

   - Add scale
   - Make sure the Limits of Construction encompass all of the work being done
   - Add concrete washout area
   - Add Sequence of Construction

   Response: All these updates have been made on the Erosion Control Plan.

4. Include a Restoration plan sheet showing areas to be revegetated.
   Response: A restoration plan has been added to the paving plan sheet. Hatches are representing the areas that are to be revegetated.

5. Update EOPC based on the comments above
   Response: The EOPC has been updated to include the cost information for the concrete washout area.

6. Provide a BMP maintenance plan with the following requirements:

   - Title sheet showing the project name, location, and project number.
   - Introduction paragraph of the BMP to be maintained including square footage.
   - Both Paragraphs from section 5.5.1 of HLWO Tech. Manual.
   - Entire section of 5.5.2

   Response: A BMP maintenance plan, encompassing all the requirements listed, has been included in this submittal.

7. VFS Maintenance Section stating the following:

   "No portion of the filter area will be greater than a 10% slope. The vegetated density must be greater than 80% with no large bare areas. The filter area should be densely vegetated with a mix of erosion-resistant plant species that effectively bind the soil. Native or adapted Grasses are appropriate because they require less fertilizer and are more drought resistant than exotic plants."
   Response: Noted. The proposed natural vegetative strips are designed to these requirements.

8. Include the following paragraphs within the maintenance plan:

   The OWNER or SUBSEQUENT OWNER shall bear all expenses for the operation and maintenance of these permanent Best Management Practices (BMP) including but not limited to all general maintenance activities needed to keep this system in proper operation condition. If this system is abused or not maintained, then it may contribute to malfunction of the storm water system. All designated BMP VFS areas shall remain free of construction, development, and encroachments.

   You as the OWNER of this property have a responsibility to provide any SUBSEQUENT OWNER or your real estate agent with a copy of this Best Management Practices (BMP) Maintenance Plan if this facility is sold so that the BMPs can be properly maintained and operated. The same rights, duties, and responsibilities borne by the current OWNER shall be borne by each subsequent OWNER.
   Response: These notes have been added to the maintenance plan report.

9. An amended copy of this document will be provided to the LCRA within thirty (30) days of any changes in the following information:

   Responsible Party for Maintenance: [Insert Development Owner name]

   Address: [Insert Street Address]

   City, State, Zip: [Insert Information]

   Telephone Number: [Insert BMP Maintenance Provider Telephone Number]

Response: This information has been filled out and provided on the maintenance plan report.

10. A current owner acknowledgement and acceptance signature block.
    Response: This has been provided on the cover sheet of the maintenance plan.

11. Prepared and Certified by an Engineer Signature Block.
    Response: The engineer signature and seal are included on the cover sheet of the maintenance plan.

Should you have any questions or require additional information, please feel free to contact me directly at (512) 518-6529 or lexie.england@kimley-horn.com.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

June 25, 2025

Lower Colorado River Authority
3700 Lake Austin Blvd.
Austin, Texas 78703

RE: HIGHLAND LAKES ES SITE IMPROVEMENTS
APPLICATION #2025-5809 U0
8200 RM 1431, GRANITE SHOALS, TX 78654

To Whom It May Concern:

Please accept this Comment Response Letter for the above referenced project. This submittal is in response to the comments provided by Lower Colorado River Authority (LCRA) on June 18, 2025. The original comments have also been included below for reference.

General Comments:

1. Provide Engineer's seal, signature and statement certifying that the plan is complete and in compliance with the ordinance on construction plans.
   Response: The Engineer's seal, signature and a statement of compliance and completion has been added on the Cover Sheet.

2. Changes to the Erosion and Sedimentation Control Plan have been requested. Please revise the cost estimate to include these changes. Once the cost estimate is approved, a letter of credit or other form of financial security acceptable to LCRA must be provided prior to issuance of a permit. A Letter of Credit shall have a minimum expiration of 3 years or shall renew automatically until LCRA determines that the project has achieved final stabilization. A letter of credit template can be found in the Development permit application [hyperlink: https://www.lcra.org/download/hlwo-developer-application-packet-1-pdf/?wpdmdl=19704]
   Response: The cost estimate has been updated according to the changes made.

3. Provide a map and exhibit list of all property owners located within 500 feet of the Site or within 1,000 feet of the project limits and a statement signed by the applicant certifying that each owner has been sent a notice of the application by first class mail. This comment can be addressed by providing proof of first-class mail receipts showing the neighboring property owner names and addresses.
   Response: Per LCRA's Application Packet, the Mailing Notice Template has been completed and distributed to all neighboring property owners. Included in the submittal are the mail receipts to the neighboring property owners.

4. How were the limits of the buffer zone determined? Please provide a description within the Engineering report.
   Response: Per LCRA Highland Lakes Watershed Ordinance Water Quality Management Technical Manual Section 2.4(1), a 25-foot buffer zone shall be established from the top of

the channel bank on both sides of the creek. Additionally, the buffers were previously defined under the original site development permit number 416-97004.

5. Have the buffer zones and WQ BMP's been recorded via easements? If not, they will need to be recorded prior to project closeout with LCRA's templates.
   Response: A 25' creek buffer easement, and two water quality easements have been shown on plans, encompassing the total water quality BMP and buffer zone areas. Easements will be recorded prior to project closeout.

6. Please remove the LCRA signature line on the cover page.
   Response: The LCRA signature line has been removed from the cover sheet.

7. Include the following note on all plan sheets: "Buffer zones shall remain undisturbed except for crossings shown on these plans. Encroachment into a Buffer Zone or damage to Buffer Zone areas will be considered a priority violation and will result in a Stop Work Order and possible fines. Refer to creek crossing details and notes for construction in creeks."
   Response: This note has been added on all plan sheets.

8. The existing conditions and demolition sheet are showing the removal of NVFS. If the NVFS is disturbed, it will need to be converted to EVIS with the same footprint proposed within the plan set. The intent for NVFS is for it to remain in its natural state.
   Response: All NVFS that has been disturbed has been converted to EVFS. EVFS detail has been added to sheet 16. A summary table of required and provided BMP areas has been added to the water quality plan on sheet 11. The combined provided EVFS and NVFS areas exceeds the required NVFS area for all basins with VFS BMPs. As EVFS can manage a larger area of IC per SF, the provided combination of EVFS and NVFS exceeds the treatment requirements.

9. Include the following note on the plan sheets: "IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.B OF THE HLWO TECHNICAL MANUAL."
   Response: This note has been added on all plan sheets.

10. How will the new parking lot convey drainage to proposed and existing VFS, will there be ribbon curb or curb cuts? The grading and paving sheets need to show such improvements and provide callouts for curb type.
    Response: The proposed parking lot and drive aisle will include ribbon curbs throughout. This has been noted as a callout on both the grading and paving sheets.

EOPC:

11. Please update the following in the EOPC Report:
    a. Provide Engineer's seal, signature, and dated.
    b. Add an item for revegetation and make sure the area within the updated limits of construction is the revegetation area provided.
    c. Adjust silt fence based on revisions requested.

Response: The revegetation area has been accounted for and added to the EOPC with the Engineer's seal, signature and submittal date. Silt fence calculations have been updated according to the revisions made.

Engineering Report:

12. Include the old engineering report as an exhibit.
Response: The old engineering report has been included within this project's Engineering Report.

ESC Plan:

13. Provide LCRA's Silt Fence and J-Hooks Details, we only allow a maximum spacing of 6' between the steel posts. (Reference Appendix 2.7.1 from HLWO Water Quality Technical Manual).
Response: Both LCRA details for the Silt Fence and J-Hooks have been added to the Erosion Control Details plan sheet.

14. Provide LCRA's Concrete Washout Area Detail. (Reference Appendix 2.7.1 from HLWO Water Quality Technical Manual).
Response: LCRA's Concrete Washout Area Detail has been included on the Erosion Control Details plan sheet.

15. Provide a Soil Protection Blanket and Matting Detail based on the type of matting proposed. Also, provide LCRA's matting installation detail (Sheet 344 within HLWO technical manual).
Response: The Soil Protection Blanket and Matting detail has been included on the Erosion Control Details plan sheet and the installation detail has been provided on the Water Quality Details & Notes plan sheet.

16. Provide LCRA's Erosion/Sedimentation Control General Notes (Sheet 356-357 within HLWO technical manual).
Response: LCRA's Erosion/Sedimentation Control General Notes have been added on the General Notes plan sheet.

17. Additional silt fence and J-Hooks (Reference screenshot below)
    d. Add silt fence around the concrete wash out area.
    e. Add silt fence around temporary spoils and stockpiles

Response: Additional silt fence has been added along the areas represented in the screenshots.

18. Provide locations of temporary spoils and stockpiles.

Response: A temporary spoils and stockpiles area has been added and called out in the Erosion Control plan sheet.

19. Provide the following note on the ESC sheet and WQ plan, “Buffer zone and Native Vegetative Filter Strip boundaries shall be staked in the field. Once staking has been completed, contact the LCRA inspector at least 48- hours before scheduled preconstruction meeting to conduct inspection.”
Response: This note has been added to the Erosion Control and Water Quality plan sheets.

20. Provide a detailed sequence of construction showing the order of construction, beginning with Erosion/Sediment control (ESC) installation, buffer zone staking, followed by site construction items (utilities, drainage, pavement, vertical construction, etc.), including any additional ESC installations or modifications, concluding with site restoration and removal of ESC. Once ESC’s are placed and all buffer zone staking has been completed, contact the LCRA inspector at least 48-hours before scheduled preconstruction meeting to conduct inspection.
Response: A revised detailed sequence of construction is provided on the General Notes and Erosion Control plan sheets.

21. Also make sure the erosion control and sequence of construction notes refer to the LCRA inspector not the city.
Response: Any reference of an “inspector” in both sets of these notes now reflects to show “LCRA inspector”.

22. For the restoration/revegetation areas please specify native seed mix instead of general vegetation. Also, for the bioretention pond, propose native plantings or a native seed mix.
Response: “Native Seed Mix” has been added for the revegetation areas and bioretention ponds.

23. Provide erosion control matting for the proposed berms that will act as the emergency spillways for the bioretention ponds.
Response: A Soil Protection Blanket has been provided for each proposed bioretention pond.

24. On the paving and revegetation plan sheet illustrates multiple storm inlets being marked, are this proposed? If so:
    f. Add inlet protection to the EOPC.
    g. Show the inlet protection on the erosion control.

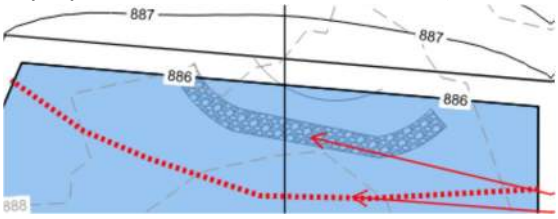
Response: There are no storm inlets existing or being proposed on the site. Those structures are light poles, that have been shaded back on the plans to reflect them already being on the site.

Water Quality:

25. For the NVFS, provide notes and the detail per LCRA Technical Manual Section 4.2.7 (A 5-7 for NVFS) sheets 204-205.
Response: These notes have been included on the Water Quality Details & Notes plan sheet.

26. Please review the bioretention pond design guide (Reference pg. 170 to 174 from HLWO Water Quality Technical Manual) and provide the following:
    h. Provide the WQ elevations of the bioretention ponds within the pond cross sections
    i. Confirm if the ponds currently have an underdrain system installed. Underdrains need to be provided unless the existing soil has an infiltration rate of 0.52 in/hr.
    j. Provide Erosion control matting for the pond slopes and show the matting on the plans.
    k. For the smaller pond, provide a riprap apron on the downstream side of the embankment and size the apron for the 25-yr flow event.

    l. Propose to relocate the existing rock gabion and tie in the proposed gabion to the pond embankment. Also provide a gabion detail and make sure the proposed sediment forebay is proposed to contain 25% of the WQV.



Response: The water quality elevations have been added and called out on both sets of profiles for Pond 1 and 2. For Pond 1, 6" PVC underdrains have been placed according to specifications highlighted in LCRA's Water Quality Management Technical Manual. For Pond 2, underdrains aren't feasible as they aren't able to adequately discharge at the minimum slope requirement. A infiltration test will be completed on Pond 2 prior to installation to ensure all requirements are being met. Erosion control matting has been added been added around the pond slopes for both ponds. The Erosion control matting detail has been added to the Erosion Control Details plan sheet and the notes have been added to the Water Quality Details & Notes plan sheet. A rip-rap apron has been sized and added to Pond 2, the smaller pond. Pond 1 will utilize the proposed road, located downstream of the pond, as its rip-rap apron. A gabion wall has been included along Pond 1's embankment, sized to contain 26% of the water quality volume it will receive. A City of Austin detail for the gabion wall has been added to the Site & Paving details plan sheet.

27. On the Water Quality Pond plan sheet please provide the following note:
    Contact LCRA to schedule the following milestone inspection(s) for the water quality structures with at least a 48-hour notice:
    - Inspection of bioretention media prior to installing.
    - Inspection of plantings prior to installing in the pond.
    - Completion of construction of water quality structure(s)

    Response: This note has been added to the Pond Plan & Profiles plan sheet.

28. Include the following note on the water quality plan sheet:

The project engineer or his designee shall certify the bioretention pond media by providing:

- A laboratory report less than 6 months old with the USDA soil classification and organic matter content by loss of ignition.
- The sample ID on the lab report will indicate the product name of the media.
- The certification will also include the delivery ticket(s) to the site of the media and shall specify the media product name that appears on the laboratory report.

Response: This note has been added on the Water Quality plan sheet.

29. Include the following note for Sediment forebay soils and vegetation:
To enhance infiltration and water storage in the basin, topsoil must be placed on the sedimentation area floor after the excavated bottom is scarified to a depth of 2 to 3 inches. The topsoil must be 6 to 8 inches deep and composed of a soil mixture of 30-40% sand or granite sand and 60-70% topsoil by volume. The topsoil must have a clay content less than 20% and be free of stones, stumps, roots, or other similar objects larger than 1 inch. Do not use caliche or infertile soils. Topsoil placement may be omitted if existing soils demonstrate an infiltration rate of 0.5 inches per hour after excavation and certified by the design engineer. The topsoil should be vegetated with native seed mix or native plantings to stabilize the area and irrigated to establish vegetation.
Response: This note has been added to the Water Quality Details & Notes plan sheet.

30. Include the following note for the bioretention pond media and vegetation:
The media shall have a minimum thickness of 30" with 18-24" of soil mixture over 6-12" of sand. The soil mixture should be 30-40% sand or granite sand and 50-60% topsoil and 10% organics. The soil mix should have less than 5% clay with no commercial fertilizers, manure, or sandy loam. Provide clean sand, free of deleterious materials. Sand should be ASTM C-33 with grain size of 0.02-0.04 inches (same as sand filter). The soil should be a uniform mix, free of stones, stumps, roots, or other similar objects larger than one inch. The 10% organics, cannot be derived from animal/human sources or unstable forms of organic matter. Native topsoil, humus. Coir fiber, peat, and mature plant derived composts with an established fungal component are suitable.
Response: This note has been added to the Water Quality Details & Notes plan sheet.

31. Include the following note on the water quality plan sheet:
The project engineer or his designee shall certify the bioretention pond media by providing:
    - A laboratory report less than 6 months old with the USDA soil classification and organic matter content by loss of ignition.
    - The sample ID on the lab report will indicate the product name of the media.
    - The certification will also include the delivery ticket(s) to the site of the media and shall specify the media product name that appears on the laboratory report.

Response: This note has been added on the Water Quality plan sheet.

BMP Maintenance Plan:

32. Make sure the sections are numbered correctly in the BMP maintenance plan There are 2 section number two's.
Response: All section numbers in the report have been revised.

33. After section 5.5.2, please include section 5.5.3 (sheet 250 of the HLWO technical manual or sheet 14 of submitted BMP plan).
Response: Section 5.5.3 from HLWO technical manual has been included on the BMP maintenance Plan.

34. Remove sheets 5-15 of the BMP maintenance plan as they are not necessary.
Response: These sheets have been removed from the BMP maintenance plan.

Should you have any questions or require additional information, please do not hesitate to contact me at (512) 518-6529 or Lexie.England@kimley-horn.com.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Lexie England, PE
Project Manager

July 1, 2025

Lower Colorado River Authority
3700 Lake Austin Blvd.
Austin, Texas 78703

RE: HIGHLAND LAKES ES SITE IMPROVEMENTS
APPLICATION #2025-5809 U2
8200 RM 1431, GRANITE SHOALS, TX 78654

To Whom It May Concern:

Please accept this Comment Response Letter for the above referenced project. This submittal is in response to the comments provided by Lower Colorado River Authority (LCRA) on June 27, 2025. The original comments have also been included below for reference.

General Comments:

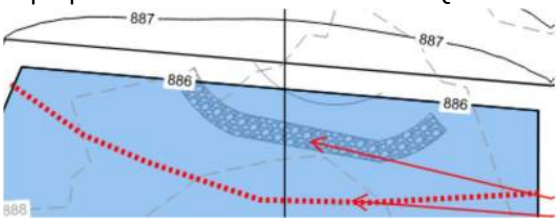
5. U1 – Have the buffer zones and WQ BMP's been recorded via easements? If not, they will need to be recorded prior to project closeout with LCRA's templates.
U2 – Comment noted. Please incorporate the plat notes found in LCRA's technical manual, (Reference Appendix 1.11 from HLWO Water Quality Technical).
Response:
U1 – A 25' creek buffer easement, and two water quality easements have been shown on plans, encompassing the total water quality BMP and buffer zone areas. Easements will be recorded prior to project closeout.

U2 – The easements will be recorded by separate instruments; the plat notes are not applicable.

Water Quality:

26. U1 – Please review the bioretention pond design guide (Reference pg. 170 to 174 from HLWO Water Quality Technical Manual) and provide the following:
    h. Provide the WQ elevations of the bioretention ponds within the pond cross sections
    i. Confirm if the ponds currently have an underdrain system installed. Underdrains need to be provided unless the existing soil has an infiltration rate of 0.52 in/hr.
    j. Provide Erosion control matting for the pond slopes and show the matting on the plans.
    k. For the smaller pond, provide a riprap apron on the downstream side of the embankment and size the apron for the 25-yr flow event.

l. Propose to relocate the existing rock gabion and tie in the proposed gabion to the pond embankment. Also provide a gabion detail and make sure the proposed sediment forebay is proposed to contain 25% of the WQV.



U2 – Comment partially addressed. Please adjust or provide the following for Pond 1:

1. Verify that all flowlines within the bioretention basin are at the same elevation.
2. Verify that all piping is perforated 6" SCH 40 PVC with 3/8" perforation and add FL callouts.
3. Provide cleanouts for all underdrains within the basin and provide a cleanout detail.
4. An orifice of 1" minimum diameter on the underdrain outfall is required. Please see sheet 172 for the requirement and sheet 177 of the HLWO technical manual to calculate the true orifice diameter. Please make sure to provide a callout specifying the orifice diameter and provide an orifice detail (threaded cap, etc.).
5. For the inner basin underdrain system please provide at least one cleanout above the WQV elevation.
6. Provide culvert discharge velocities used to calculate the riprap and add the riprap size to the call-out.
7. The top of the rock berm only needs to be at the WQV EL. Also, provide a rock berm detail or specify the following types of wire for the berm detail provided "metallic-coated or PVC-coated steel with a minimum wire size of 14 gauge (0.080 inch or 2.0 mm diameter)."

U2 – Comment partially addressed. Please adjust or provide the following for Pond 2:

8. Current slope on the upstream embankment is over 30% recommend adding riprap on embankment and sizing it to the 25-year flow event to avoid any scouring. Also, please provide calculations.
9. Provide discharge velocities used to size the downstream riprap apron. See comment #33-U1.

