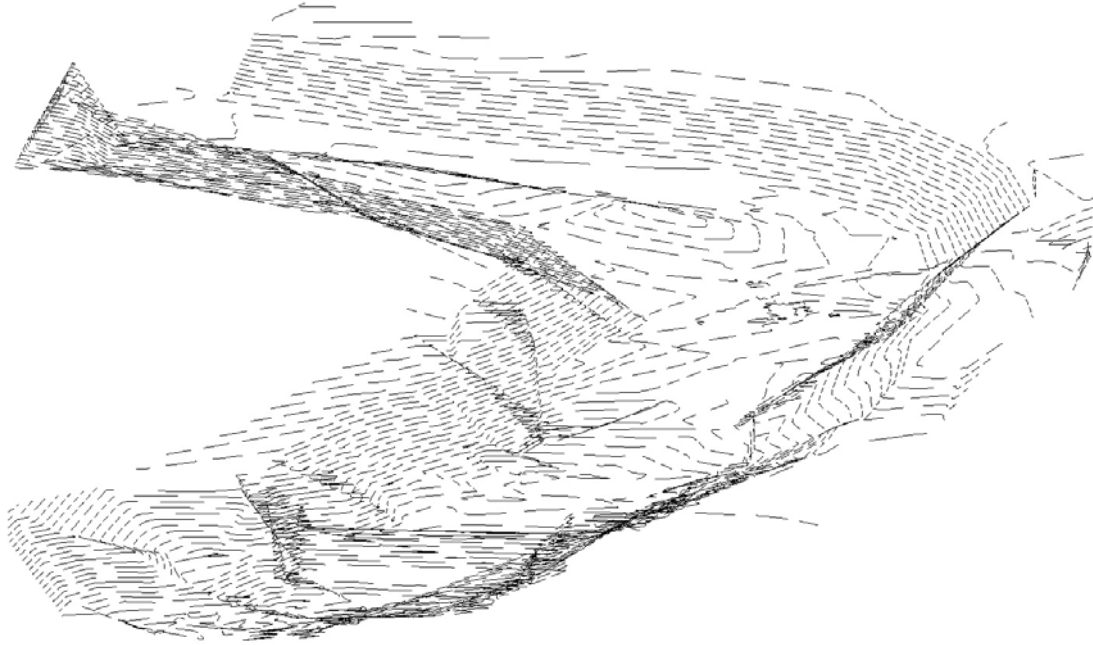


# Bushkill Creek Survey Report

## 3<sup>rd</sup> Street to the PA Route 22 Overpass



CE 421 Hydrology Class  
Prof. David Brandes  
Dept of Civil & Environmental Engineering  
Fall 2010  
Last Revised June 04, 2011

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\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

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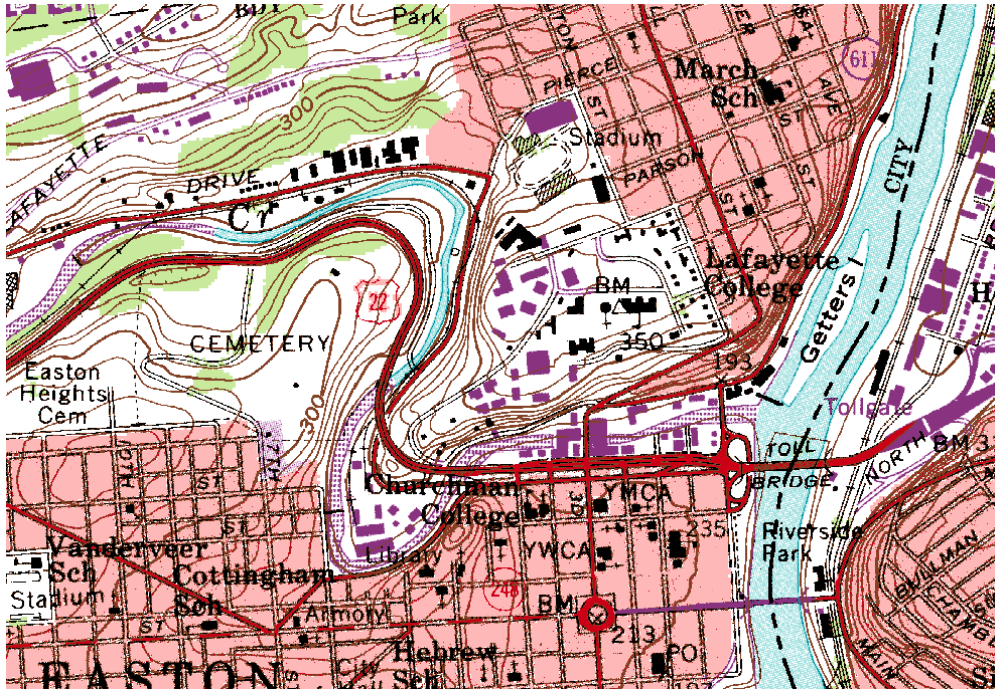
## **1. Background**

