Connecticut Coastal Imagery

NOAA

April 5, 2017

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NOTICE OF PROPRIETARY INFORMATION

Ground Control Survey Report

National Oceanic and Atmospheric Administration - Connecticut Coastal Imagery

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Section 1: Survey Report

Introduction

Report Date:	4/5/2017
Project Name:	Connecticut Coastal Imagery
Client Information:	NOAA
Delivery Date:	4/5/2017
Prepared By:	Michael Zarlengo, PLS
Woolpert Project Number:	76783

This report contains a comprehensive outline of the photo control survey that supported the Orthoimagery and Connecticut Coastal Imagery project. All surveys were performed in such a way as to achieve ground control accuracies that meet or exceed the National Mapping Accuracy Standards.

Project Area

The project area consists of approximately 951 square miles of southern and central Connecticut.

Purpose

The purpose of this survey was to establish three-dimensional coordinates for 5 supplemental photo identifiable points (PIDs) and 40 quality control (QC) points. The QC points were collected uniformly dispersed over the project area to verify fundamental, supplemental, and consolidated vertical accuracies throughout the task order AOI.

Date of Survey

Ground control field operations took place on September 14th 2017 thru September 16th 2017.

Monumentation

Prior to aerial imagery acquisition, Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing benchmarks were utilized as checks to ensure that quality x, y, and z coordinate values were computed for each of the newly established photogrammetric control stations. Recovery information sheets for the existing NGS control stations can be found in Section 5 of this report. A control diagram showing the ground control stations used to support this Photo Control mapping project can be found in Section 5 of this report.

GPS Equipment

Woolpert utilized 1 Trimble Navigation R10 Model GNSS dual-frequency GPS receiver, and 1 TSC3 data collector for this project.

Methodology

VRS Virtual Reference System or RTN Real Time Network.

The "Virtual Reference Station" (VRS) concept is based on having a network (spaced at 50-60kms) of GNSS (GPS or GPS/GLONASS) reference stations permanently connected to the control center via the Internet. The networked stations collectively and precisely, model Ionospheric errors for the individual GNSS rover in the network coverage area. The rover interprets and uses the VRS network-correction data as if it is operating with a single physical base station on a very short baseline which increases the RTK performance. Corrections (vectors) are from the closest base, but because the ionospheric error (which is traditionally baseline dependent) is practically negated, the rover's degradation in accuracy due to baseline length starts when the rover is first initialized, that is, at the work site. Thus accuracies are increased and more consistent throughout the working region

GPS Data Analysis and Processing

The field crew chief processed all session baselines each day using Trimble Navigation's Trimble Business Center (TBC) Version 3.80 baseline processor with the accompanying broadcast ephemeris. Daily processing ensured the integrity of the network as it was constructed, and allowed the field crews to immediately reschedule observations of poor baselines.

Datum Reference and Final Coordinates

The spatial reference system for the Project AOI is Connecticut State Plane Zone, NAD83(2011), U.S. Survey Feet, horizontal and NAVD88 U.S. Survey Feet vertical using the geoid model of 2012 (GEOID12B). Units for both the horizontal and vertical datums will be expressed in U.S. Survey Feet to two (2) decimal places.

Quality Assurance

Existing NGS published benchmarks were surveyed to assure that there were no discrepancies in the field observation data. Close examinations of the residuals showed no distortions in orientation or scale.

Section 2: Ground/Geodetic Control Coordinate Listings

Coordinate System: Grid

HORIZONTAL DATUM: NAD83 2011 Connecticut State Plane
VERTICAL DATUM: NAVD88
GEOID MODEL: GEOID 12B
UNITS: US Survey Feet

Photo Identifiable Points (PIDs)

NAD832011 (2010.00 epoch) CT State Plane USFT				
Point #	Northing	Easting	Elevation	Code
9_2016	617520.20	900711.79	22.17	PID
20_2016	666893.33	1070246.76	9.78	PID
24_2016	871499.66	1022688.43	145.65	PID
28_2016	738344.22	1077446.71	133.71	PID
31_2016	665989.00	1117591.09	29.70	PID

Quality Control Points

NAD832011 (2010.00 epoch) CT State Plane USFT				
Point #	Northing	Easting	Elevation	Code
1	567532.40	754985.23	51.62	PCQC
2	577078.01	771731.48	100.64	PCQC
3	610376.08	851276.66	11.13	PCQC
4	589244.52	803330.39	52.83	PCQC
5	625613.88	889357.16	8.65	PCQC
6	649836.13	903005.20	36.47	PCQC
7	689658.55	906206.73	107.69	PCQC
8	701645.77	969427.22	37.80	PCQC
9	677227.71	966450.08	22.29	PCQC
10	644128.92	932338.64	18.19	PCQC
11	664939.43	1040531.83	38.20	PCQC
12	667812.37	1017427.37	36.55	PCQC

NAD832011 (2010.00 epoch) CT State Plane USFT				
Point #	Northing	Easting	Elevation	Code
13	656633.23	967628.42	13.78	PCQC
14	669861.19	942166.13	41.43	PCQC
15	671145.54	1101868.07	27.85	PCQC
16	700461.63	1085727.76	41.01	PCQC
17	679327.06	1178334.04	88.34	PCQC
18	686162.89	1134008.91	91.81	PCQC
19	704669.39	1160885.82	149.00	PCQC
20	711662.51	1181450.81	10.81	PCQC
21	681451.13	1251366.33	11.97	PCQC
22	702339.91	1253980.80	51.48	PCQC
23	706242.86	1217243.49	36.36	PCQC
24	686355.35	1202540.42	168.25	PCQC
25	759094.32	1179047.86	118.66	PCQC
26	764409.28	1191708.96	40.19	PCQC
27	724735.93	1075994.78	70.81	PCQC
28	755516.79	1035724.19	204.77	PCQC
29	741093.70	1052479.26	63.85	PCQC
30	780641.41	1020102.46	36.33	PCQC
31	824532.33	1039867.88	65.81	PCQC
32	865920.57	1022201.21	111.24	PCQC
33	896124.45	1033782.81	53.19	PCQC
34	907690.17	1040410.64	141.67	PCQC
35	933322.41	1044554.73	136.86	PCQC
36	804435.29	1028413.92	116.03	PCQC
37	695814.08	1243681.04	38.47	PCQC
38	668632.60	1071699.57	62.29	PCQC
39	677571.09	1138775.04	41.50	PCQC
40	846887.46	1026746.38	20.40	PCQC

Geodetic Control Points

NAD832011 (2010.00 epoch) CT State Plane USFT				
PID	Designation	Northing	Easting	Elevation
LX3066	D 92	768093.77	1034695.24	30.96
LX7472	SHERWOOD 2	601489.83	840076.00	11.50

NGS Base Station Check Points

PID	Designation	Δ Northing (USFT)	Δ Easting (USFT)	Δ Elevation
LX3066	D 92	-0.02	-0.02	0.14
LX7472	SHERWOOD 2	0.01	-0.10	-0.03

Coordinate System: Geodetic

HORIZONTAL DATUM: NAD83 (2011) Epoch 2010.00
VERTICAL DATUM: NAVD88
UNITS: US Survey Feet
DATE: 4/5/2017

Photo Identifiable Points (PIDs)

NAD83 (2010.00 epoch) CT State Plane USFT				
Point #	lattitude	Longitude	Ellipsoid Height	v
9_2016	N41°09'19.09476"	W73°06'37.95522"	-76.14	PID
20_2016	N41°17'27.93423"	W72°29'39.78012"	-89.59	PID
28_2016	N41°29'13.65031"	W72°28'02.40089"	35.57	PID
24_2016	N41°51'10.31553"	W72°40'00.20178"	49.80	PID
31_2016	N41°17'17.14932"	W72°19'19.64465"	-70.47	PID