Response:
U1 – The water quality elevations have been added and called out on both sets of profiles for Pond 1 and 2. For Pond 1, 6" PVC underdrains have been placed according to specifications highlighted in LCRA's Water Quality Management Technical Manual. For

Pond 2, underdrains aren't feasible as they aren't able to adequately discharge at the minimum slope requirement. A infiltration test will be completed on Pond 2 prior to installation to ensure all requirements are being met. Erosion control matting has been added been added around the pond slopes for both ponds. The Erosion control matting detail has been added to the Erosion Control Details plan sheet and the notes have been added to the Water Quality Details & Notes plan sheet. A rip-rap apron has been sized and added to Pond 2, the smaller pond. Pond 1 will utilize the proposed road, located downstream of the pond, as its rip-rap apron. A gabion wall has been included along Pond 1's embankment, sized to contain 26% of the water quality volume it will receive. A City of Austin detail for the gabion wall has been added to the Site & Paving details plan sheet.

U2 –

1. **All underdrain laterals begin at the same elevation and slope at 0.50% minimum. Please confirm if this meets LCRA requirements.**
2. **All pipes for the underdrains are called out to be 6" SCH 40 PVC with 3/8" perforation. Each pipe flow line has been included in the callouts.**
3. **Cleanouts are provided at the start of each underdrain lateral. An LCRA detail is provided in the Water Quality Details & Notes plan sheet. Please confirm if this meets LCRA requirements.**
4. **The true orifice diameter was calculated through applying the formula on sheet 177 of the HLWO technical manual. These calculations, as well as, the equation, for reference, have been provided on Pond 1 Plan & Profile plan sheet. A threaded cap with 1.2" orifice is called out at the underdrain outlet.**
5. **There are two cleanouts provided on either side of the pond that are about 0.5' from the surface elevation. The cleanout rim has been provided on both structure's callouts.**
6. **The concrete channel discharge velocity, along with the rip-rap calculations for the flow entrance and outfall have been added to the Pond 1 Plan & Profile plan sheet. The rip-rap size has been added to the callouts.**
7. **The rock berm has been adjusted to be at the water quality elevation of 887.00'. The detail provided on Pond 1 Plan & Profile plan sheet shows the rock berm being 14" in height, with 2" being underground. A callout with the type of wire options to be used has also been added to the detail.**
8. **Rip-rap has been added all along the upper embankment of the pond, similarly to how it's shown on the downstream end. Calculations for the rip-rap sizing and apron length are provided on the Pond 2 Plan & Profile plan sheet. Peak flow and velocity for the 100-YR storm event was used in place of the 25-YR flow to provide the maximum Rip-Rap values needed.**
9. **The discharge velocity used to size the rip-rap downstream has been included within the rip-rap calculations table on the Pond 2 Plan & Profile plan sheet.**

30. U1 – Include the following note for the bioretention pond media and vegetation:
The media shall have a minimum thickness of 30" with 18-24" of soil mixture over 6-12" of sand. The soil mixture should be 30-40% sand or granite sand and 50-60% topsoil and 10% organics. The soil mix should have less than 5% clay with no commercial fertilizers, manure, or sandy loam. Provide clean sand, free of deleterious materials. Sand should be ASTM C-33 with grain size of 0.02-0.04 inches (same as sand filter). The soil should be a uniform mix, free of stones, stumps, roots, or other similar objects larger than one inch. The 10% organics, cannot be derived from animal/human sources or unstable forms of organic matter. Native topsoil, humus. Coir fiber, peat, and mature plant derived composts with an established fungal component are suitable.

U2 – Comment partially addressed. Add a separate paragraph within the Bioretention vegetation note and add the following items:

- Overall vegetation density must be greater than 80% with no large bare areas.
- Revegetate the basin bottom with native grasses alongside with the following recommended plantings.
- Provide a minimum of three (3) species from each category listed below:

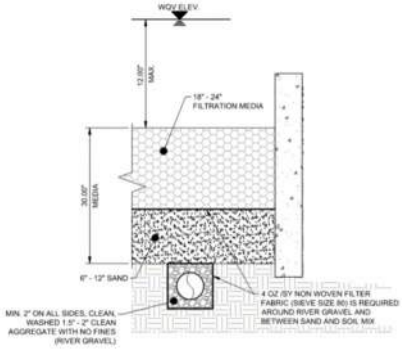
A ONE-YEAR VEGETATION WARRANTY IS REQUIRED ON ALL PLANTS.

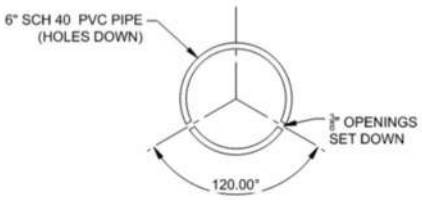
GROUND COVER	SHRUBS
SWITCH GRASS	AMERICAN BEAUTY BERRY
GREEN SPRANGLETOP	CHERRY LAUREL
INDIAN GRASS	POSSUMHAW HOLLY
EASTERN GAMMA	BUTTERFLY BUSH
MUHLY	CORAL BERRY
	PALMETTO
	OBEDIENT PLANT (FALL)

Response:
U1 – This note has been added to the Water Quality Details & Notes plan sheet.

U2 – These additional notes have been included on the Bioretention Vegetation note on the Water Quality Details & Notes plan sheet.

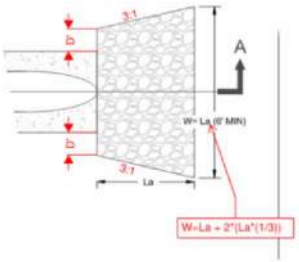
32. U1 – Remove the City of Austin details and include the following details on both pond plan sheets (FYI, perforation detail only applies to pond #1).





Response: These details have been included on Pond 1 and Pond 2 plan sheets.

33. U1 – Design the riprap aprons based on LCRA's detail for the pond 1 inflow, pond 2's emergency spillway, and include the riprap rock diameter D50 sizing, width, length, depth, and embedment dimensions within the callout for the aprons. Make sure all are sized for the 100-yr event. See the following link for the detail and the screenshot below for dimensional information. lcra.org/download/pipe-outfall-detail-pdf/?wpdmdl=29451.



Response: The rip-rap aprons for both ponds have been designed in accordance with LCRA's standard detail for the 100-YR storm event. The Rip-Rap Calculation tables contain all the required information for the rip-rap listed above. Rip-Rap dimensions have been added to the pond plan sheets. The LCRA Headwall and Rip Rap Detail has been included on the Water Quality Details & Notes plan sheet.

Should you have any questions or require additional information, please do not hesitate to contact me at (512) 518-6529 or Lexie.England@kimley-horn.com.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Lexie England, PE
Project Manager

July 2, 2025

Lower Colorado River Authority
3700 Lake Austin Blvd.
Austin, Texas 78703

RE: HIGHLAND LAKES ES SITE IMPROVEMENTS
APPLICATION #2025-5809 U3
8200 RM 1431, GRANITE SHOALS, TX 78654

To Whom It May Concern:

Please accept this Comment Response Letter for the above referenced project. This submittal is in response to the comments provided by Lower Colorado River Authority (LCRA) on July 2nd, 2025. The original comments have also been included below for reference.

General Comments:

1. The cost estimate signed, sealed, and dated 6/25/2025 in the amount of $53,900.00 has been approved as of 7/2/2025. A letter of credit or other form of financial security acceptable to LCRA must be provided prior to issuance of a permit. A Letter of Credit shall have a minimum expiration of 3 years or shall renew automatically until LCRA determines that the project has achieved final stabilization. A letter of credit template can be found in the Development permit application [hyperlink: https://www.lcra.org/download/hlwo-developer-application-packet-1-pdf/?wpdmdl=19704].
   Response: A Letter of Credit has been completed and is included in this submittal.

2. A water quality BMP easement needs to be provided for the bioretention pond #1 as well. Also, Please provide more callouts clearly depicting the Natural vegetative filter strip easements on the south side of the newly paved road.
   Response: The water quality BMP easement has been bolden to clarify its boundaries around bioretention pond #1. An additional callout has been added to depict the Natural vegetative filter strip easement boundary on the south side of the proposed roadway.

3. An underdrain cleanout detail was not included within the planset. Please provide a cleanout detail.
   Response: The LCRA cleanout detail has been included on the Water Quality Details & Notes plan sheet.

Should you have any questions or require additional information, please do not hesitate to contact me at (512) 518-6529 or Lexie.England@kimley-horn.com.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Lexie England, PE
Project Manager

ATTACHMENT H

ENGINEERING REPORT

HIGHLAND LAKES ELEMENTARY SCHOOL
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

Prepared For:

MARBLE FALLS I.S.D.
1800 Colt Circle,
Marble Falls, Texas 78654

Prepared By:

Kimley»Horn

Texas Registration #928
6800 Burleson Road
Building 312, Suite 150
Austin, Texas 78744

June 2025

TABLE OF CONTENTS

LIST OF EXHIBITS

Kimley»Horn

SECTION 1: INTRODUCTION

This Engineering Report has been prepared for the proposed improvements on the 37.20-acre site located at 8200 RM 1431, in the City of Granite Shoals, Burnet County, Texas. The subject site is currently developed. Refer to Exhibit G for the 2019 Engineering Report prepared for the previous development under permit number D97-00014. Additionally, please see Exhibit A for a location map and Exhibit B for a soils report.

This project is located within the Inks Lake – Lake Lyndon B. Johnson Watershed. According to FIRM number 48053C0576G dated November 1, 2019, the site is located in the Federal Emergency Management Agency's Zone X. The FIRM map is attached as Exhibit C. The is site not located within the Edwards Aquifer Recharge Zone according to the Edward's Aquifer GIS databases.

SECTION 2: SITE CONDITIONS

2.1 LAND USE

The lot consists of 37.20 acres of mostly developed land.

2.2 ZONING

The site is located within City of Granite Shoal's City Limits and the City of Granite Shoal's ETJ. The property is zoned as GB-2 – General Business 2.

2.3 CREEK BUFFER

An existing creek passes through the project site. A 25' creek buffer is maintained from the top of the creek banks on both sides per Section 2.4(1) of LCRA Highland Lakes Watershed Ordinance Water Quality Management Technical Manual.

SECTION 3: PROPOSED DEVELOPMENT

3.1 SUMMARY OF DEVELOPMENT

Proposed site improvements include additional impervious cover, site grading, compensatory storage and environmental quality features to mitigate increased flow capacity. The limits of construction total 3.93 acres.

3.2 TRANSPORTATION

Access to the site will be provided by the existing driveway off Ranch to Market Road 1431. An additional drive aisle will be proposed off the main driveway to access proposed additional parking and student drop off.

3.3 DRAINAGE CONDITIONS

Existing flows sheet flow south/southeast through Vegetated Filter Strips and existing bioretention ponds, ultimately ending up in the creek to the southeast of the development. The northern portion of the site flows through an existing trickle channel to a bioretention pond located centrally within the development.

SECTION 4: DRAINAGE AND WATER QUALITY ANALYSIS

4.1 WATERSHED CLASSIFICATION

The tract is located in the Inks Lake – Lake Lyndon B. Johnson Watershed.

4.2 ON-SITE DRAINAGE

On-site drainage patterns will remain consistent with existing conditions and sheet flow to the revised vegetative filter strip and expanded bioretention pond locations.

4.3 OFF-SITE DRAINAGE

Based on the overall development drainage maps and the topographic survey, offsite storm water is currently draining through the project site. The proposed conditions routes all off-site flows around the site through a ditch located on the Southeast property line. Please see Exhibit D for existing drainage map, and Exhibit E for proposed drainage map.

4.4 DETENTION AND WATER QUALITY

Water Quality treatment for the proposed increase in impervious cover is proposed to be treated through the use of natural vegetative filter strips, engineered vegetative filter strips and bioretention basins. Drainage patterns are proposed to remain consistent with existing conditions by relocating the existing filter strips and expanding the existing bioretention basins to accommodate the additional impervious cover proposed. The proposed water quality plan has been included as Exhibit F

4.5 ENGINEER'S CERTIFICATION DRAINAGE STATEMENT

I, Lexie B England, Texas License Number 139395, certify no additional adverse flooding impacts to other property will occur because of the proposed improvements.

SECTION 5: EROSION AND SEDIMENTATION CONTROLS

Temporary erosion and sedimentation controls during construction are proposed on the Erosion Control Plan and include silt fences, tree protection, and stabilized construction entrances designed to City of Austin criteria.

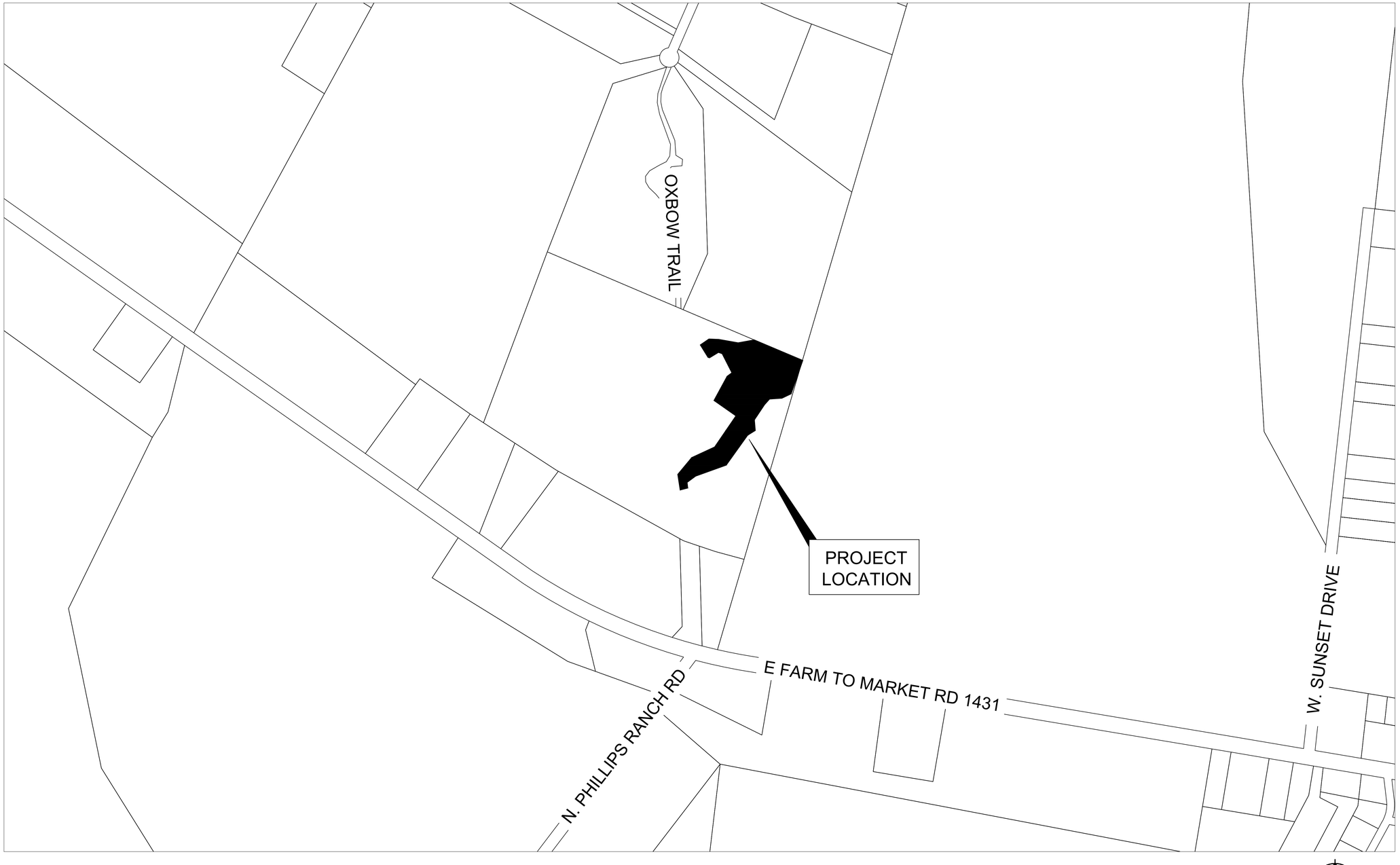
SECTION 6: UTILITIES

No utilities are proposed with this development.

EXHIBIT A
LOCATION MAP

SITE LOCATION MAP

8200 RM 1431, GRANITE SHOALS, TX 78654



LEGAL DESCRIPTION

ABS A0530 ARTHUR LUCKEY, 36.0 ACRES
ABS A0530 ARTHUR LUCKEY,1.1996 ACRES

NORTH

GRAPHIC SCALE IN FEET
0 125 250 500

EXHIBIT B
SOILS REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Blanco and Burnet Counties, Texas

May 22, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

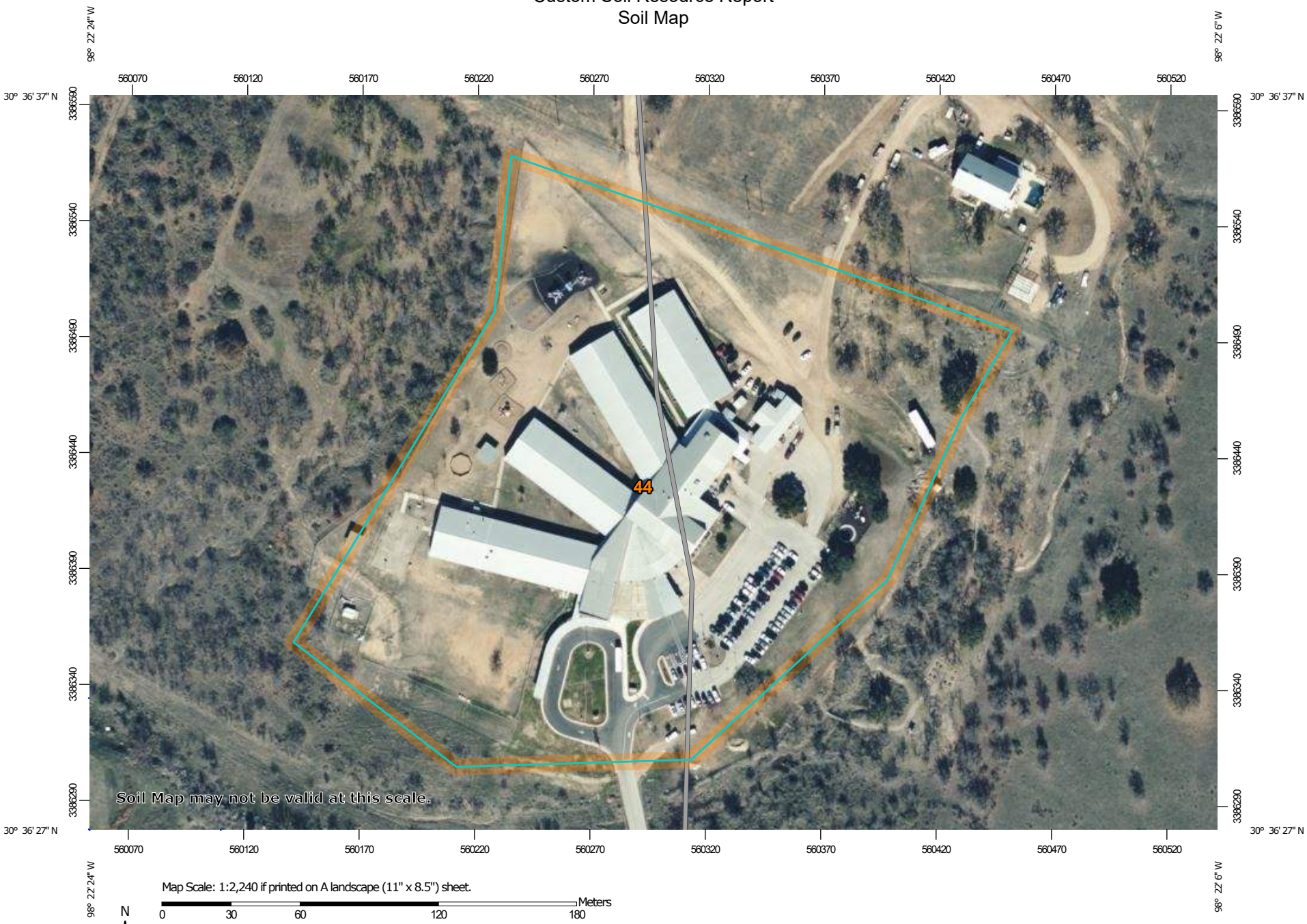
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,240 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:31,700.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Blanco and Burnet Counties, Texas
Survey Area Data: Version 21, Aug 30, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 15, 2019—Dec 19, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
44	Voca-Click association, 1 to 5 percent slopes	12.0	100.0%
Totals for Area of Interest		**12.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Blanco and Burnet Counties, Texas