The purpose of this report is to provide the necessary base mapping for the continued analysis of the Bushkill Creek low-head dam on Lafayette College owned property near 3<sup>rd</sup> Street in the city of Easton. The feasibility of this structure to provide hydro-power to the existing buildings in the immediate area was previously evaluated in the spring of 2009 and a report of those findings is available through the Department of Civil and Environmental Engineering. It appears, based on the aforementioned report, that a project utilizing hydropower at this location is neither economically or technically feasible based on currently available technologies.

Therefore focus has shifted from utilizing and rehabilitating the existing dam to the removal of the structure. This could be accomplished through the cooperation of private industry with various local and state regulatory agencies including the Pennsylvania Fish and Boat Commission which provides funding for projects similar to this one in both size and scope. This base mapping is being prepared in conjunction with separate reports that will analyze the potential environmental impacts of the removal of this dam, the flood protection which the current dam may or may not provide, and the potential hydraulic impacts to the channel if the dam were removed.

## 2. Site Description

The Bushkill Creek dam is located approximately three hundred feet (300'), west of the bridge at north Third Street in the City of Easton. There are existing structures built over the channel by using concrete piers. The survey of the channel began at the face of the first row of piers and continued to the west. The western limit of the survey is the Pennsylvania Department of Transportation (PennDOT) bridge for Route 22 over the Bushkill Creek and Bushkill Drive / Pearl Street. The total length of surveyed channel is approximately nine hundred feet (900'). *Figure 1* below shows a topographic map of the general project area from a USGS 7.5 minute, 1:24000, Easton PA-NJ quadrangle.



***Figure 1:*** Topographic Map of Bushkill Creek

The survey located the edges of existing pavement for Bushkill Drive / Pearl Street. The northern edge of pavement is also the bottom of the embankment at the base of the college campus. This also represents the northern limit of the survey. The southern limit of the survey is the top of the stream embankment adjacent to a recently demolished industrial facility, an existing warehouse, and a recently refurbished parking area. An aerial photograph, from Google Maps, is shown in *Figure 2* below and better depicts the limits of the survey.



Figure 2: Aerial Photo of Bushkill Creek

### 3. Methods & Objectives

In order to provide adequate base mapping to support the analyses mentioned in the Background section of this report two types of surveys were conducted. First, a horizontal and vertical traverse was established which encompassed the project area. According to the *Land Surveyor Reference Manual*, “a traverse is a series of lines connecting successive instrument stations of a survey. The relative position of the stations is determined by the direction and length of the lines (Harbin 1989).” The traverse is sometimes referred to as the “control” for a survey. In this case, a particular type of traverse was employed, which is called a closed traverse or loop traverse. Again using the definition from the *Land Surveyor Reference Manual*, “The closed traverse, also called the loop traverse, starts and ends at the same point. Because it is a closed polygon, the interior angles and lengths of the sides may be checked for accuracy and

mathematically adjusted (Harbin 1989).” By using this type of survey the accuracy and precision of the survey can be measured and reported.

The second type of survey conducted at this location is a topographic survey. This is done to create a topographic map or contour map of the area. Referring to the *Land Surveyor Reference Manual*, “Topographic Surveys are made to determine the relative positions of points and objects so that a map maker can accurately represent their positions on the map (Harbin 1989).” Each contour line shown on a topographic map is an imaginary line at the ground surface representing an equal vertical elevation. The contour interval is the vertical distance separating two adjacent contour lines. The most common intervals used for detailed mapping are one and two foot spacing and the one used here is the one foot spacing. This means that each contour line shown on the finished topographic map represents one foot of vertical elevation change. The spacing of the contour lines between one another also gives an indication of how steep the ground slopes. For example the closer these lines are spaced the more steep the elevation change of the ground. The farther apart contour lines are spaced the flatter or more gradual the ground slope.