Quality Control Points

NAD83 (2010.00 epoch) CT State Plane USFT				
Point #	lattitude	Longitude	Ellipsoid Height	Code
1	N41°00'54.80823"	W73°38'16.17243"	-48.98	PCQC
2	N41°02'30.75992"	W73°34'38.92692"	0.54	PCQC
3	N41°08'05.96469"	W73°17'23.60360"	-87.15	PCQC
4	N41°04'33.74802"	W73°27'47.88883"	-46.38	PCQC
5	N41°10'38.56708"	W73°09'06.87997"	-89.42	PCQC

NAD83 (2010.00 epoch) CT State Plane USFT				
Point #	lattitude	Longitude	Ellipsoid Height	Code
6	N41°14'38.47602"	W73°06'09.69905"	-61.08	PCQC
7	N41°21'12.05320"	W73°05'29.85113"	10.99	PCQC
8	N41°23'12.12545"	W72°51'41.08578"	-59.32	PCQC
9	N41°19'10.83218"	W72°52'19.69018"	-75.38	PCQC
10	N41°13'43.09167"	W72°59'45.50290"	-79.81	PCQC
11	N41°17'09.31416"	W72°36'09.08301"	-60.81	PCQC
12	N41°17'37.97785"	W72°41'11.69513"	-61.99	PCQC
13	N41°15'47.37091"	W72°52'03.87977"	-84.47	PCQC
14	N41°17'57.58795"	W72°57'37.70862"	-56.01	PCQC
15	N41°18'08.81438"	W72°22'45.31194"	-71.94	PCQC
16	N41°22'59.08972"	W72°26'15.39367"	-57.91	PCQC
17	N41°19'25.18895"	W72°06'02.66945"	-12.16	PCQC
18	N41°20'35.60853"	W72°15'43.09533"	-8.07	PCQC
19	N41°23'36.80057"	W72°09'49.09296"	49.15	PCQC
20	N41°24'44.42425"	W72°05'18.57702"	-89.17	PCQC
21	N41°19'39.64237"	W71°50'05.24000"	-88.55	PCQC
22	N41°23'05.73948"	W71°49'28.04126"	-48.71	PCQC
23	N41°23'47.90581"	W71°57'29.49731"	-63.81	PCQC
24	N41°20'32.70819"	W72°00'44.63749"	67.78	PCQC
25	N41°32'33.21605"	W72°05'45.40115"	19.35	PCQC
26	N41°33'24.74502"	W72°02'58.33967"	-59.04	PCQC
27	N41°26'59.24780"	W72°28'22.05172"	-27.52	PCQC
28	N41°32'04.29874"	W72°37'10.26552"	107.53	PCQC
29	N41°29'41.49176"	W72°33'30.37544"	-33.84	PCQC
30	N41°36'12.70728"	W72°40'35.39314"	-60.44	PCQC
31	N41°43'26.08470"	W72°36'14.24678"	-30.86	PCQC
32	N41°50'15.20318"	W72°40'06.70921"	15.33	PCQC
33	N41°55'13.45403"	W72°37'33.13660"	-42.54	PCQC
34	N41°57'07.60757"	W72°36'05.20393"	46.01	PCQC
35	N42°01'20.74839"	W72°35'09.71732"	41.47	PCQC
36	N41°40'07.69884"	W72°38'45.61337"	19.37	PCQC
37	N41°22'02.33478"	W71°51'44.03295"	-61.85	PCQC
38	N41°17'45.07554"	W72°29'20.67985"	-37.06	PCQC
39	N41°19'10.45096"	W72°14'41.26965"	-58.64	PCQC
40	N41°47'07.12322"	W72°39'06.95032"	-75.84	PCQC

Geodetic Control Points

NAD832011 (2010.00 epoch) CT State Plane USFT				
PID	Designation	Latitude	Longitude	Ellipsoid Height
LX3066	D 92	N41°34'08.57232"	W72°37'23.55237"	-66.194
LX7472	SHERWOOD 2	N41°06'37.45015"	W73°19'49.19612"	-87.021

Section 3: Photo Control Logs and Photos

This section contains the station recovery information sheets and photographs for the Photo identifiable control stations established for the project. The stations appear as they are ordered in the final coordinate listing of Section 2.

The data is assembled on the following pages.

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	Connecticut Coastal Imagery	Operator Name	T. Ash
Project Number	76783	Date of Survey	14-Sep-16
Station Name	9_2016	File Name	76783_091416TA

Methodology

RTK Base		Photo Control Point (PCP)	X
RTK VRS	X	LiDAR Control Point (GCP)	
Rapid Static		LiDAR QC Point (QCP)	
		Control Station	

Agency	OTHER		
PID	**9_2016**		
Hor. Order	**N/A**		
Ver. Order	**N/A**		
Designation	**OTHER**		

Global Coordinates

Latitude	N41°09'19.09476"	Receiver :	
Longitude	W73°06'37.95522"	R10	X
Ellipsoidal Height (ft)	-76.14	R8	
		Other, specify	

Type of Mark	Photo Control Point	Antenna Height:	6.56 USFT
			2.000 METERS
Mark Stamping	N/A		

Start Time :	14:45	Stop Time :	14:48
PDOP Max:	1.6		
Start Time :	14:48	Stop Time :	14:49
PDOP Max:	2.0		

Weather Conditions

LOCATION PHOTO

NORTH

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	Connecticut Coastal Imagery	Operator Name	T. Ash
Project Number	76783	Date of Survey	14-Sep-16
Station Name	20_2016	File Name	76783_091416TA

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [X]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency OTHER
PID 20_2016
Hor. Order N/A
Ver. Order N/A
Designation OTHER

Global Coordinates

Latitude	N41°17'27.93423"
Longitude	W72°29'39.78012"
Ellipsoidal Height (ft)	-89.59

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: Photo Control Point

Mark Stamping: N/A

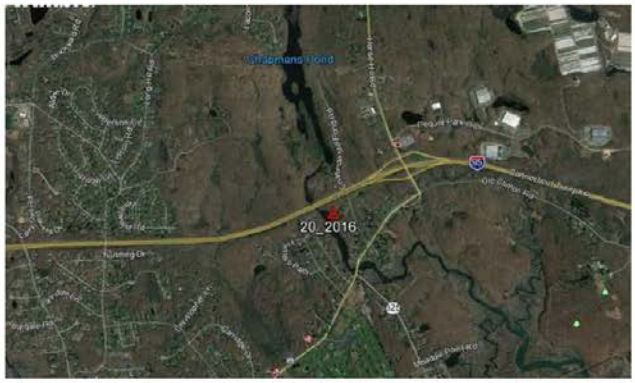
Antenna Height: 6.56 USFT / 2.000 METERS

Start Time : 14:04 Stop Time : 14:07
PDOP Max: 1.6
Start Time : 14:07 Stop Time : 14:08
PDOP Max: 1.6

Weather Conditions

LOCATION PHOTO

NORTH



GPS STATION RECOVERY - GPS LOG SHEET

Project Name	Connecticut Coastal Imagery	Operator Name	T. Ash
Project Number	76783	Date of Survey	14-Sep-16
Station Name	24_2016	File Name	76783_091416TA

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [X]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency OTHER

PID	24_2016
Hor. Order	N/A
Ver. Order	N/A
Designation	OTHER

Global Coordinates

Latitude	N41°51'10.31553"
Longitude	W72°40'00.20178"
Ellipsoidal Height (ft)	49.80

Receiver: R10 [X] R8 [ ] Other, specify [ ]

Type of Mark: Photo Control Point

Mark Stamping: N/A

Antenna Height: 6.56 USFT / 2.000 METERS

Start Time :	10:56	Stop Time :	10:59
PDOP Max:	1.5		
Start Time :	11:00	Stop Time :	11:01
PDOP Max:	1.4		