44—Voca-Click association, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 31257
Elevation: 750 to 1,520 feet
Mean annual precipitation: 30 to 33 inches
Mean annual air temperature: 65 to 67 degrees F
Frost-free period: 210 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Voca and similar soils: 67 percent
Click and similar soils: 15 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Voca

Setting

Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, convex
Across-slope shape: Linear, convex
Parent material: Slope alluvium derived from granite and/or residuum weathered from granite over grus derived from granite

Typical profile

A - 0 to 8 inches: gravelly sandy loam
Bt1 - 8 to 28 inches: gravelly clay
Bt2 - 28 to 48 inches: very gravelly clay
BCt - 48 to 80 inches: extremely gravelly coarse sandy loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R082AY600TX - Gravelly Sandy Loam 25-32 PZ
Hydric soil rating: No

Description of Click

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Residuum weathered from granite

Typical profile

A - 0 to 14 inches: gravelly sandy loam
Bt1 - 14 to 26 inches: very gravelly sandy loam
Bt2 - 26 to 36 inches: very gravelly sandy loam
BCt - 36 to 54 inches: extremely gravelly sandy loam
R - 54 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 39 to 59 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: R082AY365TX - Granite Gravel 25-32 PZ
Hydric soil rating: No

Minor Components

Keese

Percent of map unit: 8 percent
Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R082AY377TX - Shallow Granite 25-32 PZ
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Linear
Hydric soil rating: No

Oben

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: R082AY369TX - Red Sandy Loam 25-32 PZ
Hydric soil rating: No

Hye

Percent of map unit: 2 percent
Landform: Ridges
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, convex
Across-slope shape: Linear, convex
Ecological site: R082AY369TX - Red Sandy Loam 25-32 PZ
Hydric soil rating: No

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EXHIBIT C
FEMA FIRM MAP

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:LWK %)(RU 'HSWK ...
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)XWXUH &RQGLWLRQV ... &KDQFH)ORRG +D]DUG
$UHD ZLWK 5HGXFHG)OR... /HYHH 6HH 1RWHV
$UHD ZLWK)ORRG 5LVN G...

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27+(5 $5($6 $UHD RI 8QGHWHUPLQHG ...

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:DWHU 6XUIDFH (OHYDWL...
&RDVWDO 7UDQVHFW
%DVH)ORRG (OHYDWLRQ ...
/LPLW RI 6WXG\
-XULVGLFWLRQ %RXQGDU...
&RDVWDO 7UDQVHFW %D...

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1R 'LJLWDO 'DWD $YDLOD...
8QPDSSHG

7KH SLQ GLVSOD\HG RQ WKH ... SRLQW VHOHFWHG E\ WKH XV... DQ DXWKRULWDWLYH SURSHU...

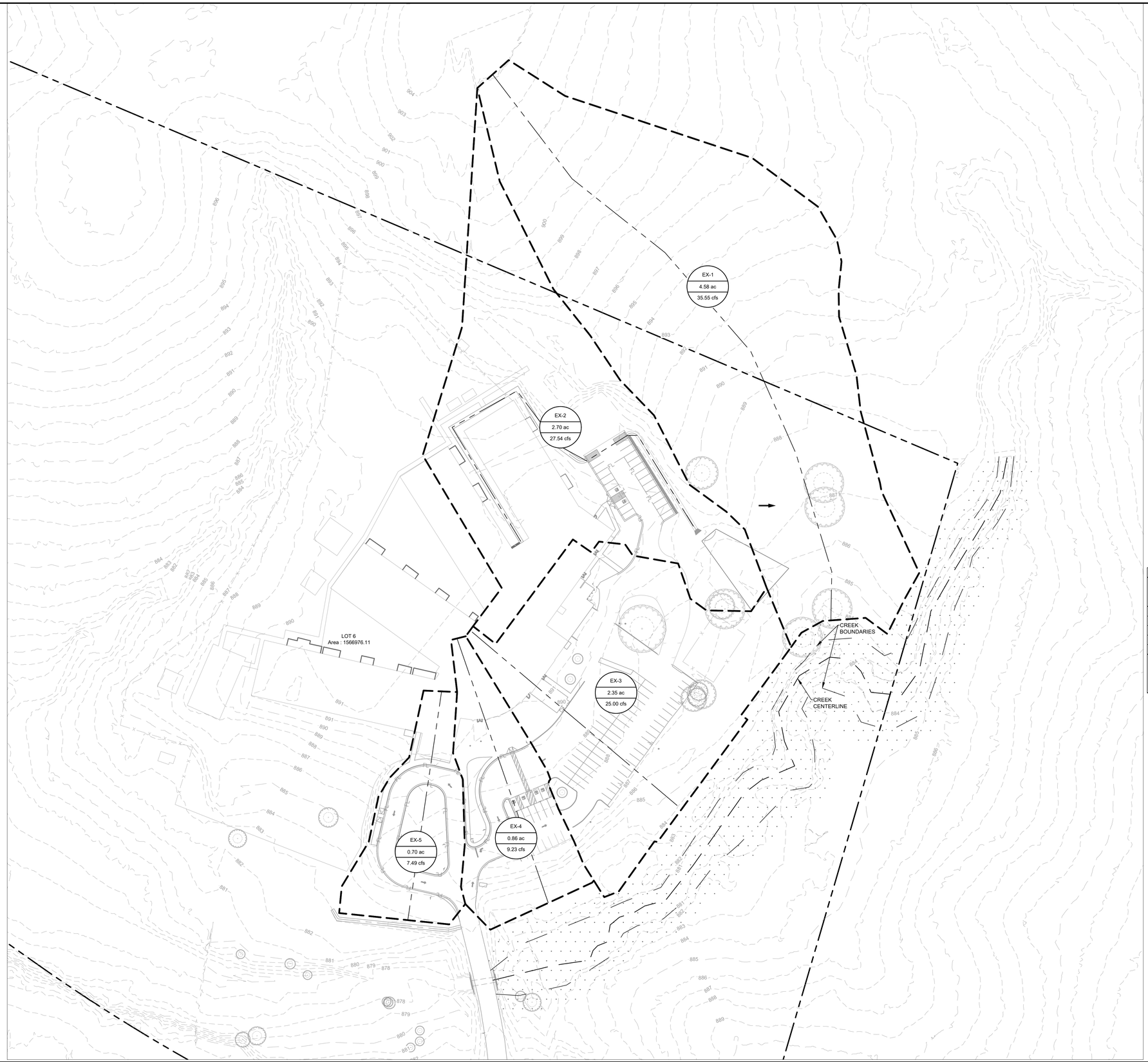
7KLV PDS FRPSOLHV ZLWK)(0$ V VWDQG... GLJLWDO IORRG PDSV LI LW LV QRW YR... 7KH EDVHPDS VKRZQ FRPSOLHV ZLWK)(... DFFXUDF\ VWDQGDUGV

7KH IORRG KD]DUG LQIRUPDWLRQ LV GH... DXWKRULWDWLYH 1)+/ ZHE VHUYLFHV S... ZDV H[SRUWHG RQ ... DQG GRHV QRW... UHIOHFW FKDQJHV RU DPHQGPHQWV VX... WLPH 7KH 1)+/ DQG HIIHFWLYH LQIRUP... EHFRPH VXSHUVHGHG E\ QHZ GDWD RY...

7KLV PDS LPDJH LV YRLG LI WKH RQH R... HOHPHQWV GR QRW DSSHDU EDVHPDS ... OHJHQG VFDOH EDU PDS FUHDWLRQ G...),50 SDQHO QXPEHU DQG),50 HIIHFWLY... XQPDSSHG DQG XQPRGHUQL]HG DUHDV ... UHJXODWRU\ SXUSRVHV

%DVHPDS ,PDJHU\ 6RXUFH 86*6 1DWLRQDO 0DS

EXHIBIT D
EXISTING DRAINAGE MAP



N

W E

S

GRAPHIC SCALE IN FEET
0 30 60 120

LEGEND

X-1 / 9.9 ac / 5.5 cfs	AREA DESIGNATOR / AREA IN ACRES / Q100 FLOW IN CFS
	PROPERTY LINE
	EXISTING STORM DRAIN LINE
	EXISTING DRAINAGE DIVIDE
	EXISTING STORM DRAIN INLET
	EXISTING STORM DRAIN MANHOLE
	EXISTING STORM DRAIN HEADWALL
	EXISTING FLOW DIRECTION
555	EXISTING CONTOUR
	CREEK BUFFER ZONE

NOTES:

1. BUFFER ZONES SHALL REMAIN UNDISTURBED EXCEPT FOR CROSSINGS SHOWN ON THESE PLANS. ENCROACHMENT INTO A BUFFER ZONE OR DAMAGE TO BUFFER ZONE AREAS WILL BE CONSIDERED A PRIORITY VIOLATION AND WILL RESULT IN A STOP WORK ORDER AND POSSIBLE FINES. REFER TO CREEK CROSSING DETAILS AND NOTES FOR CONSTRUCTION IN CREEKS.
2. IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.B OF THE HLWQ TECHNICAL MANUAL.

WEIGHTED CURVE NUMBER CALCULATIONS

Area ID	Area SF	Area Acre	Soil Group %	Impervious		Pervious		IC	CN
				SF	AC	SF	AC	%	
EX-1	199,541	4.58	100% C	0	0.00	199,541	4.58	0.0	74
EX-2	117,598	2.70	100% C	39,120	0.90	78,478	1.80	33.3	82
EX-3	102,429	2.35	100% C	54,843	1.26	47,586	1.09	53.5	87
EX-4	37,267	0.86	100% C	24,842	0.57	12,425	0.29	66.7	90
EX-5	30,664	0.70	100% C	16,529	0.38	14,135	0.32	53.9	87
TOTAL	487,499	11.19	100% C	135334	3.11	352165	8.08	27.8	81

Soil Type	Description	CN	TYPE
C	Open Space - Good Condition	74	Pervious
C	Impervious Areas	98	Impervious

*The Curve Number (Cn) has been determined from Table 2-2a of Technical Release 55. The cover type, hydrologic condition, and soil group determined for the proposed conditions are open space good condition and Type C soil group with a Cn of 74.

EXISTING TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA	SHEET FLOW				SHALLOW CONCENTRATED FLOW			TOTAL Tc**
	P-2yr24hr	4.14	IN		Paved			(min)
	N	L (ft)	S (ft/ft)	Tt (min)	L (ft)	S (ft/ft)	Tt(min)	
EX-1	0.150	100	0.020	8.61	765	0.015	6.45	15.07
EX-2	0.015	100	0.010	1.80	517	0.010	4.24	6.04
EX-3	0.015	100	0.010	1.80	250	0.030	1.18	5.00
EX-4	0.015	100	0.010	1.80	264	0.030	1.25	5.00
EX-5	0.015	100	0.010	1.80	200	0.035	0.88	5.00

*Minimum Tc is 5 minutes

Unpaved Tt = L/(60(16.1345)(S)^.5
Paved Tt = L/(60(20.3282)(S)^0.5

Existing Storm Drainage Summary (SCS Methodology)

Area ID	Flow Rate (CFS)			
	2	10	25	100
EX-1	6.53	15.20	22.18	35.55
EX-2	6.53	13.08	18.11	27.54
EX-3	6.75	12.51	16.86	25.00
EX-4	2.65	4.73	6.30	9.23
EX-5	2.02	3.75	5.05	7.49

Note: Results are from PondPack V8i modeling

811 Know what's below. Call before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV.= 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150,
AUSTIN, TEXAS 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM
TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
06/24/2025

KHA PROJECT 065002301			
DATE	JUNE 2025		
SCALE:	AS SHOWN		
DESIGNED BY:	LBE		
DRAWN BY:	GAZ		
CHECKED BY:	LBE		

EXISTING DRAINAGE AREA MAP

HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
9 OF 16

SP-XXXX-XXXX

EXHIBIT E
PROPOSED DRAINAGE MAP

N

W E

S

GRAPHIC SCALE IN FEET
0 30 60 120

LEGEND

X-1 / 9.9 ac / 5.5 cfs	AREA DESIGNATOR, AREA IN ACRES, Q100 FLOW IN CFS
A-1	INLET NUMBER
	PROPERTY LINE
	PROPOSED STORM DRAIN LINE
	EXISTING STORM DRAIN LINE
	PROPOSED DRAINAGE DIVIDE
	PROPOSED STORM DRAIN INLET
	PROPOSED STORM DRAIN MANHOLE
	PROPOSED STORM DRAIN HEADWALL
	PROPOSED FLOW DIRECTION
555	PROPOSED CONTOUR
555	EXISTING CONTOUR
	CREEK BUFFER ZONE

NOTES:

1. BUFFER ZONES SHALL REMAIN UNDISTURBED EXCEPT FOR CROSSINGS SHOWN ON THESE PLANS. ENCROACHMENT INTO A BUFFER ZONE OR DAMAGE TO BUFFER ZONE AREAS WILL BE CONSIDERED A PRIORITY VIOLATION AND WILL RESULT IN A STOP WORK ORDER AND POSSIBLE FINES. REFER TO CREEK CROSSING DETAILS AND NOTES FOR CONSTRUCTION IN CREEKS.
2. IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.B OF THE HLWO TECHNICAL MANUAL.

WEIGHTED CURVE NUMBER CALCULATIONS

Area ID	Area SF	Area Acre	Soil Group %	Impervious SF	Impervious AC	Impervious %	Pervious SF	Pervious AC	Pervious %	CN
PR-1	189,457	4.35	100% C	14,531	0.33	8%	174,926	4.02	92%	76
PR-2	133,357	3.06	100% C	52,517	1.21	39%	80,840	1.86	61%	83
PR-3	72,186	1.66	100% C	43,172	0.99	60%	29,014	0.67	40%	88
PR-4	26,383	0.61	100% C	16,062	0.37	61%	10,321	0.24	39%	89
PR-5	38,949	0.89	100% C	26,624	0.61	68%	12,325	0.28	32%	90
PR-6	30,664	0.70	100% C	16,529	0.38	54%	14,135	0.32	46%	87
TOTAL	490,996	11.27	100% C	169,435	3.89	35%	321,561	7.38	65%	82

Soil Type	Description	CN	TYPE
C	Open Space - Good Condition	74	Pervious
C	Impervious Areas	98	Impervious

*The Curve Number (Cn) has been determined from Table 2-2a of Technical Release 55. The cover type, hydrologic condition, and soil group determined for the proposed conditions are open space, good condition, and Type C soil group with a Cn of 70.

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA	SHEET FLOW P-2yr24hr N	L (ft)	S (ft/ft)	4.14 IN Tt (min)	SHALLOW CONCENTRATED FLOW L	S (ft/ft)	Tt(min)	TOTAL Tc** (min)
PR-1	0.150	100	0.020	8.61	765	0.015	6.45	15.07
PR-2	0.015	100	0.010	1.80	517	0.010	4.24	6.04
PR-3	0.015	100	0.010	1.80	226	0.030	1.07	5.00
PR-4	0.015	100	0.045	0.99	248	0.030	1.17	5.00
PR-5	0.015	100	0.045	0.99	271	0.030	1.28	5.00
PR-6	0.015	100	0.010	1.80	203	0.035	0.89	5.00

**Minimum Tc is 5 minutes

Unpaved Tt = L/(60(16.1345)(S)^.5
Paved Tt = L/(60(20.3282)(S)^0.5

Proposed Storm Drainage Summary (SCS Methodology)

Area ID	Flow Rate (CFS) 2	10	25	100
PR-1	6.79	15.18	21.85	34.56
PR-2	7.66	15.11	20.80	31.47
PR-3	4.88	8.94	12.00	17.71
PR-4	1.83	3.31	4.42	6.51
PR-5	2.77	4.95	6.58	9.65
PR-6	2.02	3.75	5.05	7.49

Note: Results are from PondPack V8i outputs

811 Know what's **below.** **Call** before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV = 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150,
AUSTIN, TX 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM
TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
06/24/2025

KHA PROJECT 065002301
DATE JUNE 2025
SCALE: AS SHOWN
DESIGNED BY: LBE
DRAWN BY: GAZ
CHECKED BY: LBE

PROPOSED DRAINAGE AREA MAP

HIGHLAND LAKES ES SITE IMPROVEMENTS

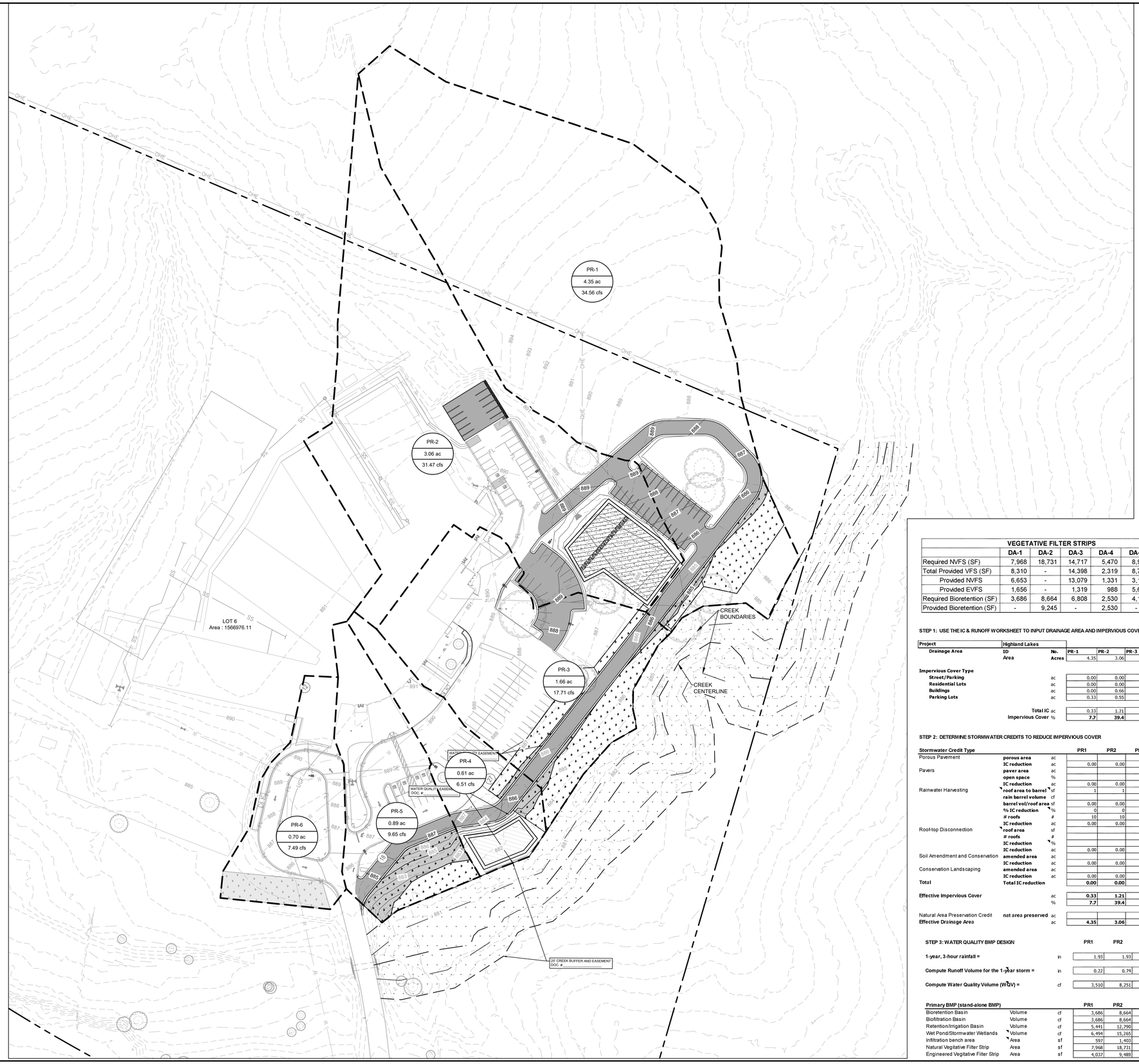
8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
10 OF 16