#### **4. Horizontal & Vertical Control Survey**

The control loop was started at a nail set along the southern edge of pavement of Bushkill Drive / Pearl Street. This point was also located just north of the existing dam. The first back-sight was established at the intersection of Bushkill Drive with North Third Street. A radial control point was established in a concrete structure on the north side of the existing dam and overlooking the area. The next control point was established travelling west and set near the northern edge of pavement of Bushkill Drive / Pearl Street and to the east of an existing two-story residential dwelling. A radial control point was established in a concrete structure along the north side of Bushkill Creek with a view of the island below the Route 22 overpass. The next control point, travelling south and west was established at the intersection of Bushkill Street with Pearl Street and sighting under the Route 22 overpass structure. This point was set in the Bushkill Street Bridge over the creek. The next control point was established travelling east along Bushkill Street on the northeast corner of the Route 22 off-ramp. The next control point was established travelling east along Bushkill Street at the northwest corner of the intersection with North Third Street. The next control point which was observed was also the first back-sight point located on the northwest corner of the intersection of North Third Street and Bushkill Drive. The last observations were made by occupying this control point and closing the traverse to the point of beginning at the first control point.

The Horizontal and Vertical Control data were recorded in a field book and the corresponding notes are included as *Attachment A* at the end of this report. At each

control station, observations were made direct and inverse to help reduce error. This data was entered into an Excel spreadsheet to determine the average observed angles in both the horizontal and vertical direction. The average horizontal angle was then used as the interior angle of the traverse loop, sometimes referred to as the angle turned. The reduction of this data is shown in the attached spreadsheet as *Attachment B*. A sketch of the raw or unadjusted traverse loop was prepared and is shown as *Attachment C*. The sum of the interior angles for any closed figure with ( $n$ ) number of sides is as follows:

$$\text{Sum of Interior Angles} = (n-2) \times 180^\circ$$

Using the above equation the total horizontal angular error can be determined. The total error for this traverse was calculated to be thirty-six seconds (36"). There are a total of six interior angles for this traverse and the error per control observation is six seconds (6"). The precision of the Topcon total station used for this survey was five seconds (5"). The angular precision for this control survey is within acceptable tolerances. The linear errors of closure were as follows:

	Hz.	Vt.
1-1'	0.037'	0.004'
2-2'	0.027'	0.008'

The total perimeter of the traverse is approximately 2782.664'. According to the *Land Surveyor Reference Manual*, "The ratio of the error, or precision, of a traverse is the ratio of the error of closure to the perimeter. It is expressed with the numerator as one (1) and the denominator in round numbers. It is a measure of the precision of a traverse (Harbin 1989)." In this case the error of closure or ratio of error is as follows:

1-1'	1 / 75,207'
2-2'	1 / 103,676'

This indicates an error of one foot per 75,207 feet in distance. Although these errors indicate a survey with acceptable precision for the sake of completeness the traverse was balanced using the compass rule, sometimes called the Bowditch rule. This method of adjustment is most commonly used and applies when the angular and linear accuracies are approximately the same (Harbin 1989). According to the *Land Surveyor Reference Manual*, "Using the compass rule, the difference in the sums of the north and south latitudes is distributed over the latitudes of the traverse. A correction is made in the latitude of each side to bring the north and south latitudes into balance. The difference in the sums of the east and west departures is distributed in the same way (Harbin 1989)."

The equation is shown as follows:

$$\text{correction for AB} = \frac{\text{dif in lat}}{\text{perimeter}} \times \text{length AB}$$

The traverse loop was adjusted based on the above equation in both the north-south (latitudes) and east-west (departures) directions. The Excel Spreadsheet showing these calculations and corresponding corrections is shown as *Attachment D* at the end of this report. These control points were then inserted into an AutoCAD drawing file, specifically Land Development Desktop 2009 edition.