Weather Conditions

LOCATION PHOTO

NORTH

GPS STATION RECOVERY - GPS LOG SHEET

Project Name	Connecticut Coastal Imagery	Operator Name	T. Ash
Project Number	76783	Date of Survey	14-Sep-16
Station Name	28_2016	File Name	76783_091416TA

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [X]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency OTHER
PID **28_2016**
Hor. Order **N/A**
Ver. Order **N/A**
Designation **OTHER**

Global Coordinates

Latitude	N41°29'13.65031"
Longitude	W72°28'02.40089"
Ellipsoidal Height (ft)	35.57

Receiver :
R10 [X]
R8 [ ]
Other, specify [ ]

Type of Mark: Photo Control Point

Mark Stamping: N/A

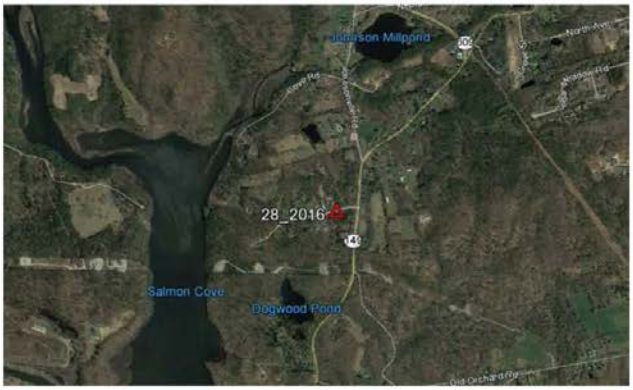
Antenna Height: 6.56 USFT / 2.000 METERS

Start Time : 16:39 Stop Time : 16:42
PDOP Max: 3.7
Start Time : 16:43 Stop Time : 16:44
PDOP Max: 3.7

Weather Conditions

LOCATION PHOTO

NORTH



GPS STATION RECOVERY - GPS LOG SHEET

Project Name	Connecticut Coastal Imagery	Operator Name	T. Ash
Project Number	76783	Date of Survey	14-Sep-16
Station Name	31_2016	File Name	76783_091416TA

Methodology: RTK Base [ ] RTK VRS [X] Rapid Static [ ]

Photo Control Point (PCP) [X]
LiDAR Control Point (GCP) [ ]
LiDAR QC Point (QCP) [ ]
Control Station [ ] Agency: OTHER

PID	31_2016
Hor. Order	N/A
Ver. Order	N/A
Designation	OTHER

Global Coordinates

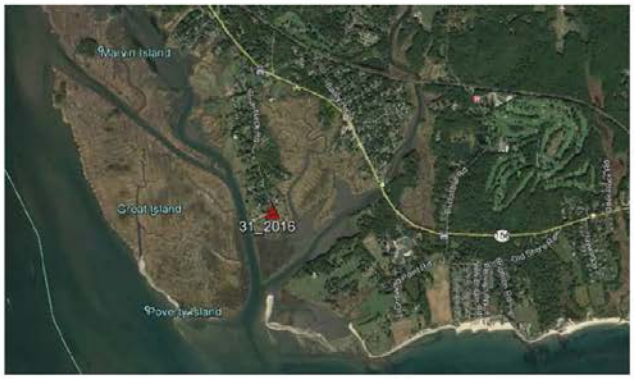
Latitude	N41°17'17.14932"
Longitude	W72°19'19.64465"
Ellipsoidal Height (ft)	-70.47

Receiver: R10 [X] R8 [ ] Other, specify [ ]

Type of Mark	Photo Control Point	Antenna Height:	6.56 USFT / 2.000 METERS
Mark Stamping	N/A		
		Start Time :	13:33 Stop Time : 13:36
		PDOP Max:	1.2
		Start Time :	13:36 Stop Time : 13:37
		PDOP Max:	1.2
		Weather Conditions	

LOCATION PHOTO

NORTH



Section 4: Existing NGS Data Sheets

This section contains the published National Geodetic Survey (NGS) Data Sheets used in the final control network for this project.