SP-XXXX-XXXX

EXHIBIT F

WATER QUALITY PLAN



N

W E

S

GRAPHIC SCALE IN FEET
0 30 60 120

LEGEND

X-1 / 9.9 ac / 5.5 cfs	AREA DESIGNATOR, AREA IN ACRES, Q100 FLOW IN CFS
	PROPERTY LINE
	EXISTING STORM DRAIN LINE
	EXISTING DRAINAGE DIVIDE
	EXISTING STORM DRAIN INLET
	EXISTING STORM DRAIN MANHOLE
	EXISTING STORM DRAIN HEADWALL
	EXISTING FLOW DIRECTION
555	EXISTING CONTOUR
	BIORETENTION POND
	NATURAL VEGETATED FILTER STRIPS
	ENGINEERED VEGETATED FILTER STRIPS
	PROPOSED PAVEMENT
	CREEK BUFFER ZONE

NOTES:

1. BUFFER ZONES SHALL REMAIN UNDISTURBED EXCEPT FOR CROSSINGS SHOWN ON THESE PLANS. ENCROACHMENT INTO A BUFFER ZONE OR DAMAGE TO BUFFER ZONE AREAS WILL BE CONSIDERED A PRIORITY VIOLATION AND WILL RESULT IN A STOP WORK ORDER AND POSSIBLE FINES. REFER TO CREEK CROSSING DETAILS AND NOTES FOR CONSTRUCTION IN CREEKS.
2. IF THE NVFS AREA IS DISTURBED, THE CONTRACTOR IS REQUIRED TO REVEGETATE AND CONVERT THE FILTER STRIP AREA TO ENGINEERED VEGETATIVE FILTER STRIP PER SECTION 4.2.7.8 OF THE HLWO TECHNICAL MANUAL.
3. BUFFER ZONE AND NATIVE VEGETATIVE FILTER STRIP BOUNDARIES SHALL BE STAKED IN THE FIELD. ONCE STAKING HAS BEEN COMPLETED, CONTACT THE LCRA INSPECTOR AT LEAST 48- HOURS BEFORE SCHEDULED PRECONSTRUCTION MEETING TO CONDUCT INSPECTION.
4. THE PROJECT ENGINEER OR HIS DESIGNEE SHALL CERTIFY THE BIORETENTION POND MEDIA BY PROVIDING:
   - A LABORATORY REPORT LESS THAN 6 MONTHS OLD WITH THE USDA SOIL CLASSIFICATION AND ORGANIC MATTER CONTENT BY LOSS OF IGNITION.
   - THE SAMPLE ID ON THE LAB REPORT WILL INDICATE THE PRODUCT NAME OF THE MEDIA.
   - THE CERTIFICATION WILL ALSO INCLUDE THE DELIVERY TICKET(S) TO THE SITE OF THE MEDIA AND SHALL SPECIFY THE MEDIA PRODUCT NAME THAT APPEARS ON THE LABORATORY REPORT.

VEGETATIVE FILTER STRIPS	DA-1	DA-2	DA-3	DA-4	DA-5	DA-6
Required NVFS (SF)	7,968	18,731	14,717	5,470	8,970	5,563
Total Provided VFS (SF)	8,310	-	14,398	2,319	8,754	5,839
Provided NVFS	6,653	-	13,079	1,331	3,125	5,839
Provided EVFS	1,656	-	1,319	988	5,628	-
Required Bioretention (SF)	3,686	8,664	6,808	2,530	4,149	2,573
Provided Bioretention (SF)	-	9,245	-	2,530	-	-

STEP 1: USE THE IC & RUNOFF WORKSHEET TO INPUT DRAINAGE AREA AND IMPERVIOUS COVER

Project	Highland Lakes							
Drainage Area	ID	No.	PR-1	PR-2	PR-3	PR-4	PR-5	PR-6	Total
	Area	Acres	4.35	3.06	1.66	0.61	0.89	0.70	11.27
Impervious Cover Type									
Street/Parking		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential Lots		ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buildings		ac	0.00	0.66	0.22	0.08	0.12	0.09	1.16
Parking Lots		ac	0.33	0.55	0.77	0.29	0.50	0.28	2.72
	Total IC	ac	0.33	1.21	0.99	0.37	0.61	0.37	3.88
	Impervious Cover	%	7.7	39.4	59.7	60.4	68.7	52.9	34.4

STEP 2: DETERMINE STORMWATER CREDITS TO REDUCE IMPERVIOUS COVER

Stormwater Credit Type			PR1	PR2	PR3	PR4	PR5	PR6	Total
Porous Pavement	porous area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pavers	paver area	ac							
	open space	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rainwater Harvesting	roof area to barrel	sf	1	1	1	1	1	1	
	rain barrel volume	cf							
	barrel vol/roof area	sf	0.00	0.00	0.00	0.00	0.00	0.00	
	% IC reduction	%	0	0	0	0	0	0	
	# roofs	#	10	10	10	10	10	10	
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roof-top Disconnection	roof area	sf							
	# roofs	#							
	IC reduction	%							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soil Amendment and Conservation	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Conservation Landscaping	amended area	ac							
	IC reduction	ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	Total IC reduction		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Effective Impervious Cover		ac	0.33	1.21	0.99	0.37	0.61	0.37	3.88
		%	7.7	39.4	59.7	60.4	68.7	52.9	34.4
Natural Area Preservation Credit	nat area preserved	ac							
Effective Drainage Area		ac	4.35	3.06	1.66	0.61	0.89	0.70	

STEP 3: WATER QUALITY BMP DESIGN

		PR1	PR2	PR3	PR4	PR5	PR6
1-year, 3-hour rainfall =	in	1.93	1.93	1.93	1.93	1.93	1.93
Compute Runoff Volume for the 1-year storm =	in	0.22	0.74	1.08	1.09	1.22	0.96
Compute Water Quality Volume (WQV) =	cf	3,510	8,251	6,483	2,409	3,951	2,451

Primary BMP (stand-alone BMP)			PR1	PR2	PR3	PR4	PR5	PR6
Bioretention Basin	Volume	cf	3,686	8,664	6,808	2,530	4,149	2,573
Biofiltration Basin	Volume	cf	3,686	8,664	6,808	2,530	4,149	2,573
Retention/Irrigation Basin	Volume	cf	5,441	12,790	10,049	3,735	6,125	3,799
Wet Pond/Stormwater Wetlands	Volume	cf	6,494	15,265	11,994	4,458	7,310	4,534
Infiltration bench area	Area	sf	597	1,403	1,102	410	672	417
Natural Vegitative Filter Strip	Area	sf	7,968	18,731	14,717	5,470	8,970	5,563
Engineered Vegitative Filter Strip	Area	sf	4,037	9,489	7,456	2,771	4,544	2,818

811 Know what's below. Call before you dig.

WARNING: CONTRACTOR IS TO VERIFY PRESENCE AND EXACT LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.

BENCHMARKS

TBM:
1. X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT
ELEV. = 890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

No.	REVISIONS	DATE	BY

Kimley»Horn
6800 BURLESON RD., BUILDING 312, SUITE 150,
AUSTIN, TX 78744
PHONE: 512-616-9942 WWW.KIMLEY-HORN.COM
TBPE Firm No. 928

STATE OF TEXAS
LEXIE B. ENGLAND
139395
LICENSED PROFESSIONAL ENGINEER
06/24/2025

KHA PROJECT 065002301
DATE JUNE 2025
SCALE: AS SHOWN
DESIGNED BY: LBE
DRAWN BY: GAZ
CHECKED BY: LBE

WATER QUALITY PLAN

HIGHLAND LAKES ES SITE IMPROVEMENTS

8200 RM 1431
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

SHEET NUMBER
11 OF 16

SP-XXXX-XXXX

EXHIBIT G

2019 ENGINEERING REPORT

ENGINEER'S REPORT

Highland Lakes Elementary School
Granite Shoals, Texas

Permit Amendment Application for Previously Approved "Granite Shoals Elementary School"

May 2019
Revised June 2019

Project Owner:

MARBLE FALLS I.S.D.
1800 Colt Circle
Marble Falls, TX 78654
PH: 830-693-4357

Prepared for:

LOWER COLORADO RIVER AUTHORITY
P.O. Box 220
Austin, TX 78767
PH: 512-578-3200

Prepared By:

Kimley»Horn
601 NW Loop 410, Suite 350
San Antonio, TX 78216
(210) 541-9166
KHA No. 068667004

Kimley»Horn

MEMORANDUM

To:	Erik Harris, P.E., Engineering Supervisor Austin, TX
From:	Richard Underwood, P.E. Kimley-Horn and Associates, Inc.
Date:	6/18/2019
Subject:	Highland Lakes Elementary School Permit Amendment

Mr. Harris,

Kimley-Horn and Associates Inc. has prepared the following memorandum summarizing how the proposed Highland Lakes Elementary School Project conforms to the drainage requirements of Granite Shoals and Lower Colorado River Authority (LCRA) Highland Lakes Watershed Ordinances at the time of the preparation of this submittal.

The proposed school site is located at 8200 Ranch Rd 1431, Granite Shoals, TX 78654. The property currently houses the existing Highland Lakes Elementary School. The proposed improvements to the Highland Lakes Elementary School are to be built in one phase and will replace portions of the existing parking lots and driveways. For this study, the information provided below shows that the proposed development does not adversely impact the downstream storm water system. An Engineer's Report was previously permitted by LCRA which is attached to the end of this report in Appendix C. The report is titled "Engineer's Report for Granite Shoals Elementary School" prepared by K.C. Engineering, Inc. on July 3, 1997. This application is intended to support the amendment of the previously permitted work.

For the purposes of this analysis, calculations for the Vegetative Filter Strips used the Commercial Development – Alternate Standards from the LCRA Highland Lakes Watershed Ordinance. According to the United States Department of Agriculture Natural Resources Conservation System, the web soil survey indicates that the existing soils are considered Voca association, gently undulating, with a hydrologic soil group classification C.

Water Quantity:

Existing Conditions:

The existing onsite drainage is divided into five drainage areas that are summarized in the previously permitted report in Appendix C. Drainage area No. 3 uses an existing vegetative filter strip and existing bioretention pond in series and drainage area No. 5 uses an existing vegetative filter strip that was designed to adequately treat TPH loads. An Existing Drainage Area Map is provided in Appendix A. Drainage area No. 3 and No. 5 are the areas that relate to the proposed improvements for the project and are identified in Table 1 below.

Table 1: Pre-Development Condition – Impervious Cover Calculations
Highland Lakes Elementary School Package 1A

EXISTING IMPERVIOUS COVER PERCENTAGE				
BASIN	AREA	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS)	PERVIOUS (GRASS: FAIR CONDITION 2-7%)	IMPERVIOUS COVER %
	(ACRES)	(ACRES)	(ACRES)	(IC%)
NO. 3	0.79	0.55	0.24	69.6%
NO. 5	0.77	0.33	0.44	42.9%
TOTAL	1.56	0.88	0.68	56.4%

Proposed Conditions:

Table 2 below shows the proposed conditions for the project. While a slight increase in total impervious area is proposed to Basins 3 and 5, the Engineer's Report that was approved in 1997 for the property documents that the ponds and filter strips are sized for an accumulated impervious cover of 0.97-AC which is less than the proposed impervious cover. Therefore the existing bmp's will continue to operate as originally designed.

Table 2: Proposed Conditions – Impervious Cover Calculations
Highland Lakes Elementary School Package 1A

PROPOSED IMPERVIOUS COVER PERCENTAGE				
BASIN	AREA	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS)	PERVIOUS (GRASS: FAIR CONDITION 2-7%)	IMPERVIOUS COVER %
	(ACRES)	(ACRES)	(ACRES)	(IC%)
NO. 3	0.86	0.58	0.28	67.4%
NO. 5	0.70	0.35	0.35	50.0%
TOTAL	1.56	0.93	0.63	59.6%

The drainage areas referenced above are depicted in the Proposed Drainage Area Map included in Appendix A. Detention requirements are met due to the proposed impervious cover matching existing impervious cover area. The drainage patterns of the site in proposed conditions are in general conformance with the drainage patterns of existing conditions. Commercial Development – Alternate Standards from the LCRA Highland Lakes Watershed Ordinance were used to determine the water quality volume, vegetative filter strip area, and minimum filter strip width needed. Table 3 below summarizes the required vegetated filter strip size.

Table 3: Proposed Vegetated Filter Strips Calculations
Highland Lakes Elementary School Package 1A

VEGETATED FILTER STRIPS CALCS			
BASIN	RAINFALL	RUNOFF COEFFICIENT (Rv)	REQUIRED WATER QUALITY VOLUME (WQV)
	(INCHES)	(INCHES)	(CUBIC FT)
NO. 3	1.93	1.20	3,755
NO. 5	1.93	0.92	2,329

Where:

Rainfall = 1 year storm rainfall from Table 2-8 of LCRA Highland Lakes Watershed Ordinance

Runoff Volume (Rv) = $[0.05+(0.0085*IC_{eff})]*1.93$ from Equation 2.9 of LCRA Highland Lakes Watershed Ordinance, where IC_{eff} = Effective impervious cover percentage (percent)

Water Quality Volume (WQV) = DA*Rv*(43,560/12) from Equation 2.10 of LCRA Highland Lakes Watershed Ordinance

Rational method runoff coefficients were taken from Appendix 2.4 of the LCRA Highland Lakes Watershed Ordinance. From Table 6-2, the following runoff coefficient assumptions were made:

- 0.69 Asphaltic Streets for imperious areas
- 0.18 Lawns, Clay Soil Average 2-7% for pervious areas

Table 4 below summarizes the calculations for the 1-year peak flow of the proposed conditions.

Table 4: Proposed Conditions – 1 year Peak Flow Calculations
Highland Lakes Elementary School Package 1A

1 YEAR, 3 HOUR PEAK FLOW					
BASIN	RUNNOFF COEFFICIENT	TIME OF CONCENTRATION	INTENSITY	AREA	PEAK FLOW
	C	TC (MIN)	I (IN/HR)	A (ACRES)	Q1-YEAR (CFS)
NO. 3	0.52	5.0	5.50	0.86	2.48
NO. 5	0.44	9.9	4.24	0.70	1.29

The equations from the LCRA Highland Lakes Watershed Ordinance for Commercial Development – Alternate Standards were used in Table 5 below.

Table 5: Proposed Conditions – Required vs Proposed Vegetated Filter Strips
Highland Lakes Elementary School Package 1A

REQUIRED VS. PROPOSED VEGETATED FILTER STRIPS				
BASIN	REQUIRED VEGETATED FILTER STRIP	PROPOSED VEGETATED FILTER STRIP	MINIMUM REQUIRED FILTER STRIP WIDTH (L)	MINIMUM PROPOSED FILTER STRIP WIDTH (L)
	(SF)	(SF)	(FT)	(FT)
NO. 3	4,318	5,760	25	64
NO. 5	2,679	4,840	13	35

Where:

Required Vegetated Filter Strip = WQV*1.15 from Equation 2-13 of LCRA Highland Lakes Watershed Ordinance

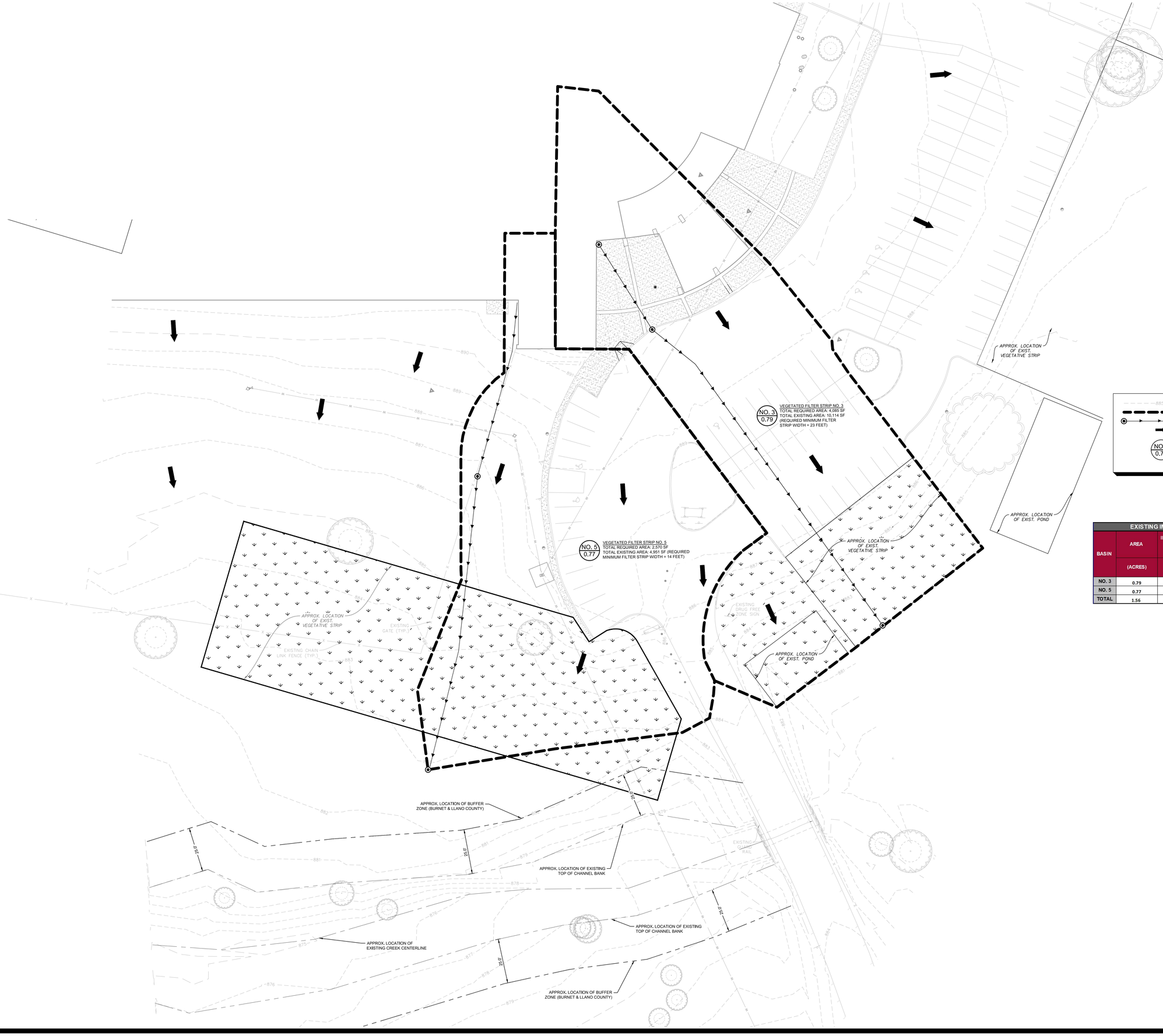
Minimum Filter Strip Width = $10*Q_{1\text{-year dev (cfs)}}$ from Equation 2-15 of LCRA Highland Lakes Watershed Ordinance

As part of this analysis, Kimley-Horn has reviewed the downstream impacts associated with this project. The existing vegetative filter strip No. 3 and the proposed vegetative filter strip No. 5 are adequate to treat the impervious runoff from the proposed improvements. The project is anticipated to have no adverse impacts downstream.

