



BHI Project No. 20190538.001.01.SRVABQ

Survey Control Report for Lubbock 2019 Orthophotography

Alan R. Benham, PE, PS, CFedS



June 10, 2019



Bohannon Huston

Introduction:

This control report documents the establishment of new panel control for 2019 Orthoimagery for the City of Lubbock. Control from the following previous projects was utilized where possible:

- BHI project number 20150378 dated June 2, 2015
- BHI project number 20170064 dated August 5, 2016
- BHI project number 20170363 dated January 30, 2017
- BHI project number 20180325 dated May 17, 2018

In this control dataset, BHI set new control monument consisting of either a 2" aluminum cap on 5/8" x 18" rebar or a PK nail with a 2" aluminum washer. Monument Control was established with Real Time Kinematic GPS double observations, fast static observations, or OPUS observations.

Project Control Process Flowchart:

See attachment

Project Control Specifications:

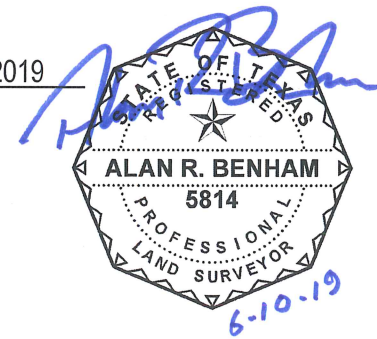
Units:	US Survey Foot
Horizontal Datum:	NAD_83(2011)(EPOCH:2010.0000)
Vertical Datum:	NAVD88
Geoid Model:	GEOID12B
Projection:	Lambert Conformal
State Plane and/or UTM Zone:	Texas North Central Zone (4202)
Basis of Bearing:	Grid Bearings
Project Combined Factor:	NA
Modification Method Used:	NA
Field Methodology:	OPUS Solution and RTK
Equipment Used:	Trimble GPS Equipment (R8-4 Dual Frequency Receivers)
Control Set Date:	April 2019
Observation Date:	April 2019
Adjustment/ Publication Date:	June 10, 2019

I, Alan R. Benham, Texas Registered Professional Land Surveyor No. 5814, do hereby certify that this Control Survey Report was prepared by me or under my direct supervision based on an actual survey on the ground as described herein; that I am responsible for this survey.



Alan R. Benham, RPLS 5814
 For and on behalf of
 Bohannon Huston, Inc.
 Courtyard I / 7500 Jefferson St. NE
 Albuquerque, NM 87109-4335
 (505).823.1000

June 10, 2019
 Date



Adjusted Coordinate Listing:

See Attached Control Datasheets

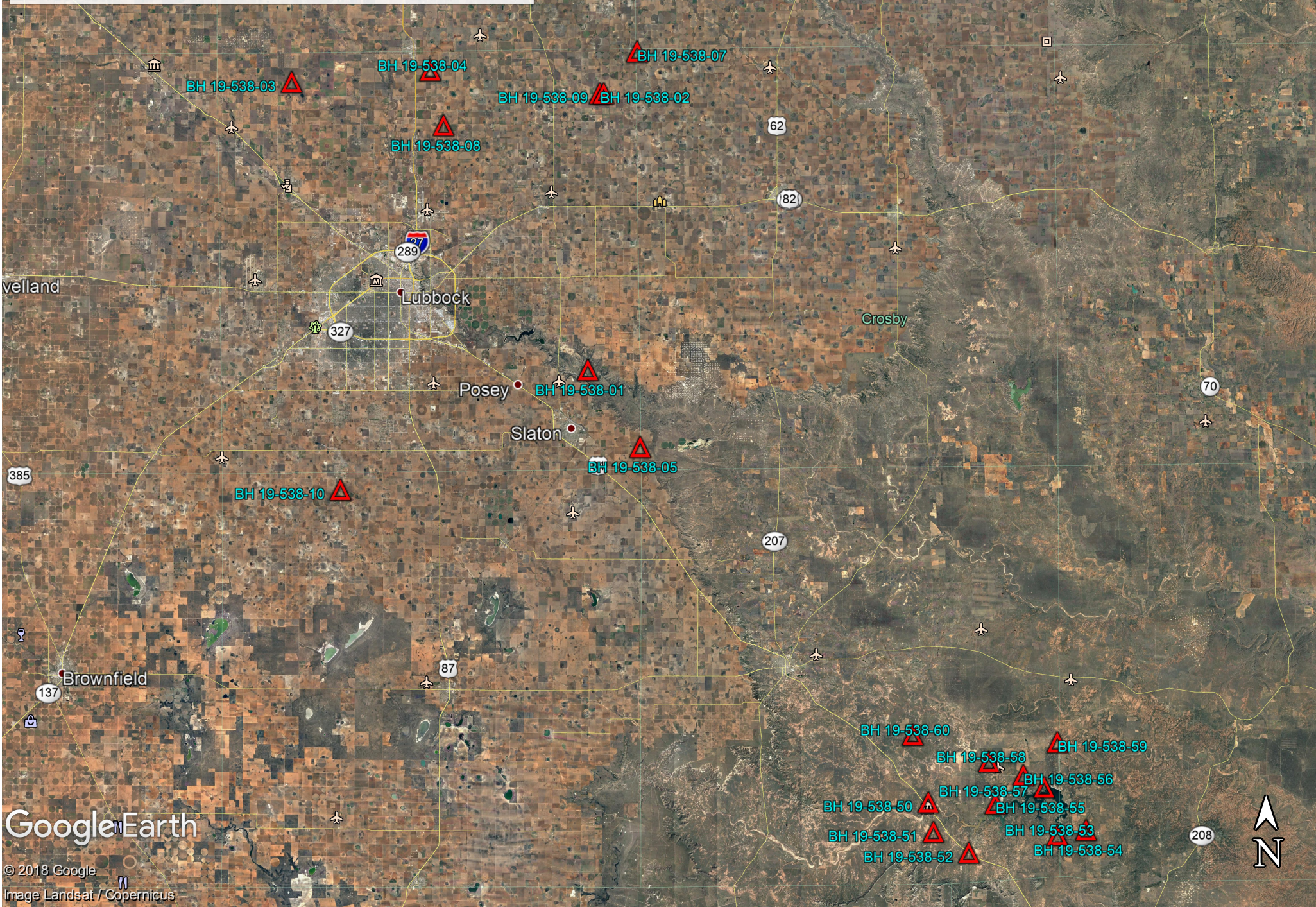
POINT	LATITUDE	LONGITUDE	ELLIPSOID (USFt)	GEOID	ORTHOMETRIC HEIGHT (USFt)	GRID NORTHING (USFt)	GRID EASTING (USFt)	DESCRIPTION
BH 19-538-01	N 33° 29' 51.29948"	W 101° 37' 21.73501"	2795.385	Geoid 12B	2877.809	7241930.300	1016708.095	2" ALUMINUM CAP
BH 19-538-02	N 33° 47' 01.41120"	W 101° 36' 28.52173"	3155.733	Geoid 12B	3239.960	7345869.631	1024291.931	2" ALUMINUM CAP
BH 19-538-03	N 33° 47' 42.81995"	W 101° 59' 31.12876"	3288.210	Geoid 12B	3370.476	7353717.989	907792.361	2" ALUMINUM CAP
BH 19-538-04	N 33° 48' 27.63451"	W 101° 49' 09.03097"	3252.666	Geoid 12B	3336.106	7356543.998	960407.961	2" ALUMINUM CAP
BH 19-538-05	N 33° 25' 04.11481"	W 101° 33' 27.86436"	2950.808	Geoid 12B	3033.390	7212334.651	1035658.610	2" ALUMINUM CAP
BH 19-538-07	N 33° 49' 38.13157"	W 101° 33' 41.65466"	3136.001	Geoid 12B	3220.808	7361290.851	1038831.556	2" ALUMINUM CAP
BH 19-538-08	N 33° 45' 02.06741"	W 101° 48' 08.79882"	3221.501	Geoid 12B	3304.639	7335615.410	964834.743	2" ALUMINUM CAP
BH 19-538-09	N 33° 47' 01.16144"	W 101° 36' 10.75536"	3154.997	Geoid 12B	3239.270	7345800.075	1025790.067	1.5 " PK NAIL
BH 19-538-10	N 33° 22' 23.16665"	W 101° 55' 45.80705"	3144.749	Geoid 12B	3224.926	7199577.338	921784.276	2" ALUMINUM CAP
BH 19-538-50	N 33° 02' 53.40580"	W 101° 12' 04.38635"	2174.256	Geoid 12B	2258.098	7074911.660	1140941.438	2" ALUMINUM CAP
BH 19-538-51	N 33° 01' 02.72868"	W 101° 11' 42.02987"	2238.906	Geoid 12B	2322.890	7063681.489	1142556.683	2" ALUMINUM CAP
BH 19-538-52	N 32° 59' 43.50503"	W 101° 09' 04.29499"	2195.757	Geoid 12B	2280.098	7055336.079	1155779.905	2" ALUMINUM CAP
BH 19-538-53	N 33° 00' 47.65893"	W 101° 02' 28.66888"	2252.953	Geoid 12B	2337.873	7060984.959	1189618.543	2" ALUMINUM CAP
BH 19-538-54	N 33° 01' 05.57251"	W 101° 00' 20.58757"	2279.311	Geoid 12B	2364.554	7062532.845	1200563.972	2" ALUMINUM CAP
BH 19-538-55	N 33° 02' 46.49593"	W 101° 07' 05.27700"	2187.693	Geoid 12B	2271.977	7073569.124	1166373.297	2" ALUMINUM CAP
BH 19-538-56	N 33° 04' 32.75485"	W 101° 05' 00.02243"	2285.125	Geoid 12B	2369.503	7084040.519	1177294.812	2" ALUMINUM CAP
BH 19-538-57	N 33° 03' 47.29215"	W 101° 03' 27.30096"	2204.464	Geoid 12B	2289.085	7079254.398	1185069.739	2" ALUMINUM CAP
BH 19-538-58	N 33° 05' 24.38718"	W 101° 07' 33.81485"	2272.605	Geoid 12B	2356.669	7089581.278	1164343.951	2" ALUMINUM CAP
BH 19-538-59	N 33° 06' 35.33520"	W 101° 02' 27.42822"	2255.206	Geoid 12B	2339.719	7096108.322	1190573.909	2" ALUMINUM CAP
BH 19-538-60	N 33° 07' 06.60241"	W 101° 13' 13.07403"	2328.690	Geoid 12B	2412.201	7100642.079	1135759.839	2" ALUMINUM CAP