Once inserted it should be noted that the original survey was conducted based on an arbitrary, assumed datum with starting point located at the first established control point with the following coordinate information:

Point #	Northing	Easting	Elevation	Description
1	5,000.00	5,000.00	100.00	PK Nail

This information was then compared with two National Geodetic Survey (NGS) control points KV1684 and KV1464. The NGS data sheets for these two control benchmarks are shown in *Attachment E* at the end of this report. The Northampton County GIS department aerial photograph was then imported into the drawing. This mapping is based on the Pennsylvania State Plane - South Zone Coordinate system. Once inserted the positions of the two control points were located based on the arbitrary survey and the desired coordinate system mentioned above. The survey was then translated and rotated to the aerial photograph as accurately as possible.

The vertical benchmark for this survey is the NGS disk located in the east pillar of the entrance gate near the intersection of Bushkill Drive and North Third Street. The datum used is the stamped elevation of 196.217 as established in 1932. It should be noted that according to NGS this survey mark is of questionable or unknown stability because repeated measurements indicate possible vertical movement. The amount of vertical movement described is acceptable for the analyses being conducted on the dam, particularly the hydrologic / hydraulic analyses for which accurate relative elevations, (i.e. elevation difference), are required rather than absolute elevations. Therefore the elevation as marked on the stamped brass disk is being used and held as the vertical control benchmark for the survey.

The method employed here does not guarantee the accuracy of the control points or survey to within survey grade precision of the State Plane Coordinate system; however the values of the observed survey positions and their relative location based on the aerial photograph were extremely close to one another. The control points listed in the



coordinate index and shown as *Attachment F* at the end of this report are within a reasonable tolerance for the analyses being conducted on the existing dam.

## 5. Topographic Survey

The topographic survey was conducted on July 16, 22, and 23, 2010. Additional data was collected on November 6, 2010. Cross sections of the channel were located at approximately fifty-foot (50') intervals. All defining features of the channel were located including edges of pavement along Bushkill Drive and Pearl Streets, top and bottom of embankment, several shots along the bottom of the stream bed, the island was located to the north and east of the Route 22 overpass, and the piers and parapet walls of the existing bridge were located. Measurements were taken to define the geometry of the dam, spillway, and concrete apron downstream of the structure. The piers of the existing buildings at North Third Street were also measured.

This information was collected using a TDS data collector / data logger. The raw data was imported into the control survey. The points were then used to create a topographic map with one foot contour intervals. The complete point file of all the data points is shown as *Appendix G* of this report. The complete topographic map showing the locations of the cross section generated for the data analysis of the existing dam structure is shown as *Appendix H* of this report. Vertical centerline profiles were generated from the base topographic mapping and are shown in the following *Appendices*:

*Appendix I:* Centerline Profile of Bushkill Creek through Center of Island

*Appendix J:* Centerline Profile of Bushkill Creek Main Channel around the North Side of the Island