The NGS Data Sheet

See file dsdata.pdf for more information about the datasheet.

```
PROGRAM = datasheet95, VERSION = 8.12.1
1        National Geodetic Survey,   Retrieval Date = APRIL  5, 2017
 LX3066 ***********************************************************************
 LX3066  DESIGNATION -  D 92
 LX3066  PID         -  LX3066
 LX3066  STATE/COUNTY-  CT/MIDDLESEX
 LX3066  COUNTRY     -  US
 LX3066  USGS QUAD   -  MIDDLE HADDAM (1984)
 LX3066
 LX3066                        *CURRENT SURVEY CONTROL
 LX3066  ______________________________________________________________________
 LX3066* NAD 83(2011) POSITION- 41 34 08.57232(N) 072 37 23.55237(W)   ADJUSTED
 LX3066* NAD 83(2011) ELLIP HT-   -20.176 (meters)        (06/27/12)   ADJUSTED
 LX3066* NAD 83(2011) EPOCH   -  2010.00
 LX3066* NAVD 88 ORTHO HEIGHT -     9.435 (meters)       30.95  (feet) ADJUSTED
 LX3066  ______________________________________________________________________
 LX3066  GEOID HEIGHT    -        -29.606 (meters)                     GEOID12B
 LX3066  NAD 83(2011) X  -  1,427,232.146 (meters)                     COMP
 LX3066  NAD 83(2011) Y  - -4,560,776.667 (meters)                     COMP
 LX3066  NAD 83(2011) Z  -  4,209,899.362 (meters)                     COMP
 LX3066  LAPLACE CORR    -         -2.08  (seconds)                    DEFLEC12B
 LX3066  DYNAMIC HEIGHT  -          9.431 (meters)       30.94  (feet) COMP
 LX3066  MODELED GRAVITY -    980,303.2   (mgal)                       NAVD 88
 LX3066
 LX3066  VERT ORDER      -  FIRST     CLASS II
 LX3066
 LX3066  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 LX3066  Standards:
 LX3066         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 LX3066            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 LX3066  ------------------------------------------------------------------
 LX3066  NETWORK    1.39   1.74           0.64   0.47   0.89      0.02636706
 LX3066  ------------------------------------------------------------------
 LX3066  Click here for local accuracies and other accuracy information.
 LX3066
 LX3066
 LX3066.The horizontal coordinates were established by GPS observations
 LX3066.and adjusted by the National Geodetic Survey in June 2012.
 LX3066
 LX3066.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
 LX3066.been affixed to the stable North American tectonic plate. See
 LX3066.NA2011 for more information.
 LX3066
 LX3066.The horizontal coordinates are valid at the epoch date displayed above
 LX3066.which is a decimal equivalence of Year/Month/Day.
 LX3066
 LX3066.The orthometric height was determined by differential leveling and
 LX3066.adjusted by the NATIONAL GEODETIC SURVEY
 LX3066.in June 1991.
 LX3066
 LX3066.Significant digits in the geoid height do not necessarily reflect accuracy.
 LX3066.GEOID12B height accuracy estimate available here.
```

```
LX3066
LX3066.The X, Y, and Z were computed from the position and the ellipsoidal ht.
LX3066
LX3066.The Laplace correction was computed from DEFLEC12B derived deflections.
LX3066
LX3066.The ellipsoidal height was determined by GPS observations
LX3066.and is referenced to NAD 83.
LX3066
LX3066.The dynamic height is computed by dividing the NAVD 88
LX3066.geopotential number by the normal gravity value computed on the
LX3066.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
LX3066.degrees latitude (g = 980.6199 gals.).
LX3066
LX3066.The modeled gravity was interpolated from observed gravity values.
LX3066
LX3066. The following values were computed from the NAD 83(2011) position.
LX3066
LX3066;                     North         East     Units Scale Factor Converg.
LX3066;SPC CT       -   234,115.448   315,375.740   MT  0.99998333   +0 05 02.7
LX3066;SPC CT       -   768,093.77  1,034,695.24   sFT  0.99998333   +0 05 02.7
LX3066;UTM  18      - 4,604,658.026   698,169.606   MT  1.00008330   +1 34 39.2
LX3066
LX3066!             -  Elev Factor  x  Scale Factor =   Combined Factor
LX3066!SPC CT       -   1.00000316  x   0.99998333  =   0.99998649
LX3066!UTM  18      -   1.00000316  x   1.00008330  =   1.00008646
LX3066
LX3066_U.S. NATIONAL GRID SPATIAL ADDRESS: 18TXM9816904658(NAD 83)
LX3066
LX3066                           SUPERSEDED SURVEY CONTROL
LX3066
LX3066  NAD 83(2007)-  41 34 08.57267(N)    072 37 23.55307(W) AD(2002.00) 0
LX3066  ELLIP H (02/10/07)  -20.157  (m)                       GP(2002.00)