Geospatial Positional Accuracy Report:

POINT	HORIZONTAL POSITIONAL ACCURACY (FT)	VERTICAL POSITIONAL ACCURACY (FT)
BH 19-538-01	0.022	0.023
BH 19-538-02	0.047	0.071
BH 19-538-03	0.052	0.076
BH 19-538-04	0.070	0.074
BH 19-538-05	0.032	0.030
BH 19-538-07	0.054	0.090
BH 19-538-08	0.056	0.072
BH 19-538-09	0.052	0.072
BH 19-538-10	0.059	0.083
BH 19-538-50	0.040	0.033
BH 19-538-51	0.044	0.069
BH 19-538-52	0.052	0.077
BH 19-538-53	0.056	0.085
BH 19-538-54	0.013	0.023
BH 19-538-55	0.020	0.033
BH 19-538-56	0.112	0.114
BH 19-538-57	0.057	0.075
BH 19-538-58	0.074	0.094
BH 19-538-59	0.017	0.028
BH 19-538-60	0.059	0.074

Lubbock 2019 Orthophotography

Littlefield



Google Earth

20190538

Lake Alan Henry Control

Legend
▲ BH



BH 19-538-01

FILE: 98630950.19o OP1559765000263

NGS OPUS SOLUTION REPORT =====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: abenham@bhinc.com DATE: June 05, 2019
RINEX FILE: 9863095q.19o TIME: 20:04:42 UTC

SOFTWARE: page5 1603.24 master95.pl 160321 START: 2019/04/05 16:39:00
EPHEMERIS: igs20475.eph [precise] STOP: 2019/04/05 19:10:00
NAV FILE: brdc0950.19n OBS USED: 6000 / 6574 : 91%
ANT NAME: TRMR8-4 NONE # FIXED AMB: 42 / 42 : 100%
ARP HEIGHT: 1.518 OVERALL RMS: 0.014(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2019.2596)

X:	-1072792.349(m)	0.006(m)	-1072793.205(m)	0.006(m)
Y:	-5215743.018(m)	0.007(m)	-5215741.617(m)	0.007(m)
Z:	3500580.996(m)	0.004(m)	3500580.821(m)	0.004(m)

LAT:	33 29 51.29948	0.003(m)	33 29 51.31622	0.003(m)
E LON:	258 22 38.26499	0.006(m)	258 22 38.22157	0.006(m)
W LON:	101 37 21.73501	0.006(m)	101 37 21.77843	0.006(m)
EL HGT:	852.035(m)	0.007(m)	850.938(m)	0.007(m)
ORTHO HGT:	877.158(m)	0.007(m)	[NAVD88 (Computed using GEOID12B)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 14)	SPC (4202 TXNC)
Northing (Y) [meters]	3709530.274	2207344.770
Easting (X) [meters]	256348.857	309893.247
Convergence [degrees]	-1.44818889	-1.70310556
Point Scale	1.00033196	0.99990282
Combined Factor	1.00019817	0.99976909

US NATIONAL GRID DESIGNATOR: 14SKC5634809530(NAD 83)

BASE STATIONS USED				
PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DO9608	TXP1 POST CORS ARP	N331057.073	W1012247.633	41622.4
DO8871	TXMT MATADOR CORS ARP	N340042.046	W1004957.847	92791.4
DO9484	TXL1 LITTLEFIELD CORS ARP	N335618.226	W1022058.275	83252.7

NEAREST NGS PUBLISHED CONTROL POINT				
PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DP0298	K 71	N332659.000	W1013904.000	5928.8

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

BH 19-538-05

FILE: 98630951.19o OP1559765153928

NGS OPUS SOLUTION REPORT =====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: abenham@bhinc.com DATE: June 05, 2019
RINEX FILE: 9863095t.19o TIME: 20:07:20 UTC

SOFTWARE: page5 1603.24 master53.pl 160321 START: 2019/04/05 19:40:00
EPHEMERIS: igs20475.eph [precise] STOP: 2019/04/05 22:12:00
NAV FILE: brdc0950.19n OBS USED: 7704 / 8077 : 95%
ANT NAME: TRMR8-4 NONE # FIXED AMB: 45 / 48 : 94%
ARP HEIGHT: 1.4783 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2019.2599)

X:	-1067863.251(m)	0.009(m)	-1067864.106(m)	0.009(m)
Y:	-5221774.535(m)	0.010(m)	-5221773.132(m)	0.010(m)
Z:	3493224.363(m)	0.004(m)	3493224.188(m)	0.004(m)

LAT:	33 25 4.11481	0.006(m)	33 25 4.13159	0.006(m)
E LON:	258 26 32.13564	0.008(m)	258 26 32.09233	0.008(m)
W LON:	101 33 27.86436	0.008(m)	101 33 27.90767	0.008(m)
EL HGT:	899.408(m)	0.009(m)	898.307(m)	0.009(m)
ORTHO HGT:	924.579(m)	0.009(m)	[NAVD88 (Computed using GEOID12B)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 14)	SPC (4202 TXNC)
Northing (Y) [meters]	3700531.716	2198323.998
Easting (X) [meters]	262167.760	315669.376
Convergence [degrees]	-1.40931111	-1.66767500
Point Scale	1.00029743	0.99989298
Combined Factor	1.00015621	0.99975181

US NATIONAL GRID DESIGNATOR: 14SKC6216700531(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DO9484	TXL1 LITTLEFIELD CORS ARP	N335618.226	W1022058.275	93421.3
DO9608	TXP1 POST CORS ARP	N331057.073	W1012247.633	30912.9
DO8869	TXLA LAMESA CORS ARP	N324540.901	W1015638.170	81253.4

NEAREST NGS PUBLISHED CONTROL POINT

DP0631	E S E LUBBOCK 1932	N332342.354	W1013324.452	2520.5
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This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

BH 19-538-50A

FILE: 07681280.19o OP1559762250975

NGS OPUS SOLUTION REPORT =====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: ABENHAM@BHINC.COM DATE: June 05, 2019
RINEX FILE: 0768128n.19o TIME: 19:18:04 UTC

SOFTWARE: page5 1603.24 master90.pl 160321 START: 2019/05/08 13:35:00
EPHEMERIS: igs20523.eph [precise] STOP: 2019/05/08 15:36:00
NAV FILE: brdc1280.19n OBS USED: 5007 / 5214 : 96%
ANT NAME: TRMR8-4 NONE # FIXED AMB: 31 / 31 : 100%
ARP HEIGHT: 1.6645 OVERALL RMS: 0.013(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2019.3496)

X:	-1039676.986(m)	0.019(m)	-1039677.840(m)	0.019(m)
Y:	-5250166.501(m)	0.009(m)	-5250165.092(m)	0.009(m)
Z:	3458799.076(m)	0.010(m)	3458798.898(m)	0.010(m)

LAT:	33 2 53.40563	0.012(m)	33 2 53.42230	0.012(m)
E LON:	258 47 55.61369	0.017(m)	258 47 55.57085	0.017(m)
W LON:	101 12 4.38631	0.017(m)	101 12 4.42915	0.017(m)
EL HGT:	662.707(m)	0.012(m)	661.591(m)	0.012(m)
ORTHO HGT:	688.262(m)	0.012(m)	[NAVD88 (Computed using GEOID12B)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 14)	SPC (4202 TXNC)
Northing (Y) [meters]	3658780.681	2156437.382
Easting (X) [meters]	294462.504	347759.647
Convergence [degrees]	-1.20084167	-1.47323056
Point Scale	1.00012091	0.99987262
Combined Factor	1.00001686	0.99976860

US NATIONAL GRID DESIGNATOR: 14SKB9446258780(NAD 83)

BASE STATIONS USED					
PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)	
DO8871	TXMT MATADOR CORS ARP	N340042.046	W1004957.847	112224.9	
DF5391	TXLU LUBBOCK RRP2 CORS ARP	N333207.490	W1015034.162	80581.8	
DO8869	TXLA LAMESA CORS ARP	N324540.901	W1015638.170	76427.1	

NEAREST NGS PUBLISHED CONTROL POINT					
DP0481	S 1462	N330256.000	W1011226.000	566.4	

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

BH 19-538-50B

FILE: 07681270.19o OP1559761939450

NGS OPUS SOLUTION REPORT =====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: ABENHAM@BHINC.COM DATE: June 05, 2019
RINEX FILE: 0768127r.19o TIME: 19:14:10 UTC