Sincerely,

Richard Underwood, P.E.
Kimley-Horn and Associates, Inc.

APPENDIX A – DRAINAGE AREA MAPS



EXISTING IMPERVIOUS COVER PERCENTAGE				
BASIN	AREA (ACRES)	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS) (ACRES)	PERVIOUS (GRASS: FAIR CONDITION 2-7%) (ACRES)	IMPERVIOUS COVER % (IC%)
NO. 3	0.79	0.55	0.24	69.6%
NO. 5	0.77	0.33	0.44	42.9%
TOTAL	1.56	0.88	0.68	56.4%

CAUTION!!

EXISTING UNDERGROUND UTILITIES IN THE AREA. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REPAIRS TO EXISTING UTILITIES DUE TO DAMAGE INCURRED DURING CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES ON THE PLANS.

811 Know what's below. Call before you dig.

BENCHMARK LIST
BM #50 X SET IN FIRE HYDRANT VALVE AT THE NORTHERN MOST CORNER OF PARKING LOT ELEV.=890.524' (NAVD '88) SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION

REVISION	DATE	
1	06/05/2019	ADDENDUM 1
2	06/18/2019	REVISED PER LCRA COMMENTS

Project:

HIGHLAND LAKES ELEMENTARY SCHOOL
PARKING AND DRIVES FOR
MARBLE FALLS I.S.D.
GRANITE SHOALS, TEXAS

Kimley»Horn
© 2019 KIMLEY-HORN AND ASSOCIATES, INC.
601 NW LOOP 410, SUITE 350, SAN ANTONIO, TX 78216
PHONE: 210-541-9166 FAX: 210-541-8699
WWW.KIMLEY-HORN.COM TBPE FIRM NO. 928

STATE OF TEXAS
RICHARD UNDERWOOD
117843
REGISTERED PROFESSIONAL ENGINEER
06/18/2019

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800.687.1229

EXISTING DRAINAGE AREA MAP

PACKAGE 1A VOLUME

Job No. 017795-01-05
Drawn By: SCM
Date: 06/05/2019
Sheet No. C5.1

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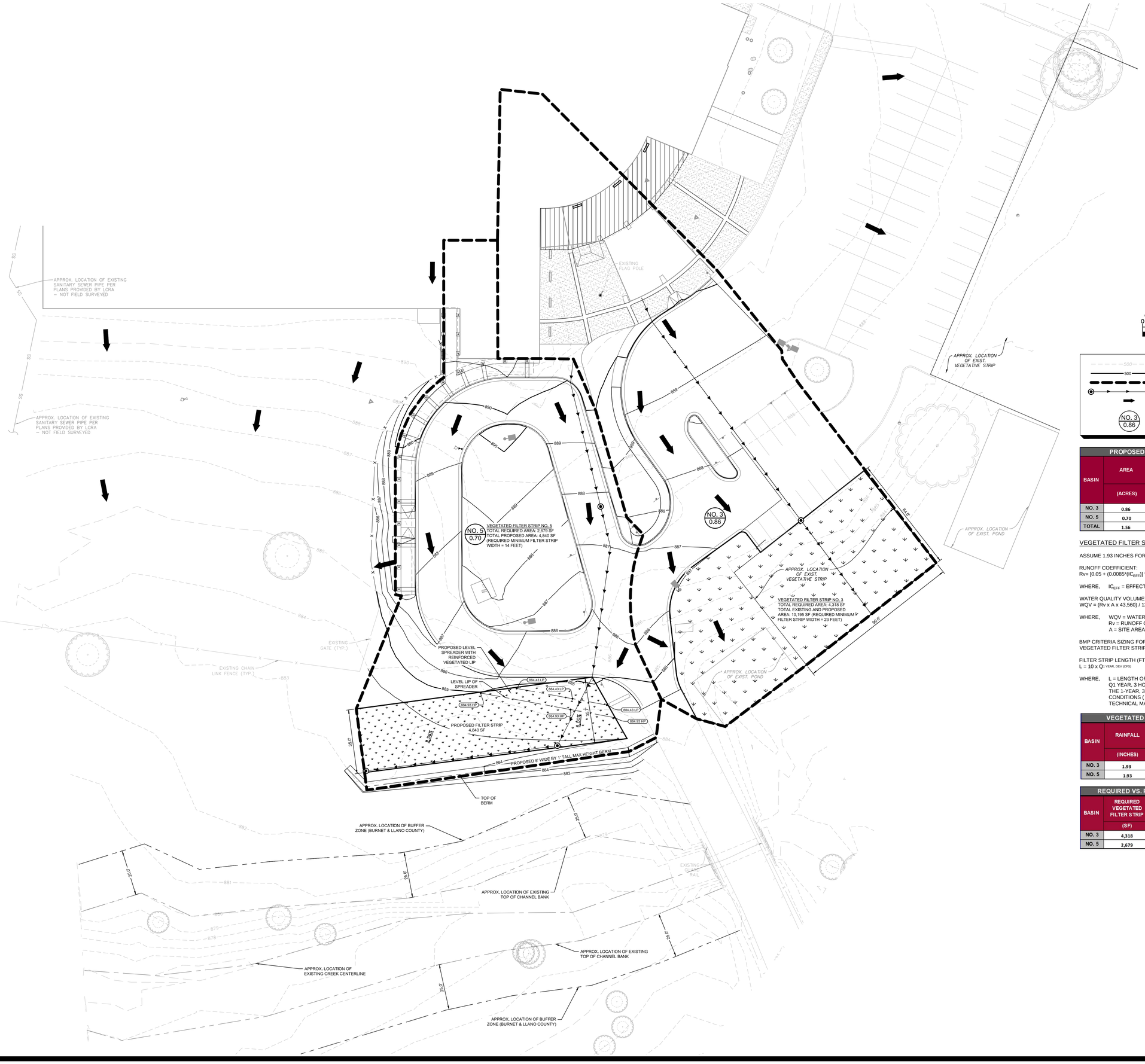

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- DRAINAGE BOUNDARY
- TIME OF CONCENTRATION FLOW DIRECTION
- NO. 3 / 0.86 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA

PROPOSED IMPERVIOUS COVER PERCENTAGE

BASIN	AREA (ACRES)	IMPERVIOUS (DRIVES, PARKING LOTS, SIDEWALKS) (ACRES)	PERVIOUS (GRASS: FAIR CONDITION 2-7%) (ACRES)	IMPERVIOUS COVER % (IC%)
NO. 3	0.86	0.58	0.28	67.4%
NO. 5	0.70	0.35	0.35	50.0%
TOTAL	1.56	0.93	0.63	59.6%

VEGETATED FILTER STRIP CALCULATIONS:

ASSUME 1.93 INCHES FOR 1 YEAR, 3 HOUR RAINFALL

RUNOFF COEFFICIENT:
$Rv = [0.05 + (0.0085*(IC_{EFF})] * 1.93$

WHERE, IC_{EFF} = EFFECTIVE IMPERVIOUS COVER PERCENTAGE

WATER QUALITY VOLUME:
WQV = (Rv x A x 43,560) / 12

WHERE, WQV = WATER QUALITY VOLUME
Rv = RUNOFF COEFFICIENT
A = SITE AREA TO BMP

BMP CRITERIA SIZING FOR 10 TOTAL ACRES OR LESS:
VEGETATED FILTER STRIPS: WQV *1.15

FILTER STRIP LENGTH (FT):
L = 10 x Q_1 YEAR, DEV (CFS)

WHERE, L = LENGTH OF FILTER STRIP IN DIRECTION OF FLOW
Q1 YEAR, 3 HOUR DEVELOPED = PEAK DISCHARGE FOR THE 1-YEAR, 3 HOUR STORM EVEVNT UNDER PROPOSED CONDITIONS (CFS, SEE LCRA WATER QUALITY TECHNICAL MANUAL FOR RAINFALL DATA)

VEGETATED FILTER STRIPS CALCS

BASIN	RAINFALL (INCHES)	RUNOFF COEFFICIENT (Rv) (INCHES)	REQUIRED WATER QUALITY VOLUME (WQV) (CUBIC FT)
NO. 3	1.93	1.20	3,755
NO. 5	1.93	0.92	2,329

REQUIRED VS. PROPOSED VEGETATED FILTER STRIPS

BASIN	REQUIRED VEGETATED FILTER STRIP ($F)	PROPOSED VEGETATED FILTER STRIP ($F)	MINIMUM REQUIRED FILTER STRIP WIDTH (L) (FT)	MINIMUM PROPOSED FILTER STRIP WIDTH (L) (FT)
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ELEV.=890.524' (NAVD '88)
SEE TOPOGRAPHIC SURVEY ON SHEET C1.1 FOR LOCATION.

REVISION	DATE	
1	06/05/2019	ADDENDUM 1
2	06/18/2019	REVISED PER LCRA COMMENTS
3	06/26/2019	REVISED PER LCRA COMMENTS

Project:
HIGHLAND LAKES ELEMENTARY SCHOOL
PARKING AND DRIVES FOR
MARBLE FALLS I.S.D.
GRANITE SHOALS, TEXAS

Kimley»Horn
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STATE OF TEXAS
RICHARD UNDERWOOD
117843
REGISTERED
PROFESSIONAL
ENGINEER
06/26/2019

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PROPOSED DRAINAGE AREA MAP

PACKAGE 1A VOLUME

Job No. 017950-01-05	Sheet No. C5.2
Drawn By: SCM	
Date: 06/05/2019	

1/15/2018 12:13:36 PM

APPENDIX B – PROPOSED MAINTENANCE PLAN

Kimley»Horn

Responsibility For Maintenance of BMPs

The Director of Facilities for the Marble Falls Independent School District shall be responsible for maintenance of the BMPs. On-site maintenance staff shall be properly informed of the purpose and function of the Vegetated Filter Strips.

If any changes in the design or function of the BMPs are proposed, the Director of Facilities shall notify the LCRA, in writing, at the following address:

Lower Colorado River Authority
Land & Environmental Services
P.O. Box 220
Austin, TX 78767-0220

Maintenance Schedule

Information provided below is applicable in conjunction with the previously permitted maintenance plan in the report titled "Engineer's Report for Granite Shoals Elementary School" prepared by K.C. Engineering, Inc. on July 3, 1997 that is found in Appendix C.

Detailed BMP inspections should occur at least twice annually. At least one of these inspections should be during or immediately following a runoff producing event. Detailed inspections should be performed by an engineer or other stormwater treatment professional. Any deficiencies identified during an inspection should be repaired immediately. The remainder of this section should be treated as a minimum checklist of items that needs to be covered during an inspection. Site maintenance should be performed as required to maintain site aesthetics, vegetation, BMP access, and debris removal. At a minimum, site maintenance should be performed twice annually.

Maintenance operations may be required as a result of deficiencies identified during a site inspection. However, general site maintenance, as described below, should be performed on a regular basis, regardless of the timing of more detailed inspections.

(1) Identify, replant, and restore eroded areas. Add a level spreader, energy dissipation, or other repairs as required to ensure that erosion is not repeated.
(2) Identify areas that do not have acceptable vegetated covers (80% or higher for most BMPs). Reseed, add soil, and irrigate as required to ensure that coverage requirements are met.
(3) Mow sites twice annually and as required to keep grass height under 18 inches. Additional mowing may be performed for site aesthetics. Export clippings from site to prevent release of nutrients from decaying plant matter. Remove any woody growth, especially from embankments, berms, and swales. For swales, grass should not be regularly mowed below four inches.
(4) Use non-chemical methods for maintaining health of vegetation. Pesticides,

herbicides, or fertilizers should only be used as a last option, and then as minimally as possible. Fertilizer should rarely be required because runoff will typically contain sufficient nutrient loads.
(5) Irrigation may be required in order to maintain acceptable levels of vegetated coverage, especially for engineered vegetated strips.
(6) Never deposit grass clippings, brush, or other debris in BMPs or buffers.
(7) Prevent over-compaction of BMP components that rely partially or wholly on infiltration (vegetation strips, bioretention bed, infiltration trenches and basins). Mowing and other maintenance should be performed with hand equipment or a light-weight lawn tractor.
(8) Remove any built-up sediment and debris, especially along uphill edges, berms, swales, and level spreaders; and around BMP inlets and outlets.
(9) Identify any other problems. A detailed inspection may be required.

Use Restrictions

(1) BMPs are not to be used as intense recreation or play areas. Such use will destroy the vegetation and compact the soil to the functional detriment of the BMPs.
(2) No vehicular parking shall be allowed in BMPs.
(3) No impervious materials shall be placed in BMPs.
(4) BMPs shall not be used as materials storage area.

APPENDIX C – PREVIOUSLY PERMITTED ENGINEER'S REPORT

ENGINEER'S REPORT
for
GRANITE SHOALS ELEMENTARY SCHOOL
Granite Shoals, Texas

Prepared for:
Marble Falls I.S.D.
2001 Broadway
Marble Falls, Texas 78654

and the

Lower Colorado River Authority
P.O. Box 220
Austin, Texas 78767-0220

Prepared by:
K.C. Engineering, Inc.
4601 S. Lamar Blvd, Suite 230
Austin, Texas 78745
(512) 892-5585

Lawrence M. Hanrahan, P.E.
July 3, 1997

ENGINEER'S REPORT

for

GRANITE SHOALS ELEMENTARY SCHOOL

SITE DEVELOPMENT IMPROVEMENTS

TABLE OF CONTENTS

Section

1.0 INTRODUCTION

This Engineer's Report is provided as part of the LCRA Development Permit application for Granite Shoals Elementary School in Granite Shoals, Texas. Granite Shoals Elementary School is to be constructed on a 36.00 acre parcel north of the intersection of F.M. 1431 and Phillips Ranch Road (a.k.a. Sherwood Shores Drive). The project is located within the Lake LBJ watershed in Burnet County, and within the ETJ of Granite Shoals, Texas. The property is subject to the current Nonpoint Source Pollution Control Ordinance of the Lower Colorado River Authority (LCRA).

2.0 PURPOSE

The purpose of this report is to identify appropriate measures (Best Management Practices, or BMPs) to mitigate the development impact on the watershed from non-point source pollution. Pollution control technologies incorporate the criteria identified in the LCRA's "Lake Travis and Upper Highland Lakes Nonpoint Source Pollution Control Ordinance Technical Manual", Second Edition.

3.0 EXISTING SITE CONDITIONS

The 36-acre site is located approximately 480 feet north of F.M. 1431 and Phillips Ranch Road in Burnet County, Texas. Slopes range from approximately 3 - 4% in upper areas to 10 - 25% in lower areas in and near waterways (see accompanying slope map). Vegetation consists predominantly of dense field grasses (Little bluestem, Arizona cottontop, Sideoats grama) and mesquite. There are no existing improvements.

According to the "Soil Survey of Blanco & Burnet Counties" published by the Soil Conservation Service (SCS), soils on the site consist of the Voca series granite gravel. This series consists of deep, well-drained gravelly soils which make it quite suitable for bioretention ponds. Depth to bedrock is approximately 40 to 60 inches, and the material is rippable for excavation. Soil permeability ranges from *moderately rapid* at the surface layer (0 to 8 inches) to *slow* at depths to bedrock.

Two main waterways traverse the site generally from north to south. These waterways then converge near the southern boundary in a channel which runs in a westerly direction toward a box culvert under F.M. 1431, approximately 1,050 feet west of the site. The westernmost waterway traversing the site has a drainage area of approximately 96 acres where it crosses under F.M. 1431. The easternmost waterway traversing the site has a drainage area of approximately 163 acres where the proposed school access road crosses it.

4.0 PROPOSED SITE CONDITIONS

Development on the 36 acre site is limited to approximately 12.04 acres near the top of a hill in the center of the site. Improvements consist of a new elementary school building, tennis courts, an outdoor sports area and associated drives and parking. Runoff from the improvements drain in three directions toward the previously-mentioned waterways traversing the 36 acre site.

5.0 POLLUTANT LOADING CALCULATIONS

The site has been divided into five drainage areas corresponding to runoff patterns after development. Pollutant loading calculations were performed for the five areas, and BMPs methodologies were examined and incorporated for each area. Loading calculations were performed for each of the following pollutants:

Total Suspended Solids (TSS)
Total Phosphorous (TP)
Total Petroleum Hydrocarbons (TPH).

The following equation was used to calculate baseline and developed annual pollutant loads:

L = A x RF x Rv x 0.226 x C, where

L = Annual Pollutant Load in pounds
A = Area of the Tract in acres (in this case, the area of each drainage sub-area)
RF = Annual Rainfall (34.39 inches per SCS Soil Survey of Blanco & Burnet Counties)
Rv = Runoff/Rainfall ratio, obtained by interpolation of quantities in Figure 3-1 of the LCRA Technical Manual
C = Pollutant Concentration in mg/l as follows:

	TSS	TP	TPH
Baseline	48	0.08	0
Developed	130	0.26	5

Appendix A contains Pollutant Loading Calculations for each drainage area as shown by the Drainage Area Map accompanying this report.

Runoff generated from developed portions of the site will be conveyed to BMP facilities as shown on the accompanying plans. BMPs for each drainage area are summarized as follows:

Drainage Area No.	Area(ac)	BMP Incorporated
1, 1-A	3.49	Bioretention Pond, Vegetated Filter Strip
2	1.56	Vegetated Filter Strip, Bioretention Pond
3	0.87	Vegetated Filter Strip, Bioretention Pond
4	3.32	Vegetated Filter Strip
5	2.80	Vegetated Filter Strip

BMPs were chosen based on the overall site's soil type and topography, as well as the size and configuration of each drainage area. An important additional factor in the selection of BMPs was the ultimate use of the site as a school. Structural BMPs were ruled out primarily for safety reasons due to the necessity to locate them near the school. Emphasis was placed on vegetative BMPs for their function, aesthetics and educational potential. Refer to Appendix B for BMP sizing calculations.

In **Drainage Area 1** (and 1-A, which was included as a part of Drainage Area 1's calculations), a Bioretention pond is the primary BMP. Runoff is conveyed via a shallow 9-foot bottom width channel, where the "first flush" is directed to Pond 1. A Vegetated Filter Strip (VFS No. 1) treats runoff from the tennis court surface, since this flow cannot be effectively directed to Pond 1.

Drainage Area 2 incorporates a VFS and a Bioretention Pond in series. Although the VFS is undersized for the treatment of TSS and TP, it is adequate to treat TPH. The Bioretention Pond (Pond 2) is sized in accordance with Section 4.4.2 of the Draft Technical Manual, and therefore should be adequate as a stand-alone facility, preliminary treatment of TPH is important in the parking areas. After flowing through the VFS, runoff is conveyed through a shallow channel to Pond 2, where the "first flush" is isolated and treated. Additional runoff is conveyed to the waterway traversing the site.

Drainage Area 3 BMP is an identical system to Drainage Area 2.

Drainage Area 4 utilizes a VFS for treatment of non-point source pollutants. The VFS is sized in accordance with the criteria in the Technical Manual. No TPH loads were assumed since only rooftop impervious cover is included in this drainage area.

Drainage Area 5 is a similar system to Drainage Area 4, with the notable exception being the loading of TPH due to a portion of the parking area contained within this drainage area.

The entry road to the school is designed such that runoff will sheet flow to the vegetation alongside the pavement. No gutter section is proposed. Check dams are to be incorporated near the road's crossing of the waterway.