LX3066  NAD 83(1996)-  41 34 08.57262(N)    072 37 23.55338(W) AD(       ) 1
LX3066  ELLIP H (06/22/01)  -20.177  (m)                       GP(       ) 4 1
LX3066  NAVD 88              9.44   (m)          31.0    (f) LEVELING    3
LX3066
LX3066.Superseded values are not recommended for survey control.
LX3066
LX3066.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
LX3066.See file dsdata.pdf to determine how the superseded data were derived.
LX3066
LX3066_MARKER: I = METAL ROD
LX3066_SETTING: 2 = OBJECT DRIVEN INTO GROUND
LX3066_SP_SET: STAINLESS STEEL ROD
LX3066_STAMPING: D 92 1986
LX3066_MARK LOGO: NGS
LX3066_PROJECTION: FLUSH
LX3066_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
LX3066_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY
LX3066_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
LX3066+SATELLITE: SATELLITE OBSERVATIONS - January 22, 2015
LX3066_ROD/PIPE-DEPTH: 5.6  meters
LX3066
LX3066  HISTORY     - Date     Condition        Report By
LX3066  HISTORY     - 19860101 MONUMENTED       NGS
LX3066  HISTORY     - 19971202 GOOD             USPSQD
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LX3066  HISTORY     - 20000615 GOOD             NGS
LX3066  HISTORY     - 20030424 GOOD             CTGS
LX3066  HISTORY     - 20150122 GOOD             INDIV
LX3066
LX3066                          STATION DESCRIPTION
LX3066
LX3066'DESCRIBED BY NATIONAL GEODETIC SURVEY 1986
LX3066'1.7 KM (1.05 MI) SE FROM PORTLAND.
LX3066'1.7 KM (1.05 MI) SOUTHEAST ALONG STATE HIGHWAY 66 FROM THE JUNCTION OF
LX3066'STATE HIGHWAY 17A IN PORTLAND TO THE MARK ON THE RIGHT AND ACROSS THE
LX3066'HIGHWAY FROM L. H. JACKSON VOLVO DEALER, 8.5 METERS (28.0 FT) SOUTH OF
LX3066'THE CENTERLINE OF THE EASTBOUND LANE OF THE HIGHWAY, 18.0 METERS
LX3066'(59.2 FT) NORTHEAST OF THE NORTHWEST CORNER OF A BRICK BUILDING, 12.6
LX3066'METERS (41.4 FT) EAST OF THE CENTER OF A DRIVEWAY, 0.48 METER (1.6 FT)
LX3066'SOUTH OF POWER POLE NO. 1798.
LX3066'NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP.
LX3066'THE MARK IS 0.18 M ABOVE HIGHWAY.
LX3066
LX3066                          STATION RECOVERY (1997)
LX3066
LX3066'RECOVERY NOTE BY US POWER SQUADRON 1997
LX3066'RECOVERED IN GOOD CONDITION.
LX3066
LX3066                          STATION RECOVERY (2000)
LX3066
LX3066'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 2000 (CSM)
LX3066'THE STATION IS LOCATED IN PORTLAND, ABOUT 1.7 KM (1.05 MI) EAST OF THE
LX3066'JUNCTION OF STATE HIGHWAYS 17-A AND 66, ALONG THE SOUTH SIDE OF
LX3066'HIGHWAY 66, NORTHEAST OF A POWER POLE, AND NORTH-NORTHWEST AND
LX3066'ACROSS THE PARKING LOT/DRIVEWAY OF THE PORTLAND VETERINARY
LX3066'HOSPITAL NUMBER 455 HIGHWAY 66.  OWNERSHIP--CONNECTICUT
LX3066'DEPARTMENT OF TRANSPORTATION.  TO REACH THE STATION FROM THE
LX3066'JUNCTION OF STATE HIGHWAYS 17-A AND 66, LOCATED 0.16 KM (0.10 MI)
LX3066'NORTHEAST OF THE NORTHEAST END OF THE HIGHWAY 17 BRIDGE OVER
LX3066'THE CONNECTICUT RIVER IN PORTLAND, GO EAST ON HIGHWAY 66 FOR 1.7
LX3066'KM (1.05 MI) TO THE STATION ON THE RIGHT, ON THE EAST SIDE OF THE
LX3066'WEST ENTRANCE DRIVE OF THE PORTLAND VETERINARY HOSPITAL AND
LX3066'JUST SOUTHWEST OF A POWER POLE WITH LINES CROSSING THE HIGHWAY
LX3066'AND LEADING TO THE VETERINARY HOSPITAL BUILDING.  THE STATION IS A
LX3066'PUNCH MARK ON THE TOP OF A STAINLESS STEEL DATUM CAP CRIMPED TO
LX3066'THE TOP OF A STAINLESS STEEL ROD, ENCASED IN A 13 CM PVC PIPE WITH
LX3066'AN NGS LOGO CAP SURROUNDED BY CONCRETE ABOUT FLUSH WITH THE
LX3066'GROUND.  LOCATED 18.05 M (59.22 FT) NORTH-NORTHWEST AND ACROSS
LX3066'THE PARKING LOT/DRIVE FROM THE NORTHWEST CORNER OF THE
LX3066'VETERINARY HOSPITAL BUILDING, 6.31 M (20.70 FT) SOUTH-SOUTHWEST OF
LX3066'THE SOUTHWEST CORNER OF A METAL CATCH BASIN ALONG HIGHWAY 66,
LX3066'2.38 M (7.81 FT) SOUTH OF THE SOUTH ASPHALT CURB OF HIGHWAY 66, 0.98
LX3066'M (3.22 FT) SOUTHWEST OF A POWER POLE WITH A SECURITY LIGHT AND
LX3066'LINES LEADING TO THE VETERINARY HOSPITAL AND 0.34 M (1.12 FT) P NORTH
LX3066'OF A CTGS FIBERGLASS WITNESS POST.
LX3066'
LX3066
LX3066                          STATION RECOVERY (2003)
LX3066
LX3066'RECOVERY NOTE BY CONNECTICUT GEODETIC SURVEY 2003 (RB)
LX3066'A DRILL HOLE IN A HEX HEAD BRASS BOLT IN A 1/4 IN. HOLE.  THE STATION
LX3066'MARK IS A NATIONAL GEODETIC SURVEY FLANGE ENCASED STAINLESS STEEL ROD
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 LX3066'DRIVEN TO A DEPTH OF 18.4 FEET. ACCESS TO THE DATUM POINT IS HAD