SOFTWARE: page5 1603.24 master75.pl 160321 START: 2019/05/07 17:03:00
EPHEMERIS: igs20522.eph [precise] STOP: 2019/05/07 21:44:00
NAV FILE: brdc1270.19n OBS USED: 12871 / 13936 : 92%
ANT NAME: TRMR8-4 NONE # FIXED AMB: 65 / 73 : 89%
ARP HEIGHT: 1.6554 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2019.3474)

X:	-1039676.989(m)	0.005(m)	-1039677.843(m)	0.005(m)
Y:	-5250166.507(m)	0.004(m)	-5250165.098(m)	0.004(m)
Z:	3458799.093(m)	0.015(m)	3458798.915(m)	0.015(m)

LAT:	33 2 53.40595	0.011(m)	33 2 53.42266	0.011(m)
E LON:	258 47 55.61362	0.005(m)	258 47 55.57078	0.005(m)
W LON:	101 12 4.38638	0.005(m)	101 12 4.42922	0.005(m)
EL HGT:	662.722(m)	0.010(m)	661.605(m)	0.010(m)
ORTHO HGT:	688.277(m)	0.010(m)	[NAVD88 (Computed using GEOID12B)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 14)	SPC (4202 TXNC)
Northing (Y) [meters]	3658780.691	2156437.392
Easting (X) [meters]	294462.503	347759.645
Convergence [degrees]	-1.20084167	-1.47323056
Point Scale	1.00012091	0.99987262
Combined Factor	1.00001686	0.99976860

US NATIONAL GRID DESIGNATOR: 14SKB9446258780(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DO9608	TXP1 POST CORS ARP	N331057.073	W1012247.633	22366.3
DO8871	TXMT MATADOR CORS ARP	N340042.046	W1004957.847	112224.9
DO8869	TXLA LAMESA CORS ARP	N324540.901	W1015638.170	76427.1

NEAREST NGS PUBLISHED CONTROL POINT

DP0481	S 1462	N330256.000	W1011226.000	566.4
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This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Control Station Data

Name of Station: **BH 19-538-01**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 5-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 19-538-01

Horizontal Method: OPUS

Vertical Method: OPUS

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 29' 51.29948"	7,241,930.300 US Ft	7,241,930.300 US Ft
Longitude Easting X:	W 101° 37' 21.73501"	1,016,708.095 US Ft	1,016,708.095 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	852.035 m	2,795.385 US Ft	2,877.809 US Ft

Location

County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

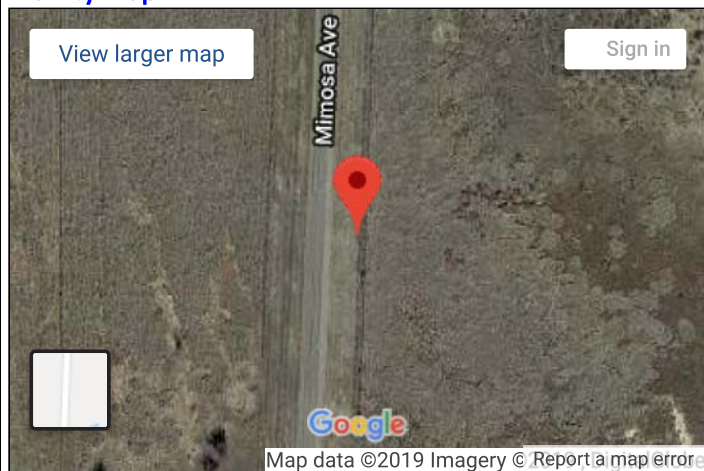
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-02**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 3-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953802

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 47' 01.41120"	7,345,869.631 US Ft	7,345,869.631 US Ft
Longitude Easting X:	W 101° 36' 28.52173"	1,024,291.931 US Ft	1,024,291.931 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	961.869 m	3,155.733 US Ft	3,239.960 US Ft

Location

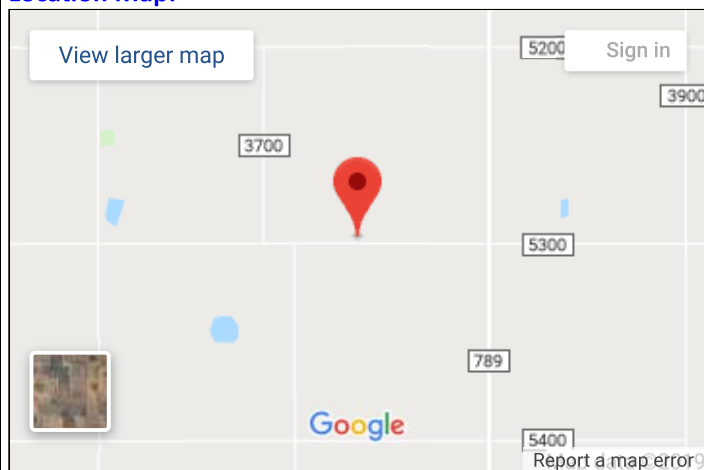
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

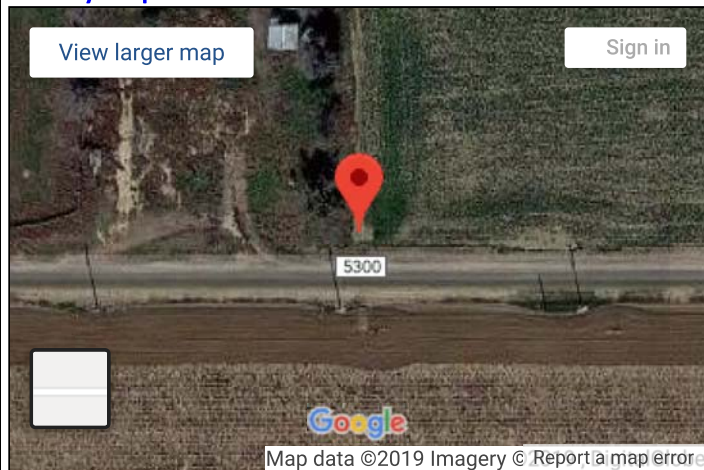
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: BH 19-538-03

Establishing Group: Bohannon Huston, Inc.

Observation Date: 3-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953803

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 47' 42.81995"	7,353,717.989 US Ft	7,353,717.989 US Ft
Longitude Easting X:	W 101° 59' 31.12876"	907,792.361 US Ft	907,792.361 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	1,002.248 m	3,288.210 US Ft	3,370.476 US Ft

Location

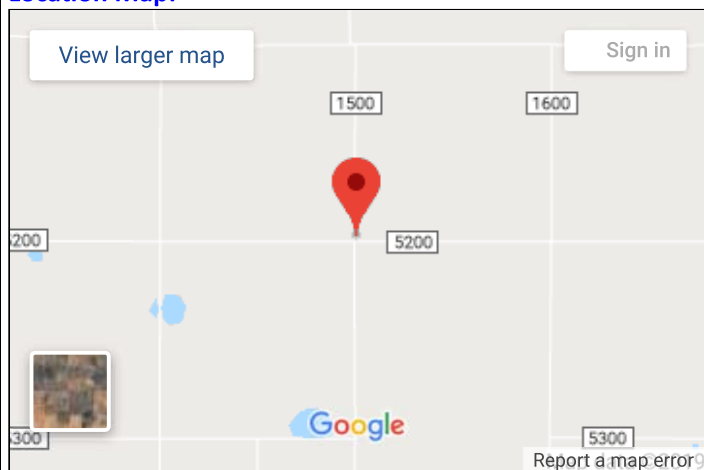
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

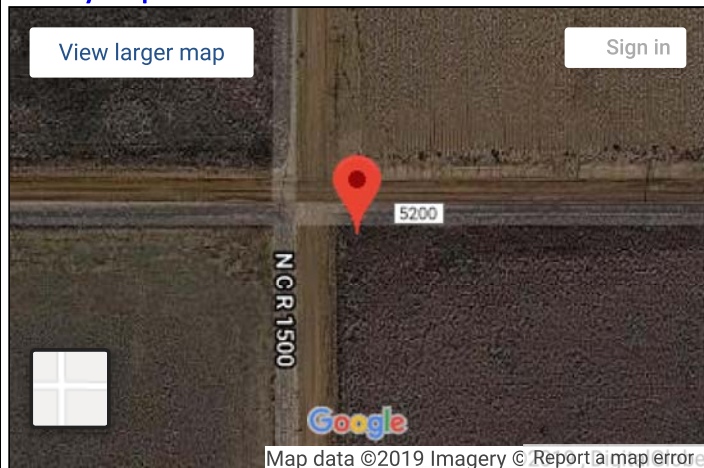
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-04**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 4-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953804

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 48' 27.63451"	7,356,543.998 US Ft	7,356,543.998 US Ft
Longitude Easting X:	W 101° 49' 09.03097"	960,407.961 US Ft	960,407.961 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	991.415 m	3,252.666 US Ft	3,336.106 US Ft

Location

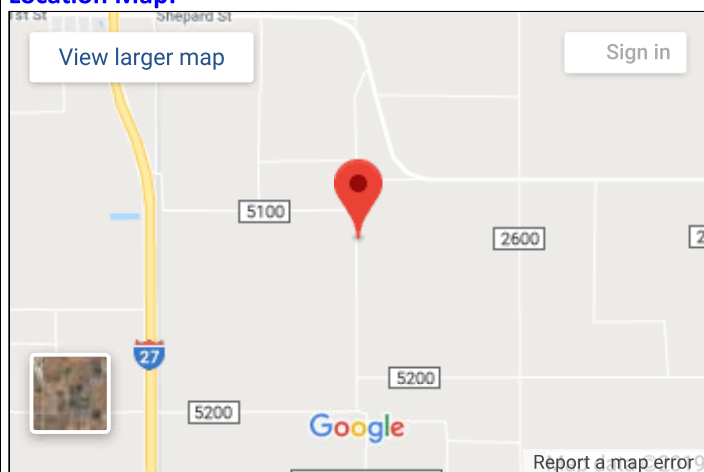
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