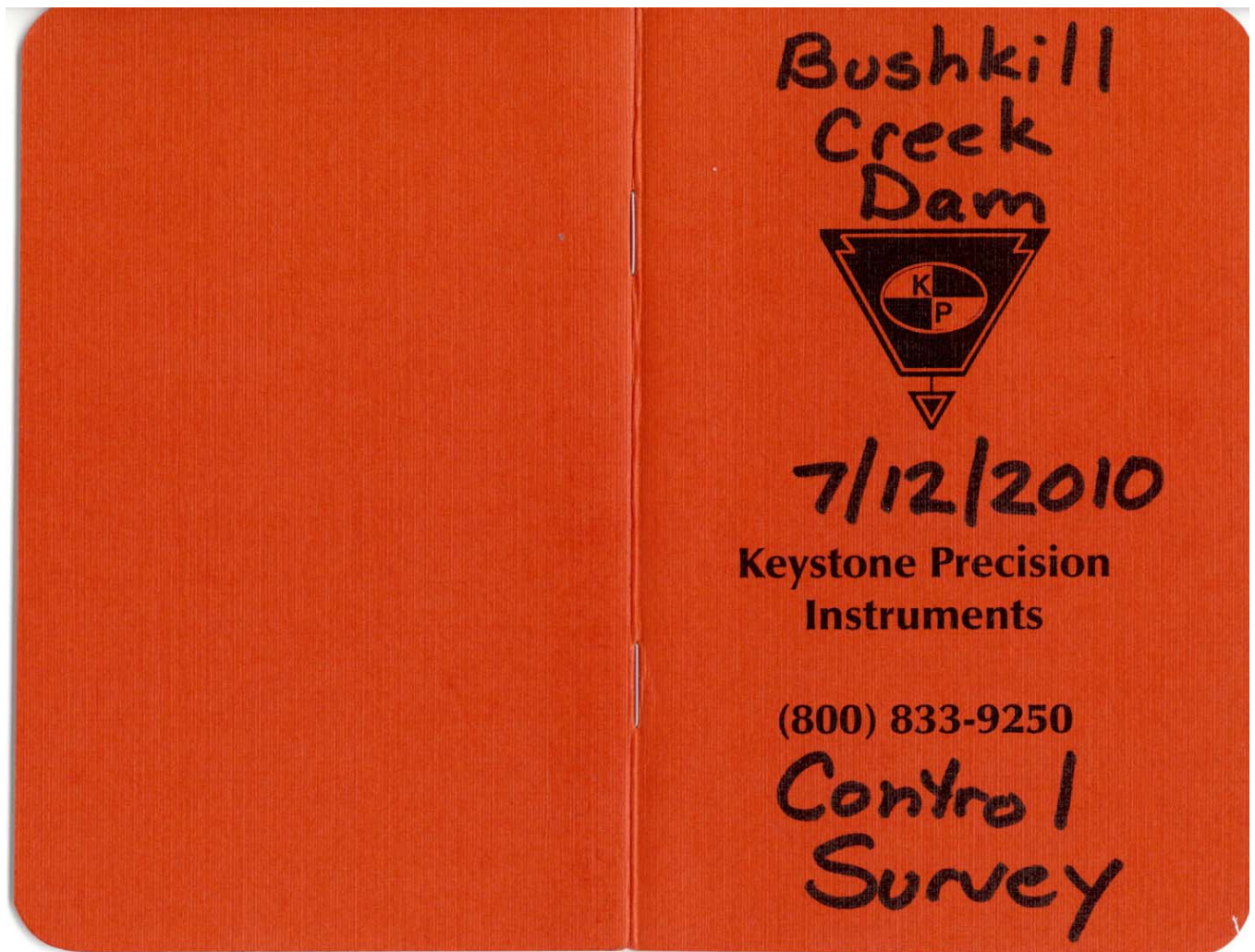
*Appendix K:* Centerline Profile of Bushkill Creek Secondary Channel around the South Side of the Island

Finally, the above mapping was combined into one sheet consisting of two plan views, one with an aerial photograph overlay and one without, and all three profile views. An exhibit size, not to scale, version of this drawing is shown in *Appendix L* at the end of this report. A full size, 24"x36" scaled copy of the same sheet is included in a separate folder at the back of this report.

## 6. References

Harbin, Andrew L. (1989). *“Land Surveyor Reference Manual.”* 2<sup>nd</sup> Edition. Professional Publications Inc., Belmont, CA.

7. Appendix A: Field Book Notes



**TRIGONOMETRIC FORMULÆ**

**Solution of Right Triangles**

For Angle A.  $\sin = \frac{a}{c}$ ,  $\cos = \frac{b}{c}$ ,  $\tan = \frac{a}{b}$ ,  $\cot = \frac{b}{a}$ ,  $\sec = \frac{c}{a}$ ,  $\csc = \frac{c}{b}$

Given	Required	Formulas
A, b	A, B, c	$\tan A = \frac{a}{b} = \cot B$ , $c = \sqrt{a^2 + b^2} = a \sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B$ , $b = \sqrt{(c+a)(c-a)} = c \sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90^\circ - A$ , $b = a \cot A$ , $c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90^\circ - A$ , $a = b \tan A$ , $c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90^\circ - A$ , $a = c \sin A$ , $b = c \cos A$

**Solution of Oblique Triangles**

Given	Required	Formulas
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$ , $C = 180^\circ - (A + B)$ , $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$ , $C = 180^\circ - (A + B)$ , $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$A + B = 180^\circ - C$ , $\tan \frac{1}{2}(A - B) = \frac{(a-b) \tan \frac{1}{2}(A+B)}{a+b}$ $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2}$ , $\sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$ $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}$ , $C = 180^\circ - (A + B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$ , $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
A, B, C, a	Area	$\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$