 LX3066'THROUGH A 5 INCH LOGO CAP STAMPED D 92 1986 THAT IS FLUSH WITH THE
 LX3066'GROUND. TO REACH THE STATION FROM PORTLAND AT THE INTERSECTION OF
 LX3066'CONNECTICUT ROUTE 66 (MARLBOROUGH STREET) AND CONNECTICUT ROUTE 17A
 LX3066'(MAIN STREET), PROCEED SOUTHEASTERLY ALONG CONNECTICUT ROUTE 66 FOR
 LX3066'1.05 MILES TO THE STATION ON THE RIGHT, ACROSS THE ROAD FROM  AN AUTO
 LX3066'DEALERSHIP. THE STATION IS LOCATED 59.2 FEET NORTHEAST OF THE
 LX3066'NORTHWEST CORNER OF A BRICK BUILDING, 41.4 FEET EAST OF THE CENTER
 LX3066'LINE OF A DRIVEWAY, 28.0 FEET SOUTH OF THE CENTER LINE OF CONNECTICUT
 LX3066'ROUTE 66 EASTBOUND AND 1.6 FEET SOUTH OF POWER POLE 1798.
 LX3066
 LX3066                          STATION RECOVERY (2015)
 LX3066
 LX3066'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2015 (GDS)
 LX3066'RECOVERED BY DEWBERRY CONSULTANTS LLC.
1        National Geodetic Survey,   Retrieval Date = APRIL  5, 2017
 LX7472 ***********************************************************************
 LX7472  DESIGNATION -  SHERWOOD 2
 LX7472  PID         -  LX7472
 LX7472  STATE/COUNTY-  CT/FAIRFIELD
 LX7472  COUNTRY     -  US
 LX7472  USGS QUAD   -  SHERWOOD POINT (1971)
 LX7472
 LX7472                         *CURRENT SURVEY CONTROL
 LX7472  ______________________________________________________________________
 LX7472* NAD 83(2011) POSITION- 41 06 37.45015(N) 073 19 49.19612(W)   ADJUSTED
 LX7472* NAD 83(2011) ELLIP HT-   -26.524 (meters)        (06/27/12)   ADJUSTED
 LX7472* NAD 83(2011) EPOCH   -  2010.00
 LX7472* NAVD 88 ORTHO HEIGHT -     3.5   (meters)       11.    (feet) GPS OBS
 LX7472  ______________________________________________________________________
 LX7472  NAVD 88 orthometric height was determined with geoid model    GEOID03
 LX7472  GEOID HEIGHT    -        -30.009 (meters)                     GEOID03
 LX7472  GEOID HEIGHT    -        -30.028 (meters)                     GEOID12B
 LX7472  NAD 83(2011) X  -  1,380,487.295 (meters)                     COMP
 LX7472  NAD 83(2011) Y  - -4,610,269.781 (meters)                     COMP
 LX7472  NAD 83(2011) Z  -  4,171,651.335 (meters)                     COMP
 LX7472  LAPLACE CORR    -          0.66  (seconds)                    DEFLEC12B
 LX7472
 LX7472  Network accuracy estimates per FGDC Geospatial Positioning Accuracy
 LX7472  Standards:
 LX7472         FGDC (95% conf, cm)     Standard deviation (cm)     CorrNE
 LX7472            Horiz  Ellip           SD_N   SD_E   SD_h      (unitless)
 LX7472  ----------------------------------------------------------------------
 LX7472  NETWORK    2.23   1.59           1.01   0.78   0.81     -0.01529615
 LX7472  ----------------------------------------------------------------------
 LX7472  Click here for local accuracies and other accuracy information.
 LX7472
 LX7472
 LX7472.The horizontal coordinates were established by GPS observations
 LX7472.and adjusted by the National Geodetic Survey in June 2012.
 LX7472
 LX7472.NAD 83(2011) refers to NAD 83 coordinates where the reference frame has
 LX7472.been affixed to the stable North American tectonic plate. See
 LX7472.NA2011 for more information.
 LX7472
 LX7472.The horizontal coordinates are valid at the epoch date displayed above
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LX7472.which is a decimal equivalence of Year/Month/Day.
LX7472
LX7472.The orthometric height was determined by GPS observations and a
LX7472.high-resolution geoid model.
LX7472
LX7472.Significant digits in the geoid height do not necessarily reflect accuracy.
LX7472.GEOID12B height accuracy estimate available here.
LX7472
LX7472.The X, Y, and Z were computed from the position and the ellipsoidal ht.
LX7472
LX7472.The Laplace correction was computed from DEFLEC12B derived deflections.
LX7472
LX7472.The ellipsoidal height was determined by GPS observations
LX7472.and is referenced to NAD 83.
LX7472
LX7472. The following values were computed from the NAD 83(2011) position.
LX7472
LX7472;                    North         East     Units Scale Factor Converg.
LX7472;SPC CT       -   183,334.468   256,055.678   MT  1.00001026   -0 23 05.3
LX7472;SPC CT       -   601,489.83    840,076.00   sFT  1.00001026   -0 23 05.3
LX7472;UTM  18      - 4,552,356.211   640,189.768   MT  0.99984188   +1 05 52.8
LX7472
LX7472!             -  Elev Factor  x  Scale Factor =   Combined Factor