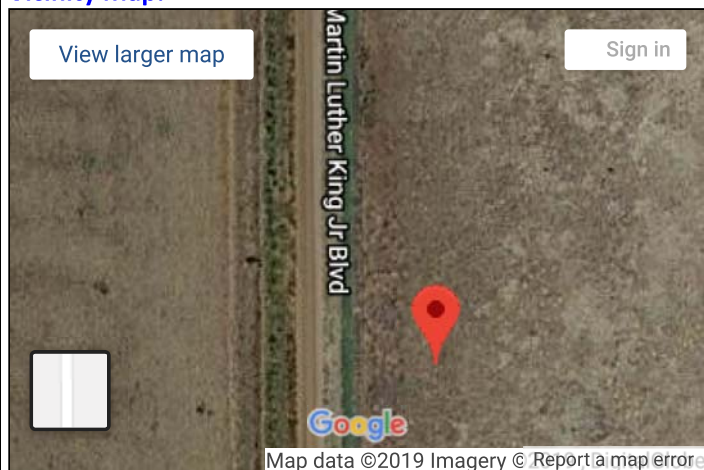
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-05**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 5-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 19-538-05

Horizontal Method: OPUS

Vertical Method: OPUS

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 25' 04.11481"	7,212,334.651 US Ft	7,212,334.651 US Ft
Longitude Easting X:	W 101° 33' 27.86436"	1,035,658.610 US Ft	1,035,658.610 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	899.408 m	2,950.808 US Ft	3,033.390 US Ft

Location

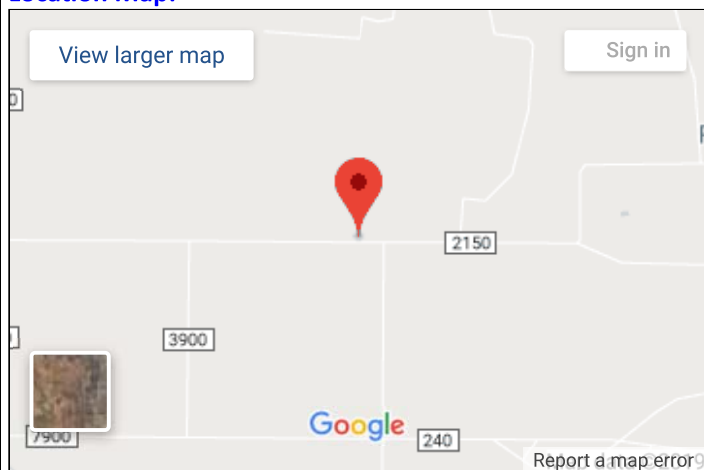
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

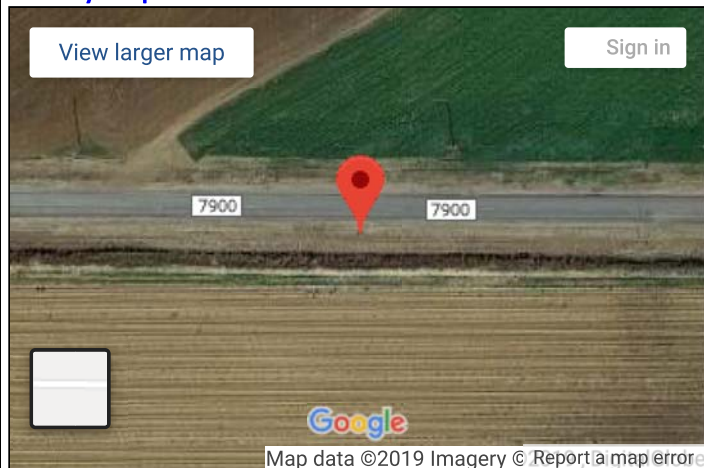
Location Map:



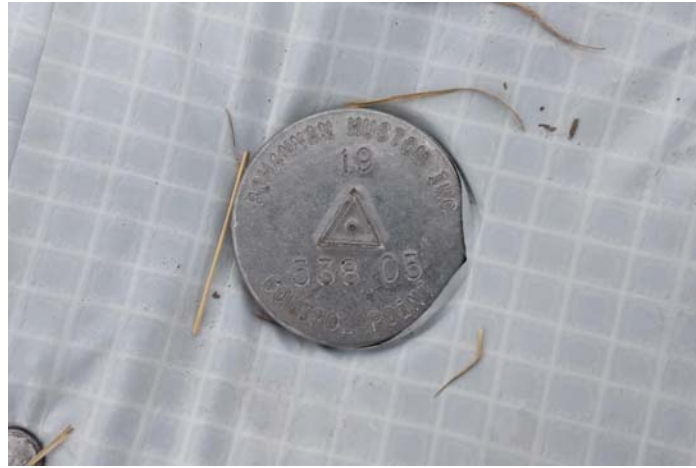
Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-07**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 4-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953807

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 49' 38.13157"	7,361,290.851 US Ft	7,361,290.851 US Ft
Longitude Easting X:	W 101° 33' 41.65466"	1,038,831.556 US Ft	1,038,831.556 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	955.855 m	3,136.001 US Ft	3,220.808 US Ft

Location

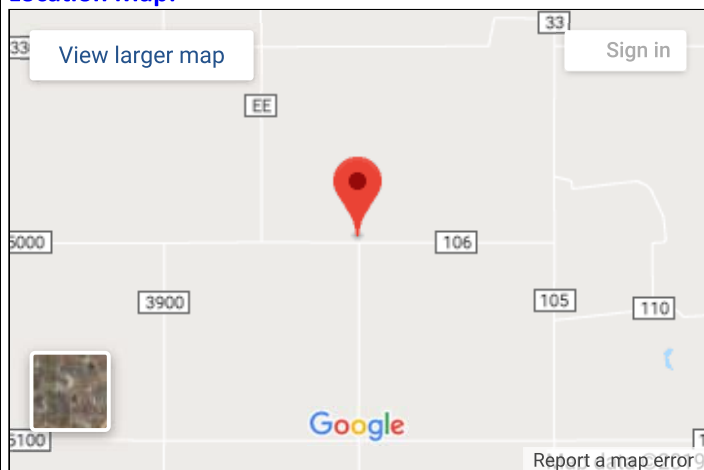
County & State: Crosby, TX

Land Grant(s): None

Note(s):

Section:

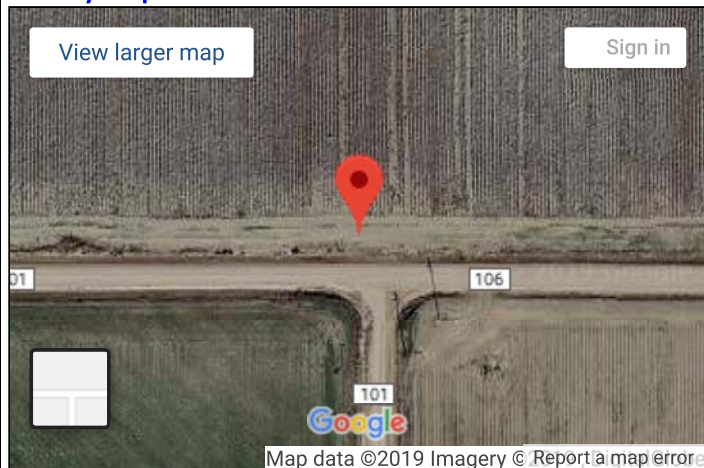
Location Map:



Vicinity Photo (Looking West):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-08**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 3-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953808

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 45' 02.06741"	7,335,615.410 US Ft	7,335,615.410 US Ft
Longitude Easting X:	W 101° 48' 08.79882"	964,834.743 US Ft	964,834.743 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	981.915 m	3,221.500 US Ft	3,304.639 US Ft

Location

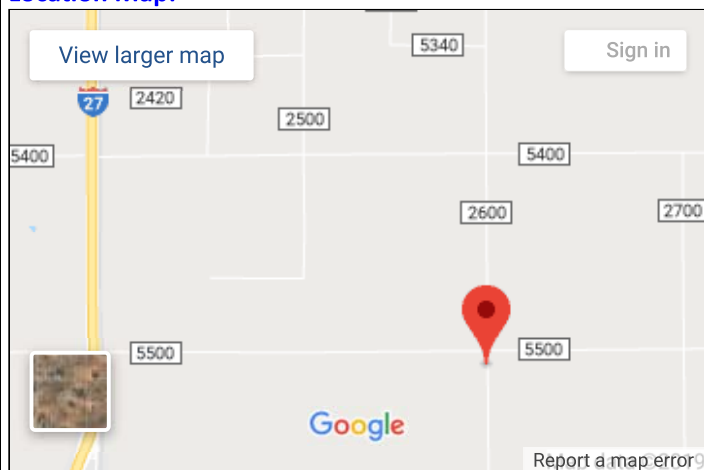
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