6.0 CERTIFICATION

I, LAWRENCE M. HANRAHAN, A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THIS PLAN COMPLIES WITH THE REQUIREMENTS OF THE LOWER COLORADO RIVER AUTHORITY NONPOINT SOURCE POLLUTION CONTROL ORDINANCE, WAS PREPARED TRUE AND ACCURATE, TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL CAPABILITY.

Lawrence M. Hanrahan, P.E. 7/9/97

LAWRENCE M. HANRAHAN, P.E. 58474 DATE
STATE OF TEXAS

APPENDIX A

POLLUTANT LOADING CALCULATIONS

GRANITE SHOALS ELEMENTARY SCHOOL
Pollutant Loading Calculations by Drainage Area

1. Drainage Area No. 1

Total Area:	3.49	Ac	
Roof I.C.	0.24	Ac	
Parking I.C.	0.00	Ac	0%
Sidewalks, etc. I.C.	0.42	Ac	
Total I.C.	0.66	Ac	19%

Pollutant Loading Calculation:
L = A*RF*Rv*0.226*C, where

For this Drainage Area:

A = Drainage Area	=	3.49	
RF = Annual Rainfall	=	34.39	
Rv = Runoff Coefficient	=	0.049	(Baseline)
		0.111	(Developed)
			(Developed - TPH Calculation)

C = Avg Annual Constituent Concentration

	TSS	TP	TPH
Baseline	48	0.08	0
Developed	130	0.26	5

Pollutant Loading (lbs/yr):

	TSS	TP	TPH
Baseline	63.80	0.11	0.00
Developed	391.41	0.78	0.00

Removal Efficiency Requirement = 70%

Required Removal:

TSS	229.33	lb/yr
TP	0.47	lb/yr
TPH	0.00	lb/yr

2.	**Drainage Area No. 1-A**									
	Total Area:		0.49	Ac						
	Roof I.C.		0.00	Ac						
	Parking I.C.		0.00	Ac	0%					
	Sidewalks, etc. I.C.		0.30	Ac						
	Total I.C.		0.30	Ac	61%					
	Pollutant Loading Calculation:				For this Drainage Area:					
	L = A*RF*Rv*0.226*C, where									
	A = Drainage Area				=	0.49				
	RF = Annual Rainfall				=	34.39				
	Rv = Runoff Coefficient				=	0.049	(Baseline)			
						0.434	(Developed)			
							(Developed - TPH Calculation)			
	C = Avg Annual Constituent Concentration									
		TSS	TP	TPH						
	Baseline	48	0.08	0						
	Developed	130	0.26	5						
	Pollutant Loading (lbs/yr):									
		TSS	TP	TPH						
	Baseline	8.99	0.01	0.00						
	Developed	215.74	0.43	0.00						
	Removal Efficiency Requirement =				70%					
	Required Removal:									
	TSS	144.73	lb/yr							
	TP	0.29	lb/yr							
	TPH	0.00	lb/yr							

3.	**Drainage Area No. 2**								
	Total Area:		1.56	Ac					
	Roof I.C.		0.28	Ac					
	Parking I.C.		0.68	Ac	44%				
	Sidewalks, etc. I.C.		0.01	Ac					
	Total I.C.		0.98	Ac	63%				
	Pollutant Loading Calculation:				For this Drainage Area:				
	L = A*RF*Rv*0.226*C, where								
	A = Drainage Area				=	1.56			
	RF = Annual Rainfall				=	34.39			
	Rv = Runoff Coefficient				=	0.049	(Baseline)		
						0.454	(Developed)		
						0.280	(Developed - TPH Calculation)		
	C = Avg Annual Constituent Concentration								
		TSS	TP	TPH					
	Baseline	48	0.08	0					
	Developed	130	0.26	5					
	Pollutant Loading (lbs/yr):								
		TSS	TP	TPH					
	Baseline	28.57	0.05	0.00					
	Developed	717.04	1.43	17.01					
	Removal Efficiency Requirement =				70%				
	Required Removal:								
	TSS	495.63	lb/yr						
	TP	0.97	lb/yr						
	TPH	11.91	lb/yr						

4.	**Drainage Area No. 3**								
	Total Area:		0.87	Ac					
	Roof I.C.		0.18	Ac					
	Parking I.C.		0.31	Ac	36%				
	Sidewalks, etc. I.C.		0.00	Ac					
	Total I.C.		0.49	Ac	56%				
	Pollutant Loading Calculation:				For this Drainage Area:				
	L = A*RF*Rv*0.226*C, where								
	A = Drainage Area				=	0.87			
	RF = Annual Rainfall				=	34.39			
	Rv = Runoff Coefficient				=	0.049	(Baseline)		
						0.386	(Developed)		
						0.218	(Developed - TPH Calculation)		
	C = Avg Annual Constituent Concentration								
		TSS	TP	TPH					
	Baseline	48	0.08	0					
	Developed	130	0.26	5					
	Pollutant Loading (lbs/yr):								
		TSS	TP	TPH					
	Baseline	15.98	0.03	0.00					
	Developed	340.48	0.68	7.42					
	Removal Efficiency Requirement =				70%				
	Required Removal:								
	TSS	227.15	lb/yr						
	TP	0.46	lb/yr						
	TPH	5.19	lb/yr						

5.	**Drainage Area No. 4**								
	Total Area:		3.32	Ac					
	Roof I.C.		0.73	Ac					
	Parking I.C.		0.00	Ac	0%				
	Sidewalks, etc. I.C.		0.04	Ac					
	Total I.C.		0.77	Ac	23%				
	Pollutant Loading Calculation:				For this Drainage Area:				
	L = A*RF*Rv*0.226*C, where								
	A = Drainage Area				=	3.32			
	RF = Annual Rainfall				=	34.39			
	Rv = Runoff Coefficient				=	0.049	(Baseline)		
						0.133	(Developed)		
							(Developed - TPH Calculation)		
	C = Avg Annual Constituent Concentration								
		TSS	TP	TPH					
	Baseline	48	0.08	0					
	Developed	130	0.26	0					
	Pollutant Loading (lbs/yr):								
		TSS	TP	TPH					
	Baseline	60.67	0.10	0.00					
	Developed	446.02	0.89	0.00					
	Removal Efficiency Requirement =				70%				
	Required Removal:								
	TSS	269.74	lb/yr						
	TP	0.55	lb/yr						
	TPH	0.00	lb/yr						

6.	**Drainage Area No. 5**								
	Total Area:		2.80	Ac					
	Roof I.C.		0.19	Ac					
	Parking I.C.		0.25	Ac	9%				
	Sidewalks, etc. I.C.		0.03	Ac					
	Total I.C.		0.48	Ac	17%				
	Pollutant Loading Calculation:				For this Drainage Area:				
	L = A*RF*Rv*0.226*C, where								
	A = Drainage Area				=	2.80			
	RF = Annual Rainfall				=	34.39			
	Rv = Runoff Coefficient				=	0.049	(Baseline)		
						0.101	(Developed)		
						0.064	(Developed - TPH Calculation)		
	C = Avg Annual Constituent Concentration								
		TSS	TP	TPH					
	Baseline	48	0.08	0					
	Developed	130	0.26	5					
	Pollutant Loading (lbs/yr):								
		TSS	TP	TPH					
	Baseline	51.27	0.09	0.00					
	Developed	286.24	0.57	7.00					
	Removal Efficiency Requirement =				70%				
	Required Removal:								
	TSS	164.47	lb/yr						
	TP	0.34	lb/yr						
	TPH	4.90	lb/yr						

APPENDIX B

BMP SIZING CALCULATIONS

DRAINAGE AREA NO. 1

1. Size Bioretention Pond
   C_2 (Per Rational Method): 19% Impervious Cover
   Use C = .74 for Asphalt/Roof; 0.33 for Pervious Areas
   C_2 = .19(.74) + .81(.33) = .41

   Area Required = 7% of Area x C_2
   = 0.07(3.49)(.41) = 0.10 Ac = 4,356 ft^2
   Use Pond Size of 35' x 125' **= 4,500 ft^2**

2. Vegetative Filter Strip (VFS)
   Area Required:
   TSS = 145 lb/yr / 376 lb/ac/yr = .39 Ac.
   TP = .29 lb/yr / .75 lb/ac/yr = .39 Ac.
   TPH = 0 (No parking areas in Drainage Area)
   Area Provided = 110' x 70' = 7,700 ft^2 = **.18 Ac.**
   Mitigating Factor is oversizing of bioretention pond for Area 1-A.

DRAINAGE AREA NO. 2

1. Size VFS
   Area Required:
   TSS = 481.92 lb/yr / 376 lb/ac/yr = 1.28 Ac.
   TP = 0.97 lb/yr / 0.75 lb/ac/yr = 0.97 Ac.
   TPH = 11.91 lb/ac / 43 lb/ac/yr = 0.28 Ac.
   Area Provided = 200' x 80' = 16,000 ft^2 = **0.37 Ac.**
   Area provided is sufficient for TPH removal, but inadequate for TSS and TP.

2. Size Bioretention Pond
   C_2: 63% Impervious Cover
   C_2 = .63(.74) + .37(.33) = .59

   Required Area = 7% of Area x C_2
   = 0.07(1.56)(.59) = 0.064 Ac = 2,788 ft^2
   Use Pond Size of 80' x 35' **= 2,800 ft^2**

DRAINAGE AREA NO. 3

1. Size VFS
   Area Required:
   TSS = 227.2 lb/yr / 376 lb/ac/yr = 0.60 Ac.
   TP = 0.46 lb/yr / 0.75 lb/ac/yr = 0.61 Ac.
   TPH = 5.2 lb/ac / 43 lb/ac/yr = 0.12 Ac.
   Area Provided = 90' x 64' = 5,760 ft^2 = **0.13 Ac.**
   Area provided is sufficient for TPH removal, but inadequate for TSS and TP.

2. Size Bioretention Pond
   C_2: 56% Impervious Cover
   C_2 = .56(.74) + .44(.33) = .56

   Required Area = 7% of Area x C_2
   = 0.07(0.87)(.56) = 0.034 Ac = 1,481 ft^2
   Use Pond Size of 50' x 30' **= 1,500 ft^2**

DRAINAGE AREA NO. 4

1. Size VFS
   Area Required:
   TSS = 269.7 lb/yr / 376 lb/ac/yr = 0.72 Ac.
   TP = 0.55 lb/yr / 0.75 lb/ac/yr = 0.73 Ac.
   TPH = 0 (No parking areas in Drainage Area)
   Area Provided = 100' x 350' = 35,000 ft^2 = **0.80 Ac.**
   Area provided is sufficient for removal of pollutants.

DRAINAGE AREA NO. 5

1. Size VFS
   Area Required:
   TSS = 146.47 lb/yr / 376 lb/ac/yr = 0.44 Ac.
   TP = 0.34 lb/yr / 0.75 lb/ac/yr = 0.45 Ac.
   TPH = 4.90 lb/yr / 43 lb/ac/yr = 0.11 Ac.
   Area Provided = 21,936 ft^2 = **0..50Ac.**
   Area provided is sufficient for removal of pollutants.

APPENDIX C

PROPOSED MAINTENANCE PLAN

RESPONSIBILITY FOR MAINTENANCE OF BMPs

The Director of Facilities for the Marble Falls Independent School District shall be responsible for maintenance of the BMPs. On-site maintenance staff shall be properly informed of the purpose and function of the Vegetated Filter Strips and Bioretention Ponds.

If any changes in the design or function of the BMPs are proposed, the Director of Facilities shall notify the LCRA, in writing, at the following address:

Lower Colorado River Authority
Land & Environmental Services
P.O. Box 220
Austin, Texas 78767-0220

MAINTENANCE SCHEDULE

A. Vegetated Filter Strips

1. Areas shall be inspected **annually** to determine if:

- Erosion is occurring;
- Vegetative cover is inadequate;
- Undesirable plant species are invading the area;
- Sediment is covering the vegetation.

2. Areas shall be inspected **monthly,** and **after significant rainfall events**, for:

- Deposition of trash and debris, including paper and plastic articles, other man-made waste; sticks and dead branches, and other deleterious materials. Affected areas shall be cleaned and such materials removed and properly disposed of.

If any of the above occurrences are evident, corrective action is required in affected areas. Such action shall include:

- Filling of eroded areas with suitable topsoil and protection of eroded slopes to prevent future erosion;
- Revegetation of inadequately vegetated areas;
- Removal of undesirable plant species through integrated management;
- Removal of sediment and re-establishment of specified plant species.

B. Bioretention Ponds

Same inspection schedule as for Vegetated Filter Strips, plus:

- Inspect to see that drawdown is occurring in ponds
- Inflow of the "first flush" of runoff is occurring
- Mowing shall be conducted as necessary to control the invasion of weeds or undesirable woody plants. After establishment of specified vegetation, mowing may be discontinued.
- Grass clippings and brush debris shall not be deposited into ponds. Material shall be used elsewhere on the site as mulch.

USE RESTRICTIONS

1. BMPs are not to be used as intense recreation or play areas. Such use will destroy the vegetation and compact the soil to the functional detriment of the BMPs.
2. No vehicular parking shall be allowed in BMPs.
3. No impervious materials shall be placed in BMPs.
4. BMPs shall not be used as materials storage areas.

APPENDIX D

LOCATION MAP

APPENDIX E

TAX PARCEL MAPS

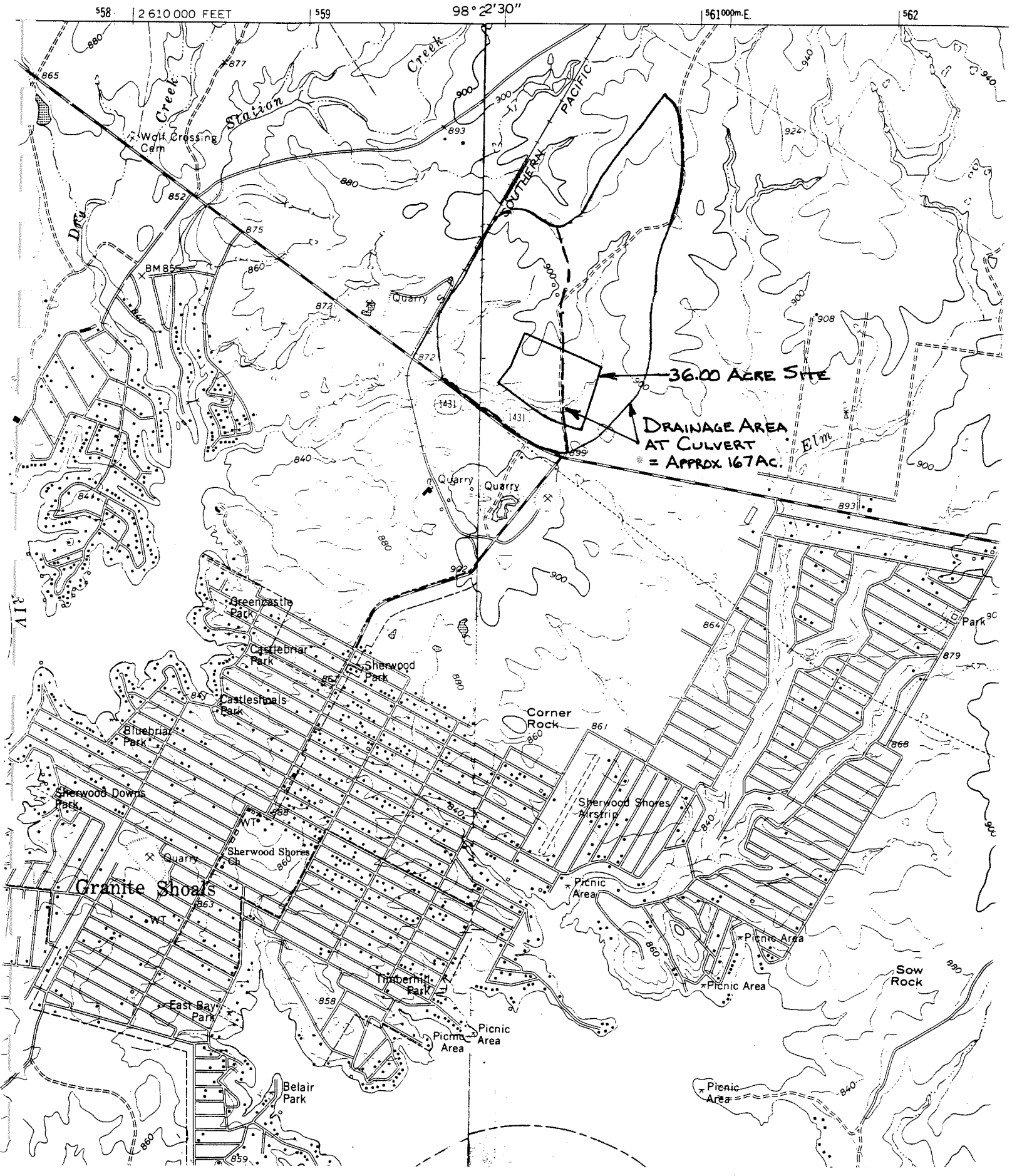
APPENDIX F

VICINITY DRAINAGE MAP

DRAINAGE AREA

DUNMAN MOUNTAIN QUADRANC
TEXAS
7.5 MINUTE SERIES (TOPOGRAPHIC)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



BMP Maintenance Plan

HIGHLAND LAKES ELEMENTARY SCHOOL
CITY OF GRANITE SHOALS
BURNET COUNTY, TEXAS

Prepared For:

MARBLE FALLS I.S.D.
1800 Colt Circle,
Marble Falls, Texas 78654

Owner Acknowledgement and Acceptance

Prepared By:

Kimley»Horn

Texas Registration #928
6800 Burleson Road
Building 312, Suite 150
Austin, Texas 78744

June 2025

TABLE OF CONTENTS

SECTION 1: INTRODUCTION AND SITE ACCESS

This BMP Maintenance plan has been prepared for the water quality treatment BMPs on the 37.20-acre site located at 8200 RM 1431, in the City of Granite Shoals, Burnet County, Texas. The site includes 2 bioretention basins (9,245 sq. ft and 2,556 sq. ft) and vegetated filter strips (totaling 39,881 sq. ft) for water quality treatment. Access to the site will be provided by the existing driveway off Ranch to Market Road 1431. The bioretention and vegetated filter strips can be accessed by the asphalt queuing lane, directly adjacent to the BMPs. An Engineer's Report was previously permitted under permit number D97-00014, by LCRA. The report was prepared by Kimley-Horn in May 2019 and revised in June 2019. The proposed improvements in this application stand to support the amendment of the previously permitted work.

The OWNER or SUBSEQUENT OWNER shall bear all expenses for the operation and maintenance of these permanent Best Management Practices (BMP) including but not limited to all general maintenance activities needed to keep this system in proper operation condition. If this system is abused or not maintained, then it may contribute to malfunction of the storm water system. All designated BMP VFS areas shall remain free of construction, development, and encroachments.

You as the OWNER of this property have a responsibility to provide any SUBSEQUENT OWNER or your real estate agent with a copy of this Best Management Practices (BMP) Maintenance Plan if this facility is sold so that the BMPs can be properly maintained and operated. The same rights, duties, and responsibilities borne by the current OWNER shall be borne by each SUBSEQUENT OWNER.

An amended copy of this document will be provided to the LCRA within thirty (30) days of any changes in the following information:

1. Responsible Party for Maintenance: Marble Falls ISD
2. Address: 1800 Colt Circle
3. City, State, Zip: Marble Falls, TX, 78654
4. Telephone Number: 830-693-4357

SECTION 2: GENERAL SITE MAINTENANCE

5.5.1 Detailed Inspections and General Maintenance

Detailed BMP inspections should occur at least twice annually. At least one of these inspections should be during or immediately following a runoff producing event. Detailed inspections should be performed by an engineer or other stormwater treatment professional. Any deficiencies identified during an inspection should be repaired immediately. The remainder of this section should be treated as a minimum checklist of items that needs to be covered during an inspection.