LX7472!SPC CT       -   1.00000416  x   1.00001026  =   1.00001442
LX7472!UTM  18      -   1.00000416  x   0.99984188  =   0.99984604
LX7472
LX7472:                Primary Azimuth Mark                    Grid Az
LX7472:SPC CT       -  SHERWOOD 2 AZ MK                       042 12 28.1
LX7472:UTM  18      -  SHERWOOD 2 AZ MK                       040 43 30.0
LX7472
LX7472_U.S. NATIONAL GRID SPATIAL ADDRESS: 18TXL4018952356(NAD 83)
LX7472
LX7472|----------------------------------------------------------------------|
LX7472| PID    Reference Object                    Distance      Geod. Az  |
LX7472|                                                          dddmmss.s |
LX7472| LX7473 SHERWOOD 2 AZ MK                   413.692 METERS 0414922.8 |
LX7472| CR9142 SHERWOOD 2 RM 1                     22.251 METERS 06319     |
LX7472| LX7465 ROWAYTON OLD WITCH STANDPIPE       APPROX. 9.6 KM 2444229.7 |
LX7472| AA9692 SHERWOOD 80                          4.102 METERS 29821     |
LX7472| LX3772 SHERWOOD                             4.105 METERS 29821     |
LX7472| CR9143 SHERWOOD 2 RM 2                     29.532 METERS 30416     |
LX7472|----------------------------------------------------------------------|
LX7472
LX7472                          SUPERSEDED SURVEY CONTROL
LX7472
LX7472  NAD 83(2007)-  41 06 37.45051(N)    073 19 49.19693(W) AD(2002.00) 0
LX7472  ELLIP H (02/10/07)  -26.504  (m)                       GP(2002.00)
LX7472  NAD 83(1996)-  41 06 37.45046(N)    073 19 49.19716(W) AD(       ) B
LX7472  ELLIP H (06/16/04)  -26.520  (m)                       GP(       ) 4 2
LX7472  NAD 83(1996)-  41 06 37.45634(N)    073 19 49.20115(W) AD(       ) 1
LX7472  NAD 83(1992)-  41 06 37.45592(N)    073 19 49.20002(W) AD(       ) 1
LX7472  NAD 83(1986)-  41 06 37.45803(N)    073 19 49.20418(W) AD(       ) 1
LX7472  NAD 83(1986)-  41 06 37.45534(N)    073 19 49.19734(W) AD(       ) 1
LX7472  NGVD 29 (10/23/89)    3.4    (m)           11.     (f) VERT ANG
LX7472
LX7472.Superseded values are not recommended for survey control.
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LX7472
LX7472.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
LX7472.See file dsdata.pdf to determine how the superseded data were derived.
LX7472
LX7472_MARKER: DH = HORIZONTAL CONTROL DISK
LX7472_SETTING: 66 = SET IN ROCK OUTCROP
LX7472_STAMPING: SHERWOOD 2 1983
LX7472_MARK LOGO: NGS
LX7472_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
LX7472_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
LX7472+STABILITY: POSITION/ELEVATION WELL
LX7472_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
LX7472+SATELLITE: SATELLITE OBSERVATIONS - May 04, 2013
LX7472
LX7472  HISTORY     - Date     Condition        Report By
LX7472  HISTORY     - 19830101 MONUMENTED       NGS
LX7472  HISTORY     - 20030424 GOOD             CTGS
LX7472  HISTORY     - 20040309 GOOD             INDIV
LX7472  HISTORY     - 20130504 GOOD             KII
LX7472
LX7472                          STATION DESCRIPTION
LX7472
LX7472'DESCRIBED BY NATIONAL GEODETIC SURVEY 1983 (VDN)
LX7472'THE STATION IS LOCATED ABOUT 5 KM (3.1 MI) SOUTHWEST OF
LX7472'SOUTHPORT, 3.5 KM (2.2 MI) SOUTHEAST OF WESTPORT, IN THE
LX7472'SHERWOOD ISLAND STATE PARK, IN A FLAT GRASSY AREA NEAR
LX7472'THE WATER.
LX7472'OWNERSHIP--OFFICE OF PARKS AND RECREATION, DEPARTMENT
LX7472'OF ENVIRONMENTAL PROTECTION, STATE OFFICE BUILDING, 165
LX7472'CAPITOL AVENUE, HARTFORD CT 06106, PARK OFFICE
LX7472'PHONE 203-226-6983.
LX7472'
LX7472'TO REACH THE STATION FROM THE INTERSECTION OF THE CONNECTICUT
LX7472'TURNPIKE AND THE SHERWOOD ISLAND CONNECTOR AT EXIT 18, GO
LX7472'SOUTH ON THE SHERWOOD ISLAND CONNECTOR FOR 0.6 KM (0.35 MI)
LX7472'TO THE TOLL BOOTH AT THE PARK ENTRANCE.  CONTINUE AHEAD FOR
LX7472'0.5 KM (O.3 MI) TO A PARKING LOT ENTRANCE ON THE RIGHT,
LX7472'TURN RIGHT, WEST, INTO LOT, THEN BEAR LEFT TO A PIPE
LX7472'GATE, 0.1 KM (0.05 MI), AT SOUTH EDGE OF LOT THAT LEADS
LX7472'TO THE PAVILION.  PASS THROUGH GATE, THEN TURN RIGHT ON
LX7472'PAVED LANE FOR 0.1 KM (0.05 MI) TO A T-LANE.  TURN LEFT,
LX7472'SOUTH, FOR 0.25 KM (0.15 MI) ON THE PAVED ROAD, THEN TRACK LANE
LX7472'TO A FLAGPOLE AND THE STATION ON THE LEFT.
LX7472'
LX7472'THE STATION IS A STANDARD NGS DISK
LX7472'STAMPED---SHERWOOD 2 1983---,
LX7472'SET INTO A ROCK OUTCROP.  IT IS LOCATED
LX7472'37.8 METERS (124.0 FT) NORTHWEST FROM A LARGE BOULDER CLOSE TO
LX7472'THE BEACH,