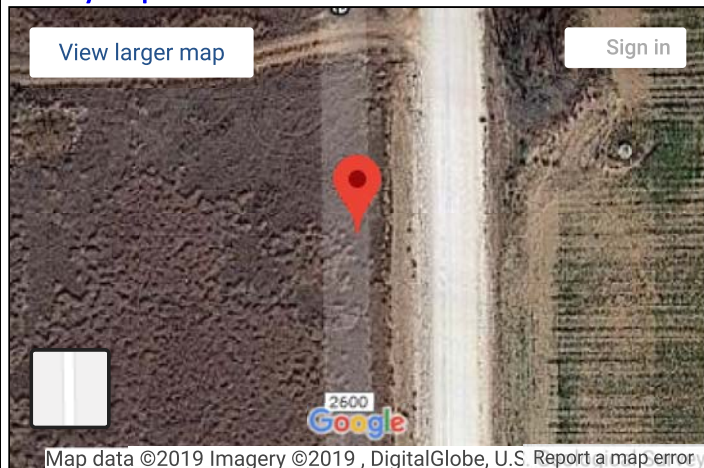
Location Map:



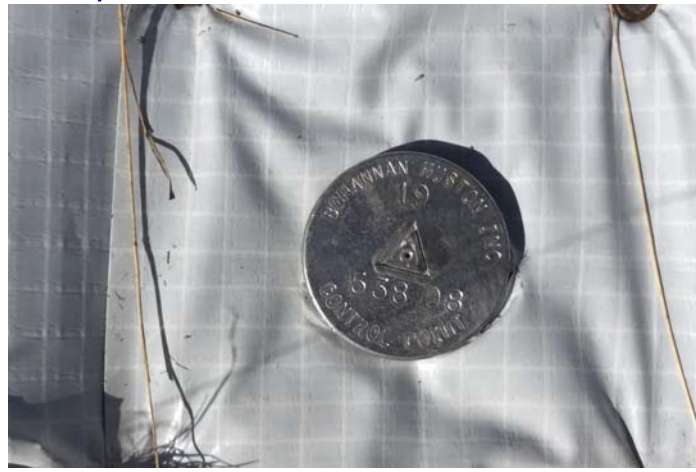
Vicinity Photo (Looking South):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-09**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 4-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: Washer

Station Height: 0.00 US Ft

Stamping: BH 1953809

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 47' 01.16144"	7,345,800.075 US Ft	7,345,800.075 US Ft
Longitude Easting X:	W 101° 36' 10.75536"	1,025,790.067 US Ft	1,025,790.067 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	961.645 m	3,154.997 US Ft	3,239.270 US Ft

Location

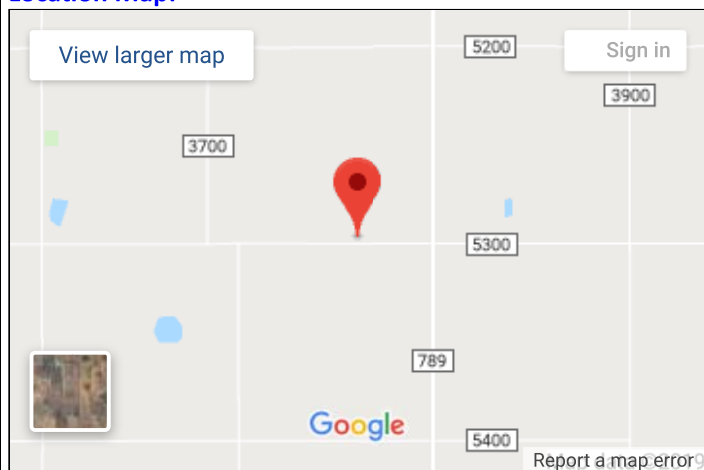
County & State: Lubbock, TX

Land Grant(s): None

Note(s):

Section:

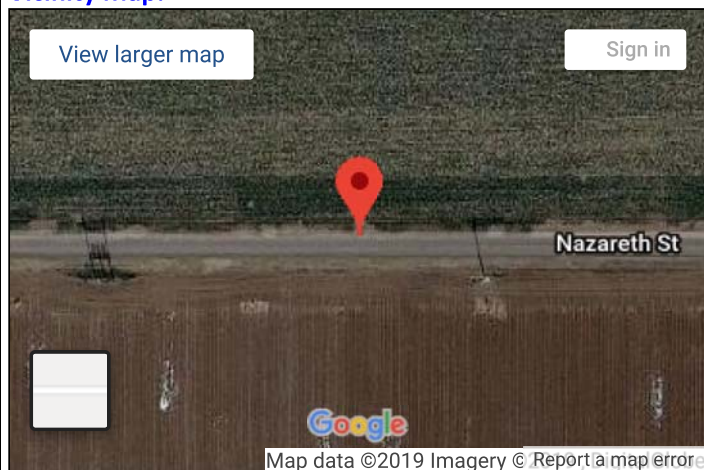
Location Map:



Vicinity Photo (Looking West):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-10**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 5-Apr-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 1953810

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 22' 23.16665"	7,199,577.338 US Ft	7,199,577.338 US Ft
Longitude Easting X:	W 101° 55' 45.80705"	921,784.276 US Ft	921,784.276 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	958.521 m	3,144.748 US Ft	3,224.926 US Ft

Location

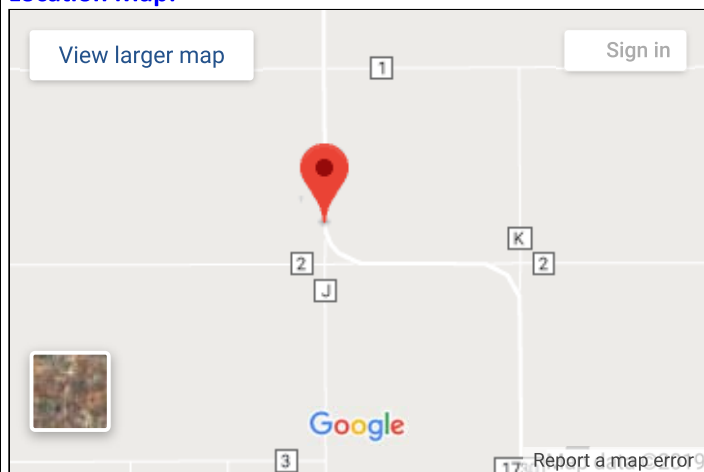
County & State: Lynn, TX

Land Grant(s): None

Note(s):

Section:

Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-50**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: 19-538-50

Horizontal Method: OPUS

Vertical Method: OPUS

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 02' 53.40580"	7,074,911.660 US Ft	7,074,911.660 US Ft
Longitude Easting X:	W 101° 12' 04.38635"	1,140,941.438 US Ft	1,140,941.438 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	662.715 m	2,174.256 US Ft	2,258.098 US Ft

Location

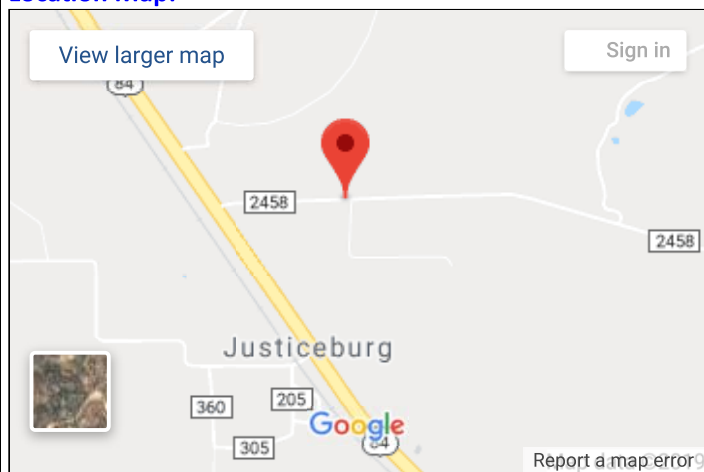
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

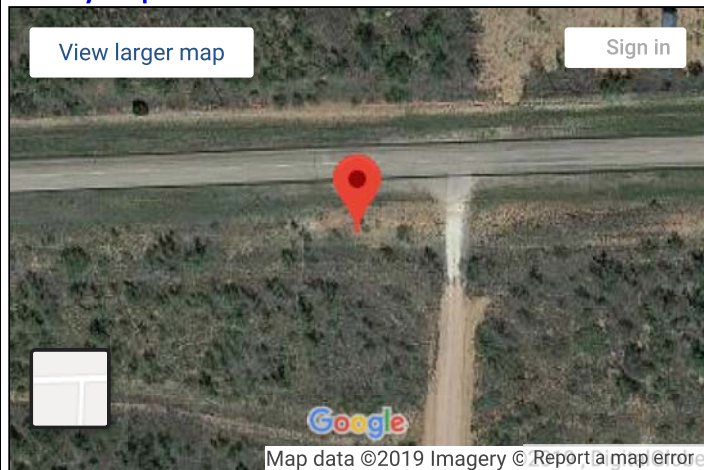
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-51**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-51

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 01' 02.72868"	7,063,681.489 US Ft	7,063,681.489 US Ft
Longitude Easting X:	W 101° 11' 42.02987"	1,142,556.683 US Ft	1,142,556.683 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	682.420 m	2,238.906 US Ft	2,322.890 US Ft