Maintenance operations may be required as a result of deficiencies identified during a site inspection. However, general site maintenance, as described in Section 5.5.2, should be performed on a regular basis, regardless of the timing of more detailed inspections. Site maintenance should be performed as required to maintain site aesthetics, vegetation, BMP access, and debris removal. At a minimum, site maintenance should be performed twice annually.

5.5.2 General Site Maintenance

1. Identify, replant, and restore eroded areas. Add a level spreader, energy dissipation, or other repairs as required to ensure that erosion is not repeated.
2. Identify areas that do not have acceptable vegetated covers (80% or higher for most BMPs). Reseed, add soil, add irrigate as required to ensure that coverage requirements are met.
3. Mow sites twice annually and as required to keep grass height under 18 inches. Additional mowing may be performed for site aesthetics. Export clippings from site to prevent release of nutrients from decaying plant matter. Remove any woody growth, especially from embankments, berms, and swales. For swales, grass should not be regularly mowed below four inches.
4. Use non-chemical methods for maintaining health of vegetation. Pesticides, herbicides, or fertilizers should only be used as a last option, and then as minimally as possible. Fertilizer should rarely be required because runoff will typically contain sufficient nutrient loads.
5. Irrigation may be required in order to maintain acceptable levels of vegetated coverage, especially for engineered vegetated strips.
6. Never deposit grass clippings, brush, or other debris in BMPs or buffers.
7. Prevent over-compaction of BMP components that rely partially or wholly on infiltration (vegetation strips, bioretention bed, infiltration trenches and basins). Mowing and other maintenance should be performed with hand equipment or a light-weight lawn tractor.
8. Remove any built-up sediment and debris, especially along uphill edges, berms, swales, and level spreaders; and around BMP inlets and outlets.
9. Identify any other problems. A detailed inspection may be required.

5.5.3 Inspection and Maintenance of Water Quality Basin BMP's

Requirement for ALL water quality basins:

1. Have sediment removed from forebays and water quality basins whenever it reaches 10% of volume (typically 3-6 inches), or if it impedes flow through the BMP resulting in standing water or decreased performance, or if there are signs of sediment erosion and re-suspension. At a minimum, remove sediment from the sediment forebay every 7-10 years, and from the primary basin every 15 years.
2. Have sediment removed from top of bioretention beds, sand filters, infiltration trenches, and infiltration basins whenever and wherever it exceeds 1" in depth, or whenever design drawdown time is exceeded.
3. Remove sediment from inlet and outlet works of BMPs whenever it reaches 3" or impacts performance.
4. Remove sediment from under-drains as required to ensure that they do not restrict flow through BMP. If condition of under-drains cannot be visually verified, they should be cleaned at least every 5 years.
5. Maintain access roads, so that vehicles and equipment can reach all BMPs. Ensure that entire outer perimeter of BMP is kept clear and accessible.
6. Remove debris and litter from BMP site, especially at inlet and outlet works.
7. Identify and repair any structural damage including repairing cracked concrete, sealing voids, and removal of vegetation from cracks and joints.
8. Identify and repair any subsidence, leakage, and cracking along pond embankments.
9. Evaluate for nuisances (insects, weeds, odors, algae, etc.) particularly in areas of permanent

standing water. If standing water is not part of BMP design, then BMP should be repaired to improve drainage. If standing water is required (i.e. wet pond, wetland) or desirable for aesthetics, then use non-chemical solutions whenever possible to remove nuisances. Fish such as flathead minnow are recommended for control of algae and mosquitoes.

10. Treat or replace any diseased vegetation. Replace any dead vegetation. For wet ponds and wetlands, multiple plantings may be required before a viable mix of plant-life is found.

BMP-Specific Requirements:

1. Sand Filters: Replace top layer of sand filter as required to ensure that design drawdown time is not exceeded.
2. Bioretention: Add mulch where required to maintain 2”-3” thick layer at locations where ground vegetation is not present. Mulch layer should be replaced every 2-3 years. If bioretention incorporates sand filter overflows, then maintain per sand filter criteria.
3. Retention/Irrigation: Inspect and test operation six times annually, at least twice immediately following wet weather. Immediately repair any leaks, broken spray heads, or other malfunctions. Remove sediment from sump when it reaches 3 inches or impacts pump performance. Trim vegetation so that it does not interfere with irrigation equipment.
4. Infiltration Trench: Assess drawdown time using observation well. Scarify or remove and replace top filter layer of trench, as required to ensure design drawdown times. If complete rehabilitation is necessary, remove all stone and remove sediment deposited in base of trench. Till bottom of trench and wash and replace stone.
5. Infiltration Basin: Scarify infiltration surface with a hand-guided rotary tiller or light-weight lawn tractor with tiller, as required to ensure design drawdown times.
6. Porous Concrete: Follow all of manufacturer’s maintenance recommendations. Maintain signs preventing the placement of dirt and chemicals on pavement surface. Inspect for adequate permeability during heavy rainfall at least twice per year (ponding water or runoff from pavement surface are indications that system is not functioning adequately). If performance decreases below design levels, and pressure or vacuum washing does not prove effective, then pavement replacement or additional BMPs will be required.
7. Wet Basins: If basin is designed with a permanent pool, ensure that water levels are sufficient to maintain aquatic habitat during dry months. Provide supplemental water if required.

SECTION 3: BIORETENTION

There are two bioretention ponds on the subject site. They shall be generally maintained per all LCRA maintenance guidelines.

In addition:

1. Add mulch where required to maintain 2”-3” thick layer at locations where ground vegetation is not present. Mulch layer should be replaced every 2-3 years.

SECTION 4: NATURAL VEGETATIVE FILTER STRIPS

There are Natural Vegetated Filter Strips along any area that will not be disturbed by the proposed improvements. They shall be generally maintained per all LCRA maintenance guidelines.

In addition:

1. No portion of the filter area will be greater than a 10% slope
2. The vegetated density must be greater than 80% with no large bare areas
3. The filter area should be densely vegetated with a mix of erosion-resistant plant species that effectively bind the soil.
4. Allowable flow length between 30 and 60 feet and a soil depth of 4-inches.
5. Native or adapted grasses are appropriate because they require less fertilizer and are more drought resistant than exotic plants

SECTION 5: ENGINEERED VEGETATIVE FILTER STRIPS

There are Engineered Vegetative Filter Strips proposed along the majority of the proposed drive aisle and any other area where there is disturbance from the proposed improvements. All proposed filter strips shall be generally maintained per all LCRA maintenance guidelines.

In addition:

1. No portion of the filter area will be greater than a 20% slope when combined with an infiltration berm
2. The vegetated density must be relatively light as it must be capable of maintaining an even sheet flow across the entire filter strip.
3. The filter area should have a uniform slope, free of gullies, rills and flow concentrations. The strip must be sodded or seeds with a soil blanket or matting.
4. They require a flow length between 20 and 40 feet, a minimum of 6-inches of topsoil and an even surface

Permit Application Form

Application # _____
(to be completed by LCRA)

LCRA HIGHLAND LAKES WATERSHED ORDINANCE
DEVELOPMENT PERMIT APPLICATION

APPLICANT *(PERSON OR ENTITY SEEKING PERMIT)*
NAME: MACKIE PRICE FIRM: MARBLE FALLS ISD
STREET ADDRESS: 1800 COLT CIRCLE
CITY/STATE/ZIP: MARBLE FALLS, TX 78654
PHONE: 830-693-4357 FAX: _____ EMAIL: mprice@mfisd.txed.net

PROPERTY OWNER
NAME: MACKIE PRICE FIRM: MARBLE FALLS ISD
STREET ADDRESS: 1800 COLT CIRCLE
CITY/STATE/ZIP: MARBLE FALLS, TX 78654
PHONE: 830-693-4357 FAX: _____ EMAIL: mprice@mfisd.txed.net

AGENT/ ENGINEER
NAME: LEXIE ENGLAND, PE FIRM: KIMLEY-HORN
STREET ADDRESS: 6800 BURLESON RD, BUILDING 312, SUITE 150
CITY/STATE/ZIP: AUSTIN, TX 78744
PHONE: 512-518-6529 FAX: _____ EMAIL: lexie.england@kimley-horn.com

PROJECT NAME: HIGHLAND LAKES ES SITE IMPROVEMENTS

NUMBER OF ACRES IN PROJECT: 4.09

ADDRESS/LOCATION OF PROPERTY: 8200 RM 1431, GRANITE SHOALS, TX 78654

COUNTY: BURNET LAKE: INKS LAKE TAX PARCEL ID: 53337

BRIEF DESCRIPTION OF PROJECT: ADDITION OF QUEUING LANE, PARKING, AND ASSOCIATED WATER QUALITY IMPROVEMENTS

CERTIFICATION

I (we), the undersigned, do hereby certify that to the best of our knowledge this application correct, complete and complies with the LCRA Highland Lakes Watershed Ordinance. By submitting an application, the applicant and/or owner is authorizing LCRA to enter the site to obtain information required for review of this permit application.

Applicant — Date: 6/5/2025

Property Owner — Date: 5/23/2025

Agent/Engineer — Date: 5/23/2025

95 02 120 WARRANTY DEED WITH VENDOR'S LIEN 3806

DATE: May 17, 1995
EFFECTIVE: May 19, 1995

GRANTOR: Leslie P. Stephens and wife, Kim Stephens

GRANTOR'S MAILING ADDRESS: HCO 3, Box 148, Marble Falls, Burnet County, Texas, 78654

GRANTEE: Marble Falls Independent School District

GRANTEE'S MAILING ADDRESS: 2001 Broadway, Marble Falls, Burnet County, Texas, 78654

CONSIDERATION: Ten and No/100-($10.00)-Dollars and a note of even date that is in the principal amount of FORTY SIX THOUSAND FOUR HUNDRED AND NO/100-($46,400.00)-DOLLARS, and is executed by Grantee, payable to the order of Grantor. The note is secured by a vendor's lien retained in the favor of Grantor in this deed and by a deed of trust of even date from grantee to Wade Hutto, Trustee.

PROPERTY (including any improvements):

TRACT I: BEING 36.00 acres of land out of the Arthur Luckey Survey No. 23, Abstract No. 530, in Burnet County, Texas, and being more fully described by plat and field notes labelled Exhibit "A" attached hereto and made a part hereof for all pertinent purposes.

TRACT II: BEING a 100 foot wide non-exclusive, uninterrupted easement for ingress and egress to Farm-To-Marker Highway #1431, in Burnet county, Texas, and being more fully described in field notes labelled Exhibit "B" attached hereto and made a part hereof for all pertinent purposes.

TRACT III: BEING a 100 foot wide non-exclusive, uninterrupted easement for ingress and egress to Farm-To-Market Highway #1431, in Burnet county, Texas, and being more fully described in field notes labelled Exhibit "C" attached hereto and made a part hereof for all pertinent purposes.

TRACT IV: BEING a 50 foot wide non-exclusive, uninterrupted easement for ingress and egress and being more fully described in field notes labelled Exhibit "D" attached hereto and made a part hereof for all pertinent purposes.

VOL 647 PAGE 762

RESERVATIONS: 1.) 20 foot wide right of way easement granted to P.E.C. by instrument recorded in Volume 542, Page 751, Real Property Records of Burnet County, Texas; 2.) Telephone line as shown on survey plat dated March 24, 1995, prepared by Wallace Dale Bergman, R. P. L. S. No. 3130; and 3.) Easement granted to Charles Craig Pierce by Easement Deed dated May 9, 1995, recorded in Volume 646, Page 889, Real Property Records of Burnet County, Texas.

Grantor for the consideration and subject to the reservations from and exceptions to conveyance and warranty, grants, sells and conveys to Grantee the property, together with all and singular the rights and appurtenances thereto in any wise belonging, to have and hold it to Grantee, Grantee's heirs, executors, administrators, successors or assigns forever. Grantor hereby binds Grantor and Grantor's heirs, executors, administrators and successors to warrant and forever defend all and singular the property to Grantee and Grantee's heirs, executors, administrators, successors, and assigns, against every person whoever lawfully claiming or to claim the same or any part thereof, except as to the reservation from and exception to warranty.

The vendor's lien against and superior title to the property are retained until each note described is fully paid according to its terms, at which time this deed shall become absolute.

When the context requires, singular nouns and pronouns include the plural.

Leslie P. Stephens

Leslie P. Stephens

Kim Stephens

Kim Stephens

VOL 647 PAGE 763

State of Texas

County of Burnet

This instrument was acknowledged before me on the 18th day of May, 1995, by Leslie P. Stephens and wife, Kim Stephens.

T. WHITMAN
Notary Public, State of Texas
My Commission Expires
AUGUST 3, 1997

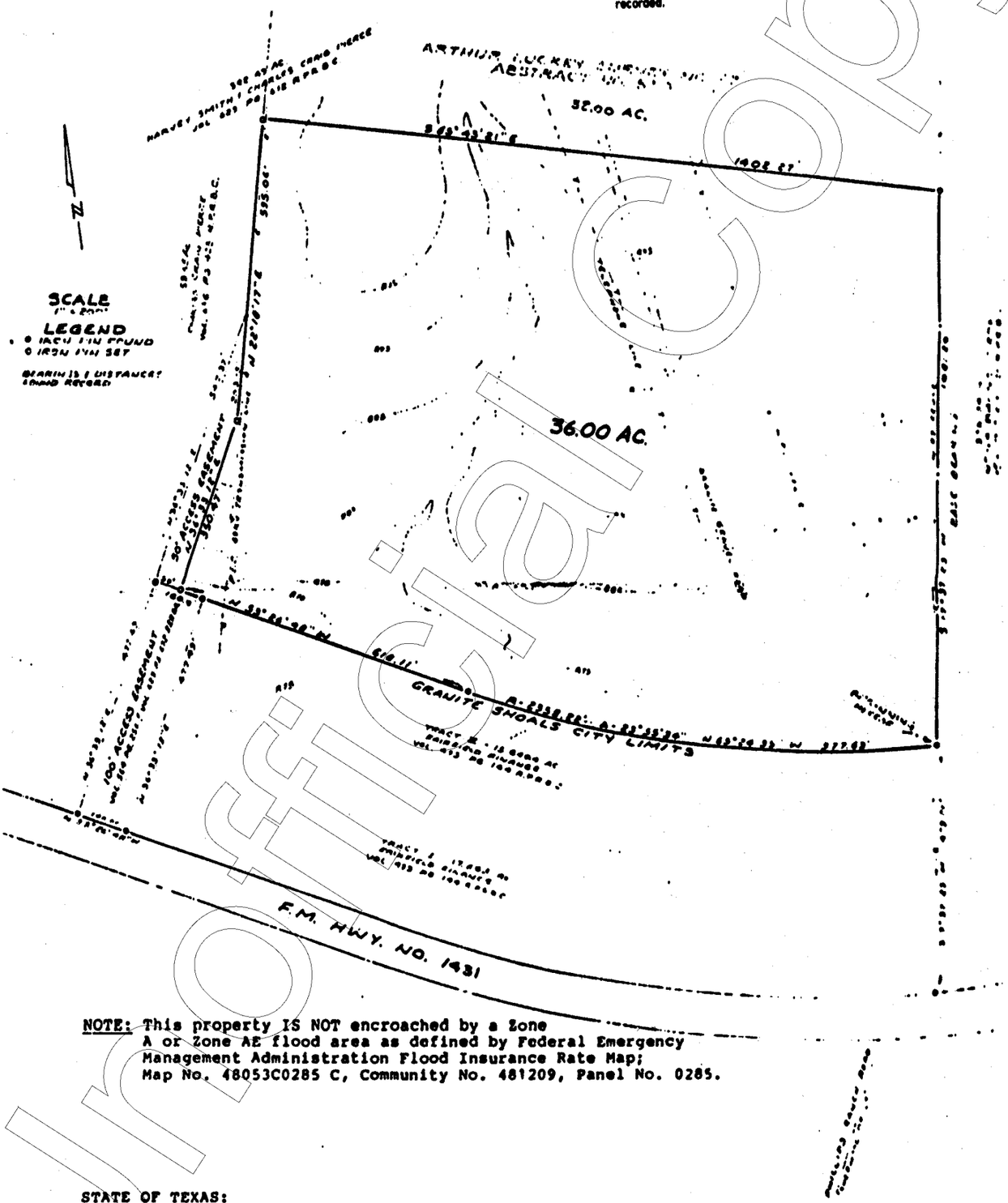
T. Whitman

NOTARY PUBLIC, STATE OF TEXAS

EXHIBIT "A"
page 1 of 2

SURVEY PLAT-Being 36.00 acres out of the Arthur Luckey Survey No. 21, Abstract No. 530 in Burnet County, Texas and being out of that certain 342.49 acre tract described in Deed from Johnnie Kay Barnett Peril, et vir to Harvey Smith and Charles Craig Pierce as recorded in Vol. 629 at Page 672 of the REAL PROPERTY RECORDS of Burnet County, Texas.

RECORDER'S MEMORANDUM:
At the time of recordation, this instrument was found to be inadequate for the best photographic reproduction because of illegibility, carbon or photo copy, discolored paper, etc. All blockouts, additions and changes were present at the time the instrument was filed and recorded.



NOTE: This property IS NOT encroached by a Zone A or Zone AE flood area as defined by Federal Emergency Management Administration Flood Insurance Rate Map; Map No. 48053C0285 C, Community No. 481209, Panel No. 0285.

STATE OF TEXAS:
COUNTY OF BURNET:

The undersigned does hereby certify that the foregoing plat and accompanying field notes represent the results of an on the ground survey made under my direction and supervision in February, 1995.

WITNESS MY HAND AND SEAL this the 17th day of February, 1995.

Wallace Dale Bergman March 24, 1995
Wallace Dale Bergman
BERGMAN ENGINEERING

STATE OF TEXAS
REGISTERED
WALLACE DALE BERGMAN
3103
SURVEYOR

VOL 647 PAGE 764

FIELD NOTES
OF 36.00 ACRES OF LAND
IN BURNET COUNTY, TEXAS

BEING 36.00 acres of land out of the Arthur Luckey Survey No. 23, Abstract No. 530 in Burnet County, Texas and being that Southeast portion of that certain 342.49 acre tract described in Deed from Johnnie Kay Barnett Peril, et vir to Harvey Smith and Charles Craig Pierce as recorded in Vol. 629 at Page 672 of the REAL PROPERTY RECORDS of Burnet County, Texas, said 36.00 acres being more particularly described as follows:

BEGINNING at an iron pin found in the fence westerly line of that certain 375.94 acre, EAST TRACT, described in Partition Deed to Nona Barnett Fox as recorded in Vol. 412 at Page 581 of the REAL PROPERTY RECORDS of Burnet County, Texas, at the Southeast corner of said 342.49 acre tract, and the Northeast corner of that certain TRACT II of 15.8404 acres described in Special Warranty Deed to Fairfield Financial Group, Inc. as recorded in Vol. 493 at Page 144 of the REAL PROPERTY RECORDS of Burnet County, Texas, for the Southeast corner hereof, whence the Northwest corner of the J. C. Hoffman Survey No. 1009, Abstract No. 417 in the easterly line of said Luckey Survey bears N 42° 19' 27" E 5811.41 ft.;

THENCE along the northerly line of said 15.8404 acre tract in two (2) courses and distances as follows:

1) along a curve to the right of radius 2358.22 ft., central angle 23° 55' 34", and a long chord bearing N 65° 24' 35" W 977.63 ft., an iron pin found; and
2) N 53° 26' 48" W at 568.10 ft., pass an iron pin found at the Northeast corner of that certain 100 foot wide access easement to F. M. Highway No. 1431 of record in Vol. 564 at Page 256 of the REAL PROPERTY RECORDS of Burnet County, Texas, and at 618.10 ft., in all to an iron pin found at the centerline termination of said easement, for the Southwest corner hereof and the Southeast corner of that certain 58.65 acre tract described in Deed to Charles Craig Pierce as recorded in vol. 636 at Page 423 of the REAL PROPERTY RECORDS of Burnet County, Texas;

THENCE along the easterly line of said 58.65 acre tract N 36° 33' 12" E 350.47 ft., an iron pin found; and N 22° 18' 17" E 595.06 ft., to an iron pin found at the Southwest corner of a 32.00 acre parcel, for the Northwest corner hereof;

THENCE S 65° 43' 21" E 1402.27 ft., to an iron pin found in the fenced westerly line of said Fox tract and the easterly line of said 342.49 acre tract, at the Southeast corner of said 32.00 acre tract, for the Northeast corner hereof;

THENCE S 17° 37' 23" W along said common boundary 1081.20 ft., to the Place of BEGINNING hereof and containing 36.00 acres of land.