LX7472'28.9 METERS (95.0 FT) EAST-NORTHEAST FROM A BOULDER BY THE BEACH,
LX7472'16.0 METERS (52.5 FT) SOUTH FROM A FLAG POLE AND
LX7472'8.8 METERS (29.0 FT) SOUTH-SOUTHEAST FROM A LARGE
LX7472'BOULDER BY THE FLAG POLE.
LX7472'
LX7472'REFERENCE MARK NUMBER 1 IS A STANDARD NGS DISK
LX7472'STAMPED---SHERWOOD 2 NO 1 1983---,
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LX7472'SET INTO A ROCK OUTCROP. IT IS LOCATED
LX7472'36.3 METERS (119.0 FT) NORTH FROM THE LARGE BOULDER BY THE BEACH,
LX7472'25.9 METERS (85.0 FT) WEST-SOUTHWEST FROM THE FLAG POLE AND
LX7472'23.8 METERS (78.0 FT) WEST-NORTHWEST FROM THE LARGE BOULDER BY
LX7472'THE FLAGPOLE.
LX7472'MARK IS LEVEL WITH STATION.
LX7472'
LX7472'REFERENCE MARK NUMBER 2 IS A STANDARD NGS DISK
LX7472'STAMPED---SHERWOOD 2 NO 2 1983---,
LX7472'SET INTO A ROCK OUTCROP. IT IS LOCATED
LX7472'20.7 METERS (68.0 FT) SOUTHEAST FROM THE LARGE BOULDER BY THE
LX7472'FLAG POLE,
LX7472'18.9 METERS (62.0 FT) EAST-SOUTHEAST FROM THE FLAG POLE AND
LX7472'13.9 METERS (45.5 FT) SOUTH FROM A 60 CM IN DIAMETER TREE.
LX7472'MARK IS LEVEL WITH STATION.
LX7472'
LX7472'HEIGHT OF LIGHT SHOWN ABOVE THE MARK WAS 1.4 METERS.
LX7472'
LX7472'DESCRIBED BY D.W. SMITH, CHECKED BY J.N. LEONHARDT.
LX7472
LX7472   STATION RECOVERY (2003)
LX7472
LX7472'RECOVERY NOTE BY CONNECTICUT GEODETIC SURVEY 2003 (RB)
LX7472'THE STATION IS A STANDARD NGS DISK, STAMPED SHERWOOD 2 1983, SET
LX7472'INTO A ROCK OUTCROP, WHICH IS FLUSH WITH THE SURFACE OF THE GROUND.
LX7472'TO REACH THE STATION FROM THE INTERSECTION OF THE CONNECTICUT
LX7472'TURNPIKE AND THE SHERWOOD ISLAND CONNECTOR AT EXIT 18, GO SOUTH ON
LX7472'THE SHERWOOD ISLAND CONNECTOR FOR 0.6 KM (0.35 MI) TO THE TOLL BOOTH
LX7472'AT THE PARK ENTRANCE. CONTINUE AHEAD FOR 0.5 KM (O.3 MI) TO A
LX7472'PARKING LOT ENTRANCE ON THE RIGHT. TURN RIGHT INTO THE LOT, THEN BEAR
LX7472'LEFT TO A PIPE GATE, 0.1 KM (0.05 MI), AT SOUTH EDGE OF LOT THAT LEADS
LX7472'TO THE PAVILION. PASS THROUGH GATE, THEN TURN RIGHT ON PAVED LANE
LX7472'FOR 0.1 KM (0.05 MI) TO A T-LANE. TURN LEFT, SOUTH, FOR 0.25 KM
LX7472'(0.15 MI) ON THE PAVED ROAD, THEN TRACK LANE TO A FLAGPOLE AND THE
LX7472'STATION ON THE LEFT. THE STATION IS LOCATED 37.8 METERS (124.0 FT)
LX7472'NORTHWEST FROM A LARGE BOULDER CLOSE TO THE BEACH, 28.9 METERS (95.0
LX7472'FT) EAST-NORTHEAST FROM A BOULDER BY THE BEACH, 16.0 METERS (52.5 FT)
LX7472'SOUTH FROM A FLAG POLE, 8.8 METERS (29.0 FT) SOUTH-SOUTHEAST FROM A
LX7472'LARGE BOULDER BY THE FLAG POLE, 131.3 FT. SOUTHEAST OF A 30 IN. OAK
LX7472'TREE, 54.4 FT. NORTHEAST OF THE NORTHEAST CORNER OF A 9-11 MEMORIAL,
LX7472'AND 4 FT.NORTHEAST OF A WITNESS POST.   RM 1 A STANDARD NGS DISK,
LX7472'STAMPED SHERWOOD 2 NO 1 1983, SET INTO A ROCK OUTCROP. IT IS 119.0
LX7472'FT NORTH OF THE LARGE BOULDER BY THE BEACH, 85.0 FT WEST-SOUTHWEST OF
LX7472'A FLAG POLE, AND 78.0 FT WEST-NORTHWEST OF THE LARGE BOULDER BY THE
LX7472'FLAGPOLE.   RM 2 A STANDARD NGS DISK, STAMPED SHERWOOD 2 NO 2 1983,
LX7472'SET INTO A ROCK OUTCROP. IT IS 68.0 FT SOUTHEAST OF THE LARGE
LX7472'BOULDER BY THE FLAG POLE, 62.0 FT EAST-SOUTHEAST OF THE FLAG POLE,
LX7472'AND 45.5 FT SOUTH OF A 12 IN DIAMETER TREE. AZI MARK A STANDARD NGS
LX7472'AZIMUTH MARK DISK, STAMPED SHERWOOD 2 1983, SET INTO A 2 X 6 FT.
LX7472'CONCRETE PAD WHICH IS FLUSH WITH THE GROUND. IT IS 82.0 FT. SOUTH OF
LX7472'THE CENTERLINE OF A GRAVEL DRIVEWAY, 75.0 FT. NORTH OF THE CENTERLINE
LX7472'OF ANOTHER GRAVEL DRIVEWAY, AND 30.5 FT. WEST OF THE WEST EDGE OF A
LX7472'BUILDING AT THE NORTHWEST CORNER OF THE SHOWERS.
LX7472
LX7472   STATION RECOVERY (2004)
LX7472
LX7472'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2004 (DLL)

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LX7472'RECOVERED AS DESCRIBED, BY THE TOWN OF WESTPORT,SURVEYING DIVISION
LX7472
LX7472                          STATION RECOVERY (2013)
LX7472
LX7472'RECOVERY NOTE BY KUCERA INTERNATIONAL INC 2013 (BL)
LX7472'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:06
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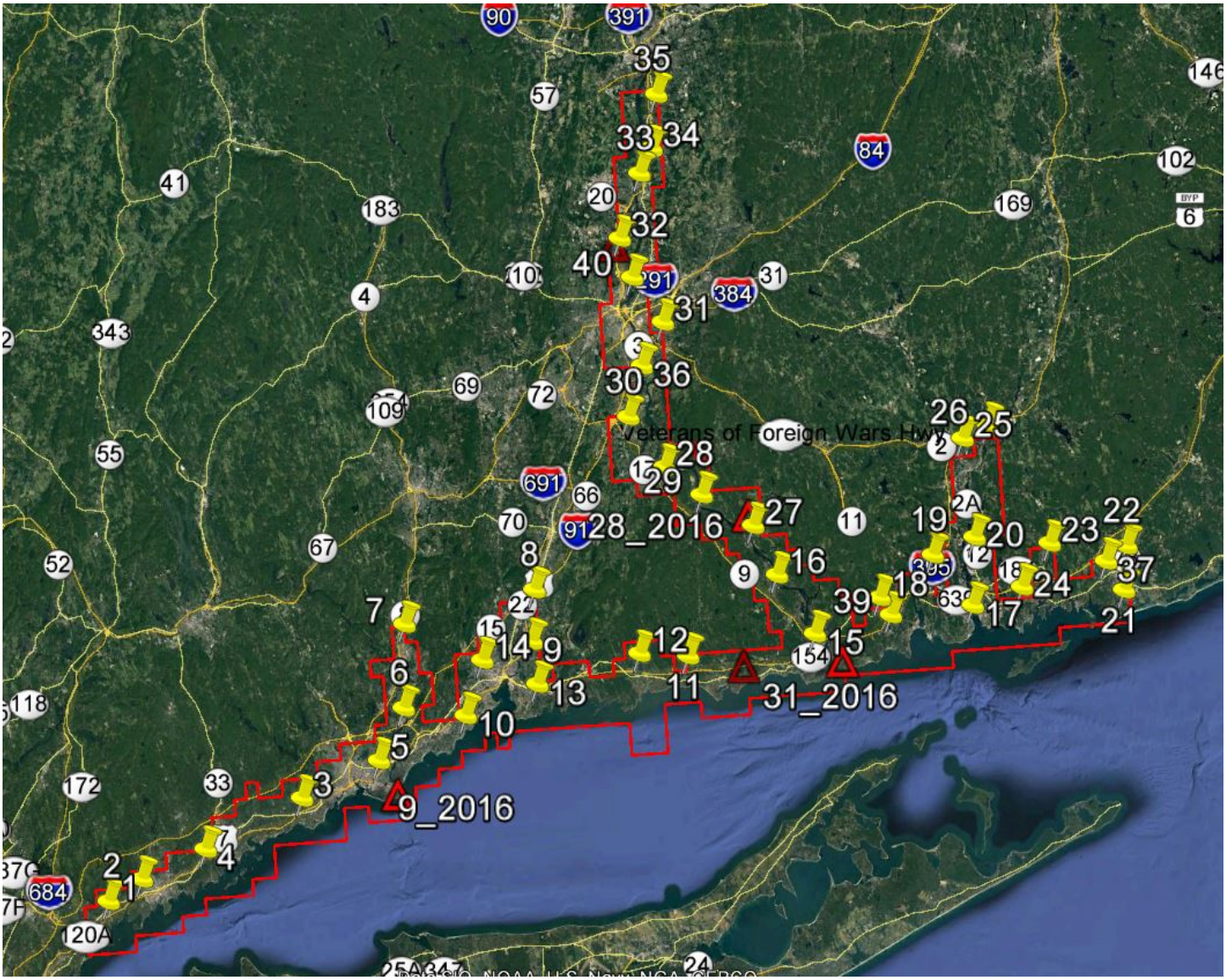
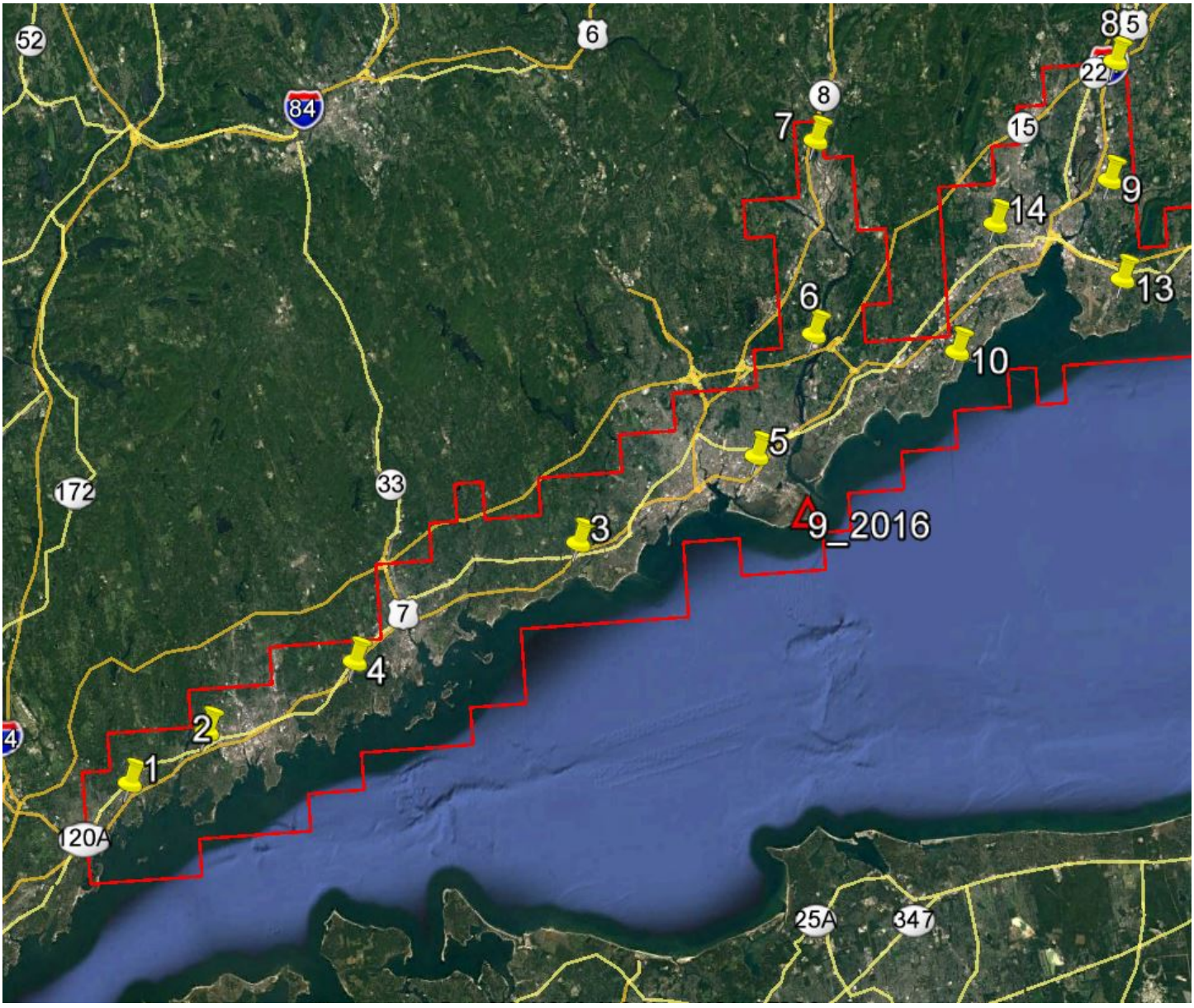
Section 5: GPS Control Diagram

This section contains a graphical representation of the new and existing control stations used for the project.



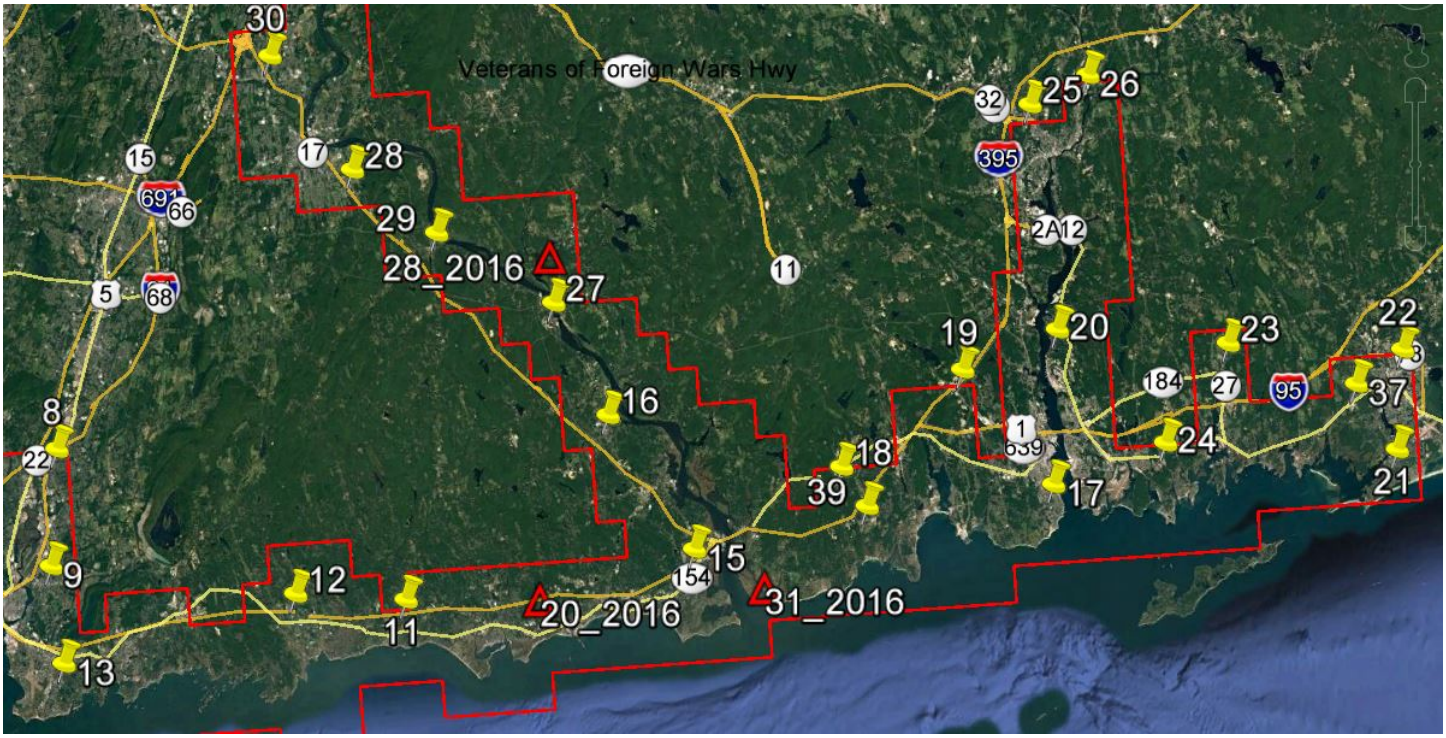
N

Not to Scale



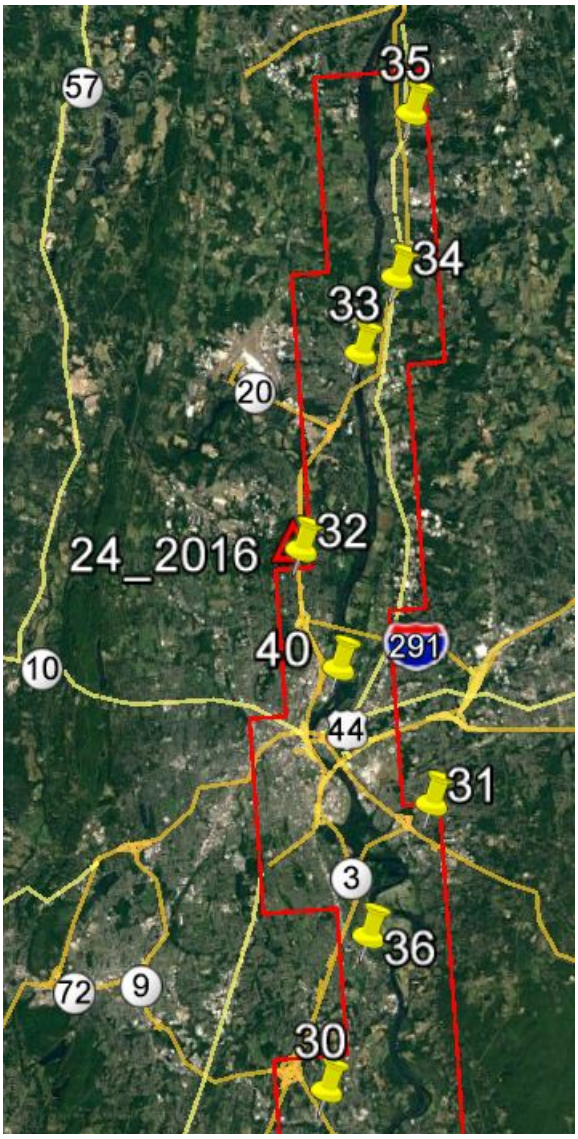
N

Not to Scale



N

Not to Scale



N

Not to Scale