Location

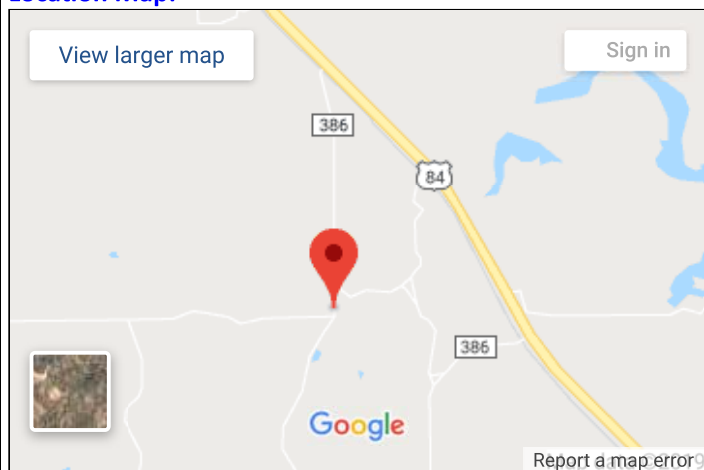
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

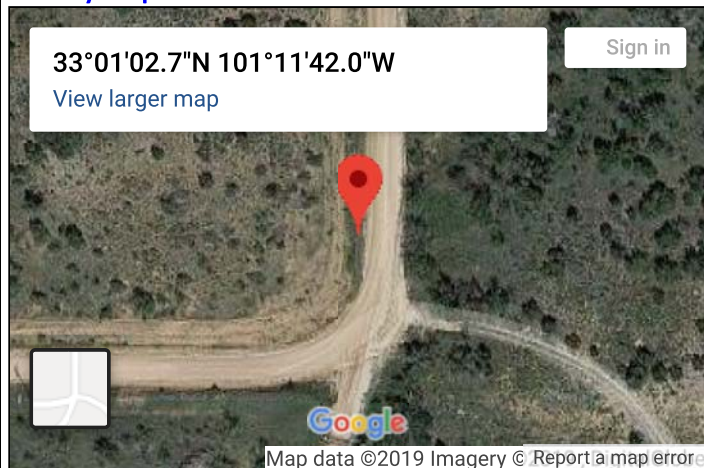
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-52**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-52

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 32° 59' 43.50503"	7,055,336.079 US Ft	7,055,336.079 US Ft
Longitude Easting X:	W 101° 09' 04.29499"	1,155,779.905 US Ft	1,155,779.905 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	669.268 m	2,195.756 US Ft	2,280.098 US Ft

Location

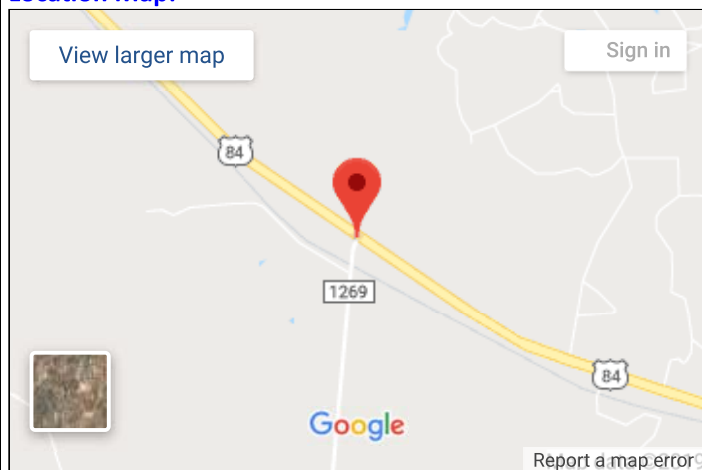
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

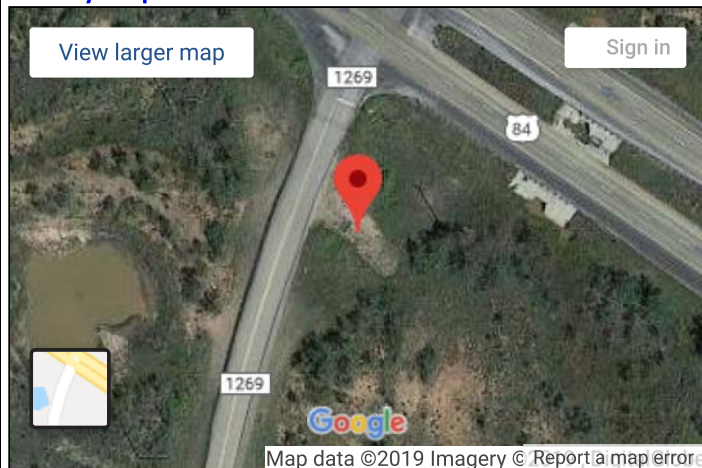
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-53**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-53

Horizontal Method: Static

Vertical Method: Static

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 00' 47.65893"	7,060,984.959 US Ft	7,060,984.959 US Ft
Longitude Easting X:	W 101° 02' 28.66888"	1,189,618.543 US Ft	1,189,618.543 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	686.702 m	2,252.953 US Ft	2,337.873 US Ft

Location

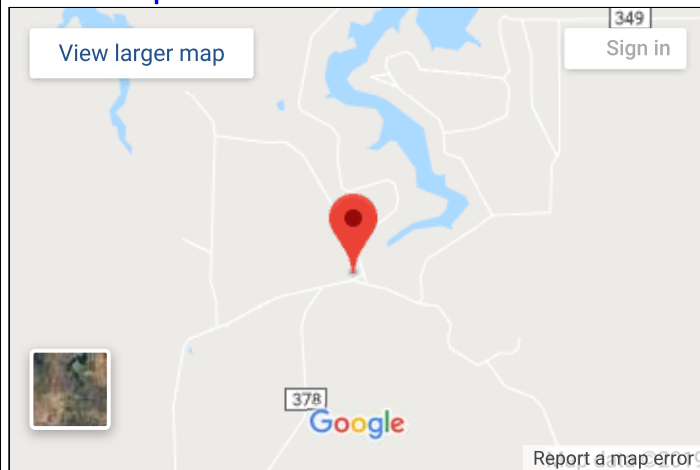
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

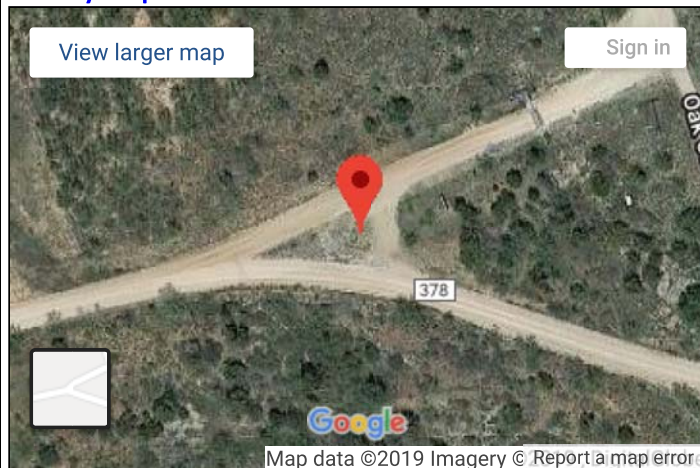
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-54**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-54

Horizontal Method: Static

Vertical Method: Static

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 01' 05.57251"	7,062,532.845 US Ft	7,062,532.845 US Ft
Longitude Easting X:	W 101° 00' 20.58757"	1,200,563.972 US Ft	1,200,563.972 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	694.735 m	2,279.311 US Ft	2,364.554 US Ft

Location

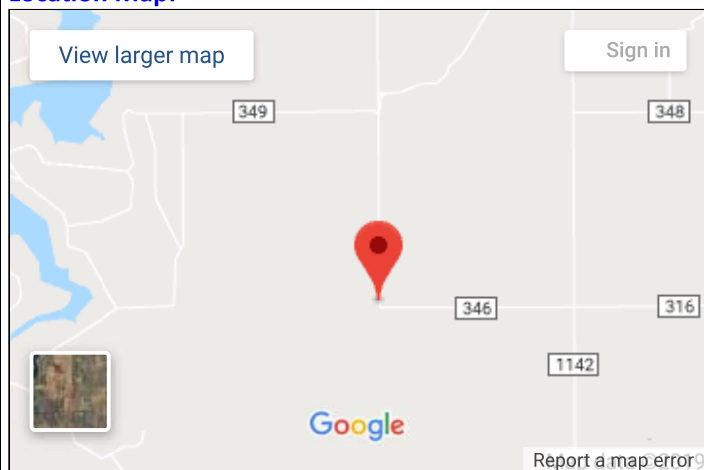
County & State: Kent, TX

Land Grant(s): None

Note(s):

Section:

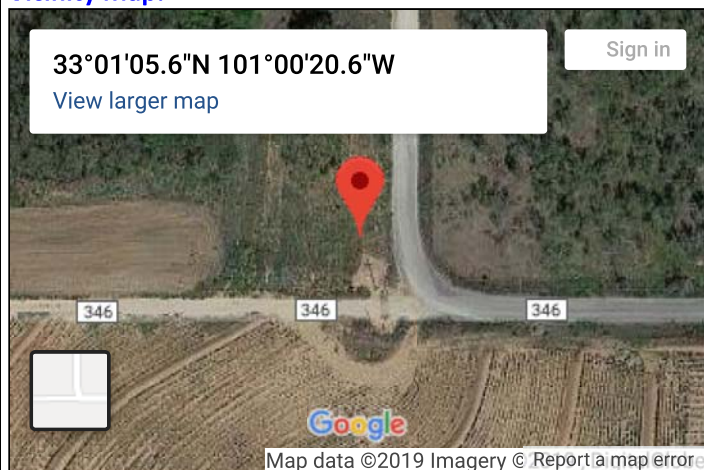
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-55**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-55