The undersigned does hereby certify that the foregoing field notes and accompanying plat represent the results of an on the ground survey made under my direction and supervision in March, 1995.

WITNESS MY HAND AND SEAL this the 24th day of March, 1995.

March 24, 1995

Wallace Dale Bergman

Wallace Dale Bergman
Reg. Prof. Land Surveyor
Reg. No. 3103
86/54

BERGMAN ENGINEERING
702 BROADWAY PH. (210) 693-2231
MARBLE FALLS, TX 78654

STATE OF TEXAS
REGISTERED
WALLACE DALE BERGMAN
3103
PROFESSIONAL
LAND SURVEYOR

VOL 647 PAGE 765

Exhibit "B"

FIELD NOTES
OF A 100 FOOT WIDE
ACCESS EASEMENT

BEING an Access Easement 100 feet in width extending from the northerly line of a 17.603 acre parcel of land out of that certain 375.94 acre tract, Exhibit A, West Tract, described in Partition Deed between Johnnie Kay Peril and Nona Barnett Fox as recorded in Vol. 342 at Page 476 of DEED RECORDS of Burnet County, Texas, across a 15.8404 acre parcel, said easement being more particularly described by metes and bounds as follows:

BEGINNING at a point in the northerly line of said 17.603 acre tract and the southerly line of said 15.8404 acre tract at the Northeast corner of an easement extending across said 17.603 acre tract to F.M. Highway No. 1431, for the Southeast corner hereof;

THENCE N 53° 26' 48" W with the northerly line of said 17.603 acre tract, 100.00 ft., to the Southwest corner hereof;

THENCE N 36° 33' 12" E crossing said 15.8404 acre tract 227.49 ft., to the Northwest corner hereof, in the northerly line of said 15.8404 acre tract;

THENCE S 53° 26' 48" E with the northerly line of said 15.8404 acre tract 100.00 ft., to the Northeast corner hereof;

THENCE S 36° 33' 12' W 227.49 ft., to the PLACE OF BEGINNING hereof.

The undersigned does hereby certify that the foregoing field notes represents the result of a partial on the ground survey made under my direction and supervision in May, 1985.

WITNESS MY HAND AND SEAL this the 9th day of June, 1987.

Wallace Dale Bergman
Reg. Public Surveyor
Reg. No. 3103

STATE OF TEXAS
WALLACE DALE BERGMAN
3103
REGISTERED
PUBLIC SURVEYOR

VOL 647 PAGE 766

Exhibit "C"

FIELD NOTES
OF A 100 FOOT WIDE
ACCESS EASEMENT

BEING an Access Easement 100 feet in width extending from F.M. Hwy. No. 1431 across a 17.603 acre parcel of land out of that certain 375.94 acre tract, Exhibit A, West Tract, described in Partition Deed between Johnnie Kay Peril and Nona Barnett Fox as recorded in Vol. 342 at Page 476 of DEED RECORDS of Burnet County, Texas, said easement being more particularly described by metes and bounds as follows:

BEGINNING at a point in the northerly right-of-way line of F.M. Hwy. No. 1431 and the southerly line of said 17.603 acre tract and said 375.94 acre tract, for the Southeast corner hereof, whence the Southeast corner of said 17.603 acre tract and said 375.94 acre tract bears S 53° 26' 48" E 568.1 ft., and S 64° 59' 17" E 1134.72 ft.;

THENCE N 53° 26' 48" W with said highway right-of-way, 100.0 ft., to the Southwest corner hereof;

THENCE N 36° 33' 12" E 250.0 ft., to the Northwest corner hereof in the northerly line of said 17.603 acre tract;

THENCE S 53° 26' 48" E with said northerly line, 100.0 ft., to the Northeast corner hereof;

THENCE S 36° 33' 12" W 250.0 ft., to the place of BEGINNING hereof.

The undersigned does hereby certify that the foregoing field notes represents the result of an on the ground survey made under my direction and supervision in May, 1985.
WITNESS MY HAND AND SEAL this the 28th day of May, 1985.

Wallace Dale Bergman
Wallace Dale Bergman
Reg. Public Surveyor
Reg. No. 3103

STATE OF TEXAS
WALLACE DALE BERGMAN
3103
REGISTERED PUBLIC SURVEYOR

VOL 647 PAGE 767

Exhibit "D"

FIELD NOTES
OF 0.515 ACRES OF LAND
FOR ACCESS EASEMENT
IN BURNET COUNTY, TEXAS

BEING 0.515 acre of land out of Arthur Luckey Survey No. 23, Abstract No. 530 in Burnet County, Texas and being out of the Southeast corner of that certain 58.65 acre tract described in Deed to Charles Craig Pierce as recorded in Vol. 636 at Page 423 of the REAL PROPERTY RECORDS of Burnet County, Texas, said 0.515 acre being more particularly described as follows:

BEGINNING at an iron pin found at the Southeast corner of said 58.65 acre tract and the Southwest corner of that certain 36.00 acre tract described in Deed to Leslie P. Stephens and wife, Kim Stephens as recorded in Vol. 640 at Page 860 of the REAL PROPERTY RECORDS of Burnet County, Texas, in the northerly line of that certain TRACT II of 15.8404 acres described in Deed to Fairfield Financial Group, Inc., as recorded in Vol. 493 at Page 144 of the REAL PROPERTY RECORDS of Burnet County, Texas, at the centerline termination of that certain 100 foot wide access easement to F. M. Highway No. 1431 of record in Vol. 629 at Page 672 of the REAL PROPERTY RECORDS of Burnet County, Texas, for the Southeast corner hereof, whence the Northwest corner of the J. C. Hoffman Survey No. 1009, Abstract No. 417 in the easterly line of said Luckey Survey bears N 56° 23' 22" E 6362.07 ft.;

THENCE N 53° 26' 48" W along said common boundary 50.00 ft., to an iron pin found at the Northwest corner of said 100 foot wide access easement, for the Southwest corner hereof;

THENCE N 36° 33' 12" E 547.37 ft., to the North corner hereof in the easterly line of said 58.65 acre tract, and the westerly line of said 36.00 acre tract;

THENCE along said common boundary S 22° 18' 17" W 203.15 ft., an iron pin found; and S 36° 33' 12" W 350.47 ft., to the Place of BEGINNING hereof and containing 0.515 acre of land

The undersigned does hereby certify that the foregoing field notes and accompanying plat represents the results of an on the ground survey made under my direction and supervision in April, 1995.

WITNESS MY HAND AND SEAL this the 4th day of April, 1995.

Wallace Dale Bergman

Wallace Dale Bergman
Reg. Prof. Land Surveyor
Reg. No. 3103

BERGMAN ENGINEERING
702 BROADWAY PH. (210) 693-2231
MARBLE FALLS, TX 78654

STATE OF TEXAS
REGISTERED
WALLACE DALE BERGMAN
3103
PROFESSIONAL
LAND SURVEYOR

VOL 647 PAGE 768

STATE OF TEXAS
COUNTY OF BURNET
I hereby certify that this instrument was FILED on the date and at the time stamped hereon by me and was duly RECORDED in Volume 647
Page 768-769 of the Real Property RECORDS
of Burnet County, Texas.

Janet Parker
JANET PARKER, COUNTY CLERK
BURNET COUNTY, TEXAS
BY: Jennifer Russell Deputy

ANY PROVISION HEREIN WHICH RESTRICTS THE SALE, RENTAL OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW.
THE STATE OF TEXAS
COUNTY OF BURNET
I hereby certify that this instrument was FILED in file number Sequence on the date and at the time stamped hereon by me and was duly RECORDED in the Real Property Records Burnet County, Texas on 5/24/95

Janet Parker
COUNTY CLERK
BURNET COUNTY, TEXAS

3806
FILED
1995 MAY 23 AM 9 01
JANET PARKER
COUNTY CLERK
BURNET COUNTY, TEXAS
COMPUTER

VOL 647 PAGE 769

ENGINEER'S OPC

KIMLEY-HORN AND ASSOCIATES

PROJECT NAME:	Highland Lakes Elementary School
CITY:	Granite Shoals

A. EROSION CONTROL ITEMS

DESCRIPTION		*UNIT*	*QUANTITIES*	*PRICE*	*AMOUNT*
SILT FENCE		LF	2,200	$3.00	$6,600.00
CONSTRUCTION ENTRANCE		EA	1	$1,500.00	$1,500.00
TREE PROTECTION		EA	9	$200.00	$1,800.00
REVEGETATION MATTING-SLOPES (WOOD FIBER)		SY	19,000	$2.00	$38,000.00
CONCRETE WASHOUT		EA	1	$1,000.00	$1,000.00
ROCK BERM		LF	200	$25.00	$5,000.00
TOTAL					**$53,900.00**

NOTES

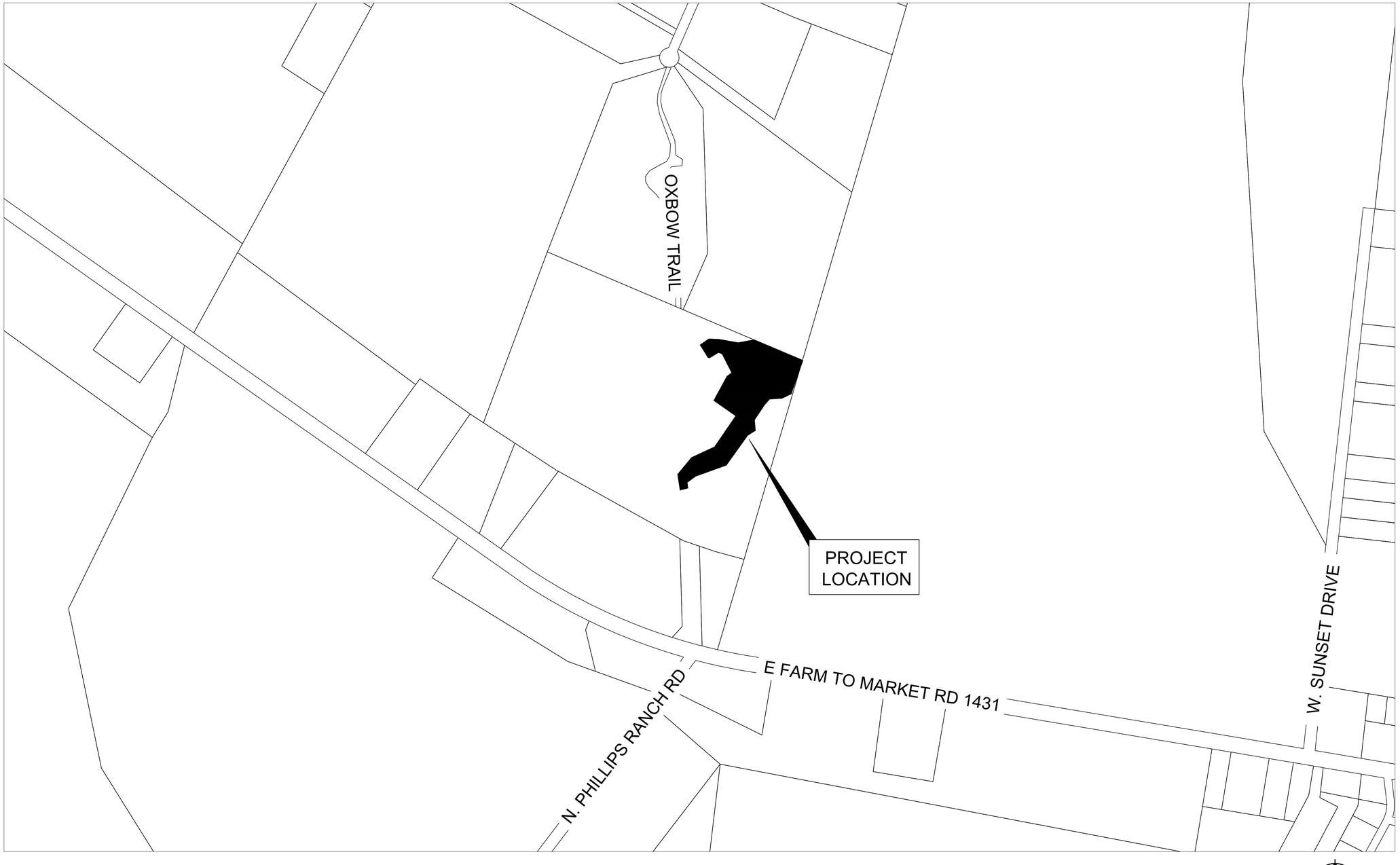
The Consultant has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Consultant at this time and represent only the Consultant's judgment as a design professional familiar with the construction industry. The Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

LEXIE B. ENGLAND, KIMLEY HORN

06/25/2025
DATE

SITE LOCATION MAP

8200 RM 1431, GRANITE SHOALS, TX 78654



LEGAL DESCRIPTION

ABS A0530 ARTHUR LUCKEY, 36.0 ACRES
ABS A0530 ARTHUR LUCKEY,1.1996 ACRES

NORTH

GRAPHIC SCALE IN FEET
0 125 250 500

Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	5.00%	52767.01	
2	5.00%	20.00%	4926.10	
3	20.00%	100.00%	8853.44	

Highland Lakes Elementary Slope Map

Granite Shoals, Texas
June 2025

DWG NAME K:\EAU_CIVIL\065002301 - HIGHLAND LAKES ELEMENTARY SCHOOL\CAD\EXHIBITS\PLANSHEETS\SLOPE MAP EXHIBIT.DWG
LAST SAVED 6/6/2025 9:36 AM

Kimley»Horn
6800 Burleson Road, Building 312, Suite 150
Austin, Tx 78744
512-646-2237
State of Texas Registration No. F-928

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

LEGEND

- PROPERTY LINE
- LOC — LIMITS OF CONSTRUCTION
- GRASS AREA
- TREE AREA

Highland Lakes Elementary Vegetation Map

Granite Shoals, Texas
June 2025

DWG NAME
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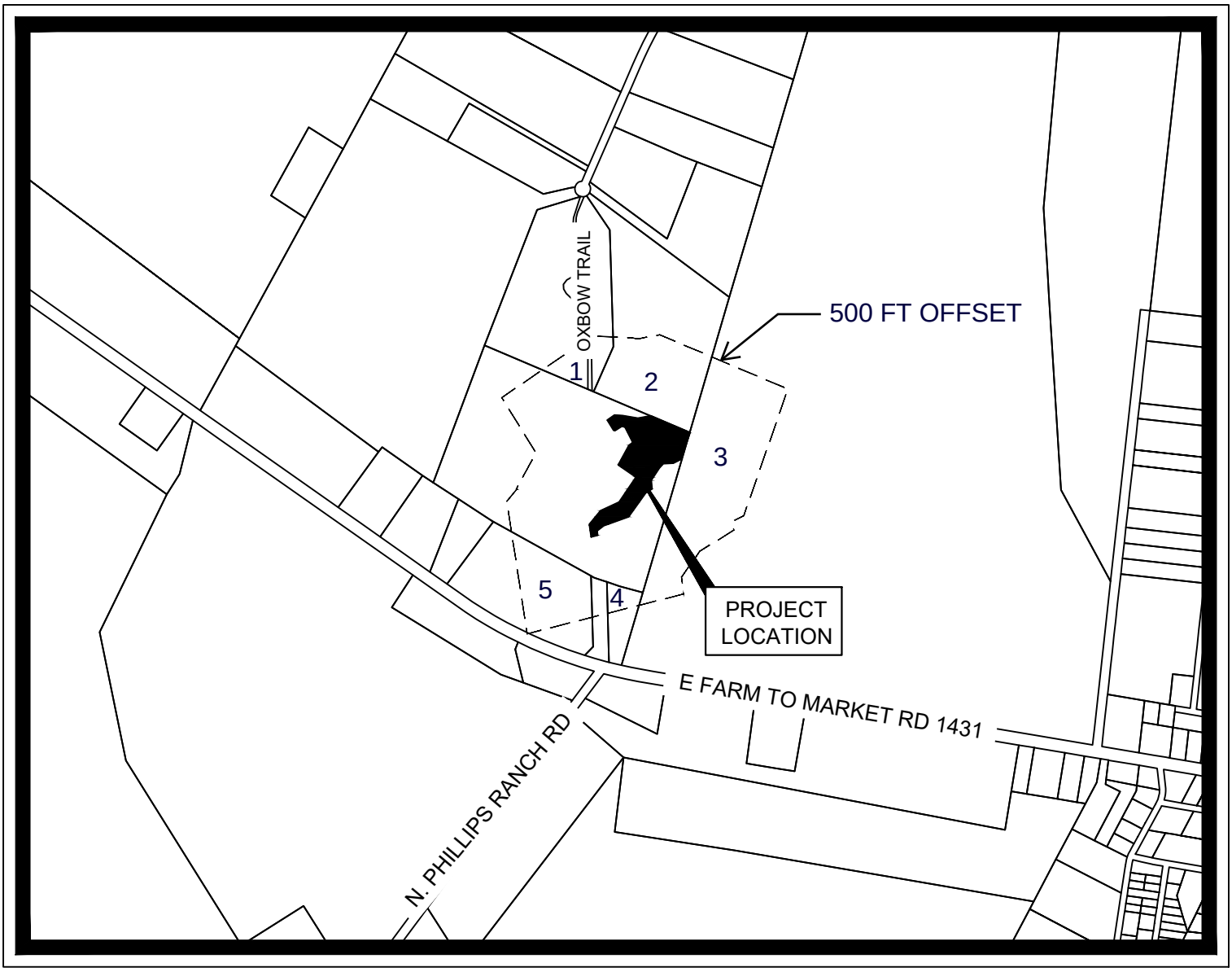
State of Texas Registration No. F-928



VICINITY MAP

SCALE: 1" = 1,000'

1. HUNT WARREN C ETUX MARCELLA
   930 OXBOW TRL
   MARBLE FALLS, TX 78654-9614

2. ROSS THOMAS S AND CARI D'ANN
   929 OXBOW TRL
   MARBLE FALLS, TX 78654-9602

3. WINTERS TEMPE MARQUE'FOX
   PO BOX 967
   MARBLE FALLS, TX 78654-0967

4. COMMERCIAL NATIONAL BANK OF BRADY
   PO BOX 591
   105 E 2ND ST
   BRADY, TX 76825

5. FOX TODD
   PO BOX 1094
   MARBLE FALLS, TX 78654-1094

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JUN 20 2024

ROSS THOMAS S AND CARI D'ANN
929 OXBOW TRL
MARBLE FALLS, TX 78654-9602

PS Form 3800, January 2023 PSN 7530-02-000-9047 See Reverse for Instructions

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- ☐ Adult Signature Restricted Delivery $

Postage $0.72

Total Postage and Fees $

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MARBLE FALLS, TX 78654-0967

PS Form 3800, January 2023 PSN 7530-02-000-9047 See Reverse for Instructions