Horizontal Method: Static

Vertical Method: Static

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 02' 46.49593"	7,073,569.124 US Ft	7,073,569.124 US Ft
Longitude Easting X:	W 101° 07' 05.27700"	1,166,373.297 US Ft	1,166,373.297 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	666.810 m	2,187.693 US Ft	2,271.977 US Ft

Location

County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

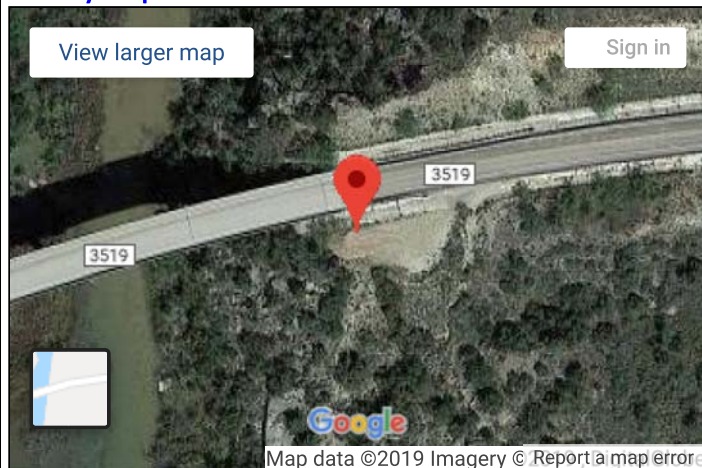
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-56**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-56

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 04' 32.75485"	7,084,040.519 US Ft	7,084,040.519 US Ft
Longitude Easting X:	W 101° 05' 00.02243"	1,177,294.812 US Ft	1,177,294.812 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	696.507 m	2,285.125 US Ft	2,369.503 US Ft

Location

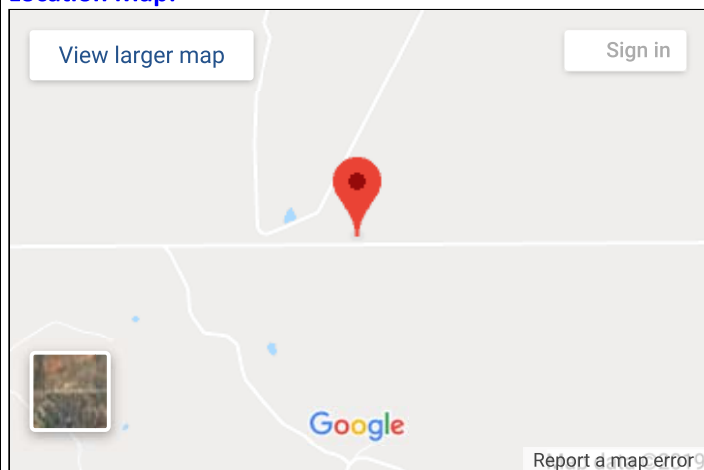
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

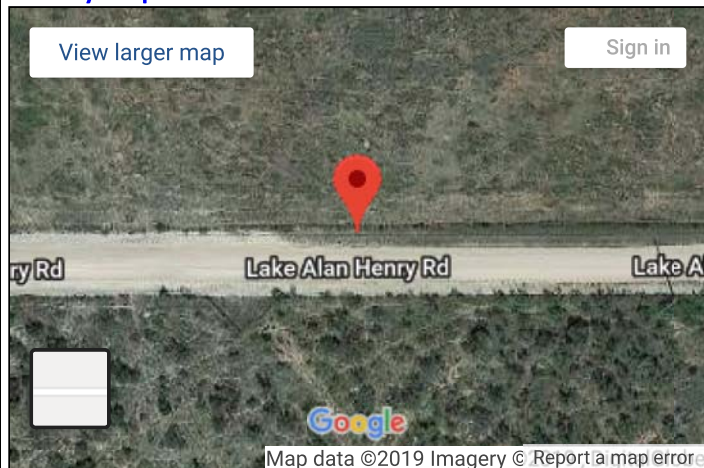
Location Map:



Vicinity Photo (Looking West):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-57**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-57

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 03' 47.29215"	7,079,254.398 US Ft	7,079,254.398 US Ft
Longitude Easting X:	W 101° 03' 27.30096"	1,185,069.739 US Ft	1,185,069.739 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	671.922 m	2,204.463 US Ft	2,289.085 US Ft

Location

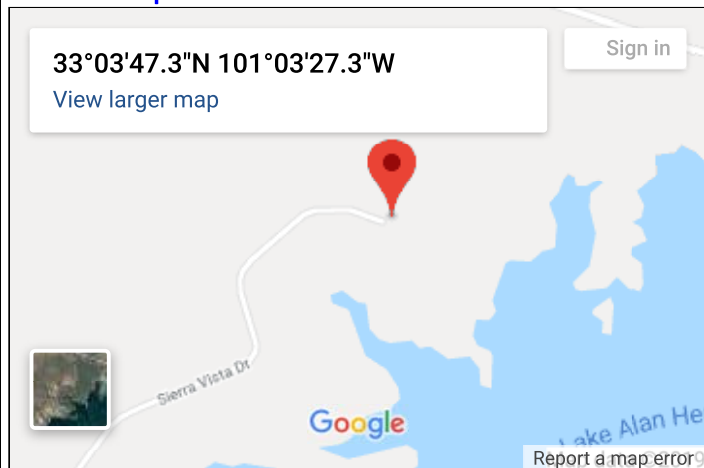
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

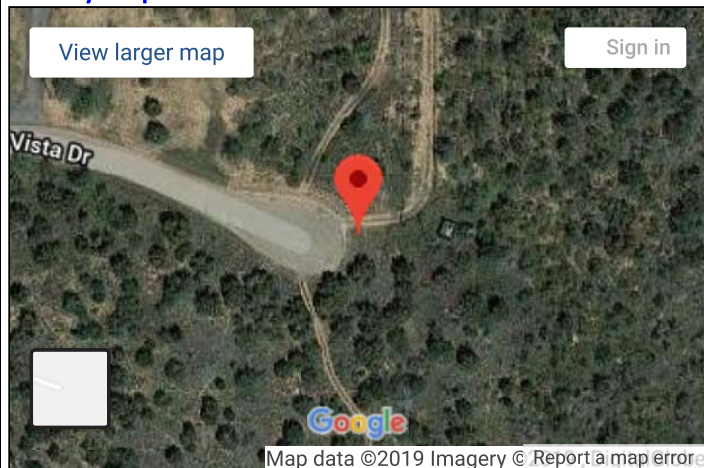
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: BH 19-538-58

Establishing Group: Bohannon Huston, Inc.

Observation Date: 8-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-58

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 05' 24.38718"	7,089,581.278 US Ft	7,089,581.278 US Ft
Longitude Easting X:	W 101° 07' 33.81485"	1,164,343.951 US Ft	1,164,343.951 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	692.691 m	2,272.605 US Ft	2,356.669 US Ft

Location

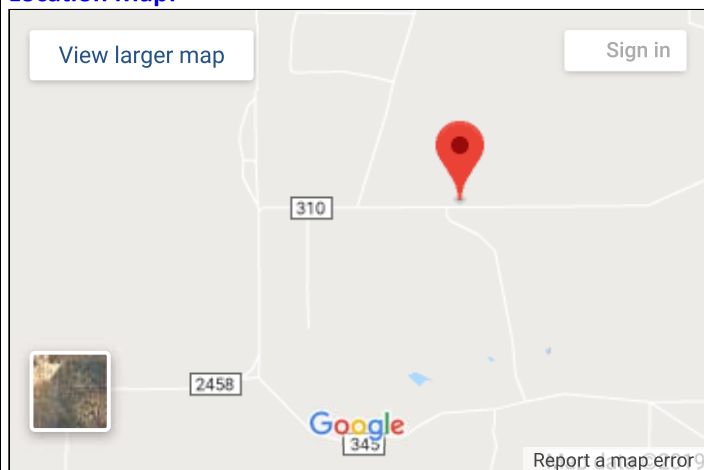
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

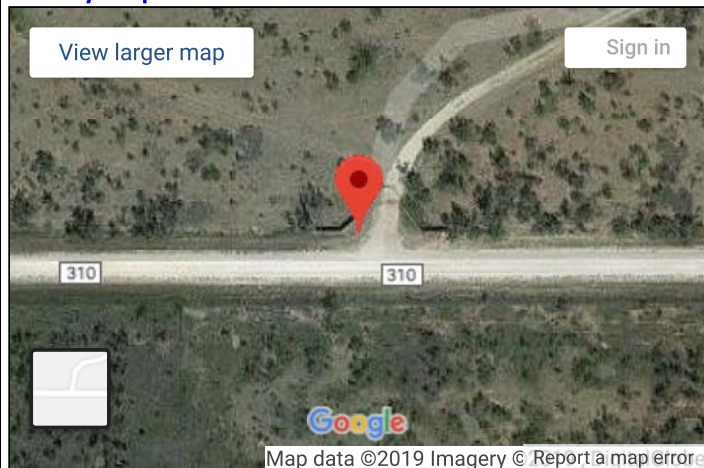
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-59**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 8-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-59

Horizontal Method: Static

Vertical Method: Static

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 06' 35.33520"	7,096,108.322 US Ft	7,096,108.322 US Ft
Longitude Easting X:	W 101° 02' 27.42822"	1,190,573.909 US Ft	1,190,573.909 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	687.388 m	2,255.206 US Ft	2,339.719 US Ft

Location

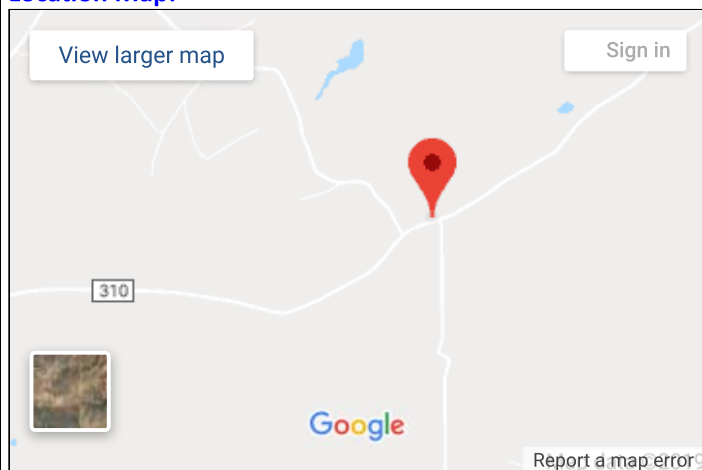
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

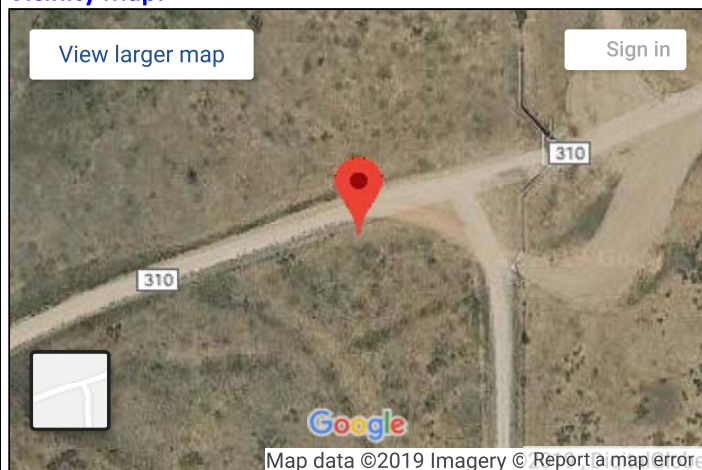
Location Map:



Vicinity Photo (Looking North):



Vicinity Map:



Close Up Photo:



Control Station Data

Name of Station: **BH 19-538-60**

Establishing Group: Bohannon Huston, Inc.

Observation Date: 7-May-2019

BST Project #: 20190538

Project Name: Lubbock 2019
Orthophotography

Station Data

Type/Composition: 2" Aluminum Cap

Station Height: 0.00 US Ft

Stamping: BH 19-538-60

Horizontal Method: Real-Time Kinematic

Vertical Method: Real-Time Kinematic

Coordinate Data

Horizontal Datum:	Geodetic (NAD83)	Grid (TX83-NCF)	Alternate (TX83-NCF)
Latitude Northing Y:	N 33° 07' 06.60241"	7,100,642.079 US Ft	7,100,642.079 US Ft
Longitude Easting X:	W 101° 13' 13.07403"	1,135,759.839 US Ft	1,135,759.839 US Ft
Vertical Datum:	Ellipsoid (GRS80)	Ellipsoid (GRS80)	Orthometric (NAVD88, GEOID12B)
Elevation:	709.786 m	2,328.690 US Ft	2,412.201 US Ft

Location

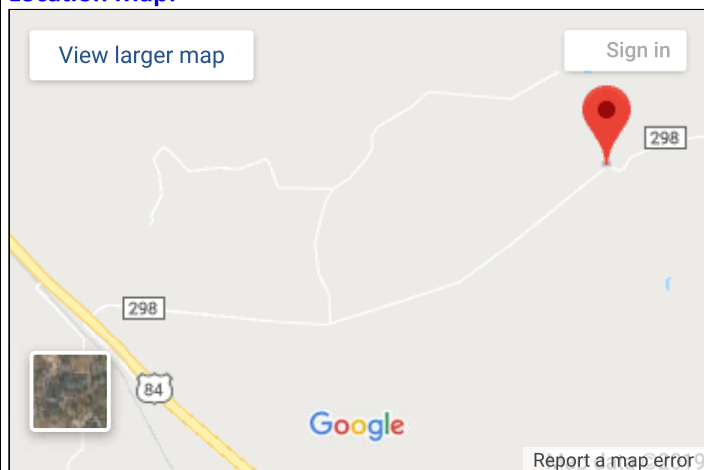
County & State: Garza, TX

Land Grant(s): None

Note(s):

Section:

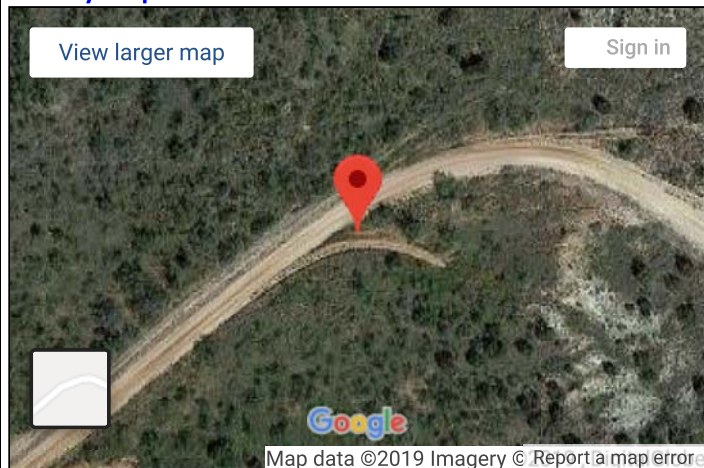
Location Map:



Vicinity Photo (Looking East):



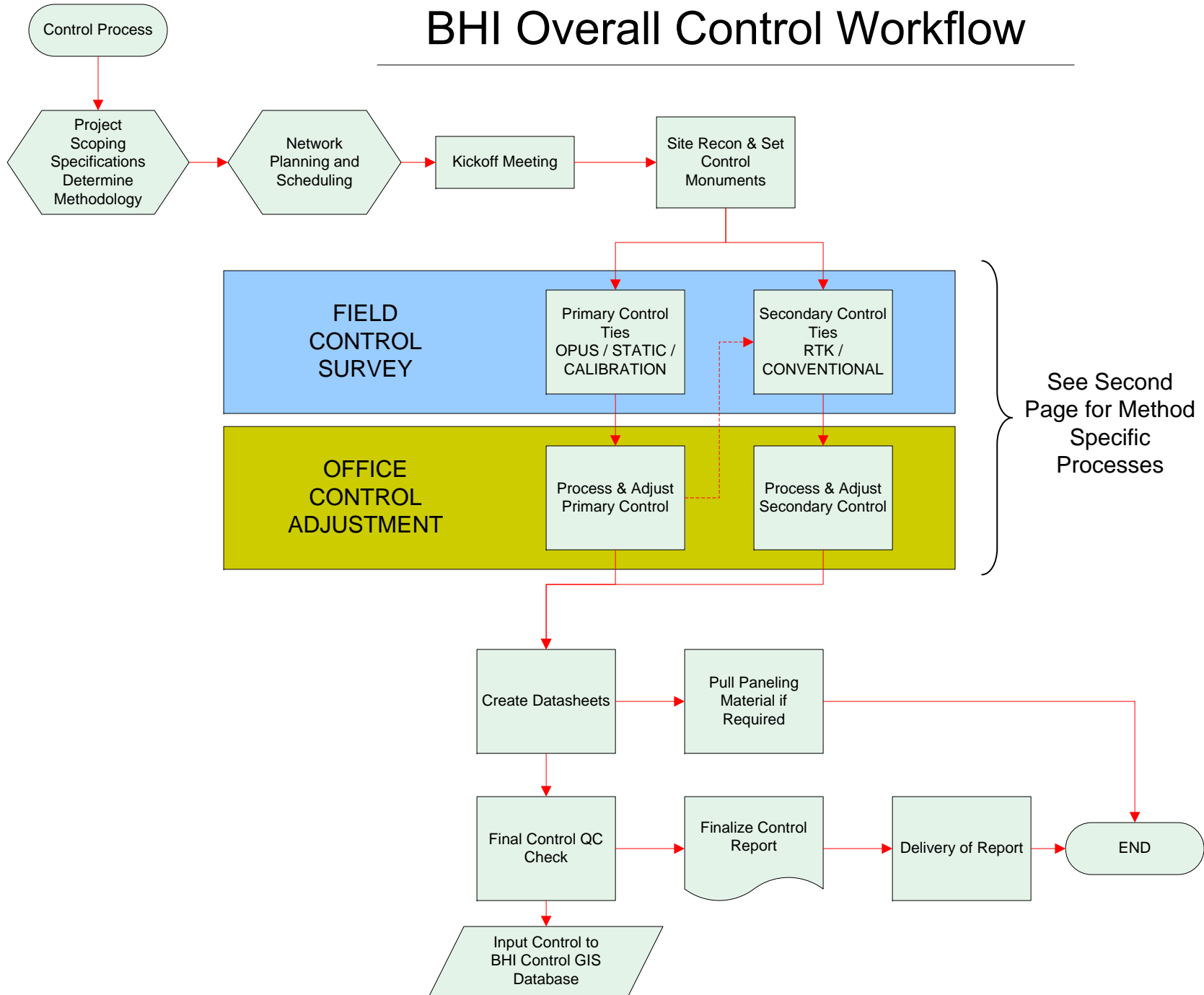
Vicinity Map:



Close Up Photo:



BHI Overall Control Workflow



OPUS - RTK PROCESS