Bushkill Creek Control Survey

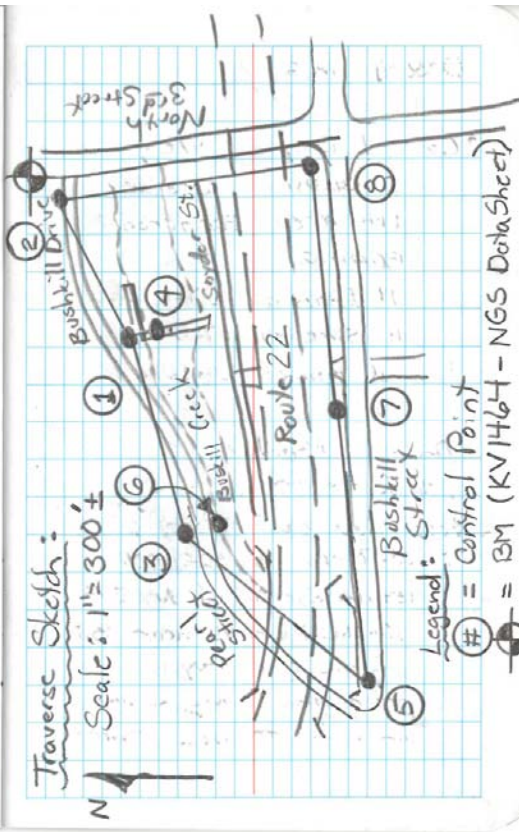
7/12/2010  
Dates: 7/13/2010

Party: W.T. Barlow  
A. Bernstein  
D. Brandes, Ph.D.  
D. Germanoski, Ph.D.  
T. Germanoski  
M. Conlan  
M. Thompson

~ 5:30 ~ 7:30 PM  
~ 85° Sunny / Warm / Humid ~ 7/12/2010  
~ 85° Humid / Overcast  
Rain at end of set-up ~ 7/13/2010

Description:

- Control Loop Survey for Bushkill Creek Dam area topographical mapping.
- Start Loop at Dam on North side of Creek.
- Looped counter-clockwise.
- Traveled west along Bushkill Drive & Pearl St under PA, Route 22 overpass.
- Proceeded east along Bushkill Street to N. 3rd Street.
- Proceeded north on N. 3rd Street to Bushkill Drive near B.M. at stone archway.
- Proceeded west along Bushkill Dr. & Pearl St. to close traverse loop at P.O.B.



π@ 1 B.S. 2  
H.I. = 5.156'

STA:	H <sub>z</sub>	V <sub>t</sub>
1	00-00-00	88-13-20
	199-50-30	89-40-55
	180-00-25	271-46-30
	19-50-45	270-18-55
	110-16-05	97-50-40
	290-16-05	262-09-15

π@ 3 B.S. 1  
H.I. = 5.135'

STA:	H <sub>z</sub>	V <sub>t</sub>
3	00-00-00	90-20-40
	134-00-35	89-36-05
	180-00-30	269-39-10
	314-00-55	270-23-40
	15-24-20	93-33-15
	195-24-30	266-26-45

Slope Dist.	Target	H.T.	Notes
323.585	2	5.00'	PK
429.510	3	5.00'	PK
323.605	2	5.00'	inverse
429.520	3	5.00'	inverse
44.215	4	5.00'	PK-Dam
44.205	4	5.00'	inverse

Slope	Target	H.T.	Notes
429.460	1	5.00'	PK
482.005	5	5.00'	PK
429.465	1	5.00'	inverse
482.000	5	5.00'	inverse
99.025	6	5.00'	PK-Dam
99.005	6	5.00'	inverse

π@ 5 B.S. 3  
H.I. = 5.391'

STA:	H <sub>z</sub>	V <sub>t</sub>
5	00-00-00	90-16-30
	48-42-15	88-25-50
	180-00-20	269-43-15
	228-42-40	271-34-00
	246-15-40	80-15-20
	66-16-35	279-44-05

π@ 7 B.S. 5  
H.I. = 5.063'

STA:	H <sub>z</sub>	V <sub>t</sub>
7	00-00-00	91-17-45
	180-13-55	90-16-35
	180-00-15	268-41-55
	00-14-15	269-43-05

Slope	Target	H.T.	Notes
481.985	3	6.50'	PK
541.470	7	7.00'	PK
481.955	3	6.50'	inverse
541.495	7	7.00'	inverse
168.970	KV	5.00'	BM-NGS
168.945	"	5.00'	Disk inverse

Slope	Target	H.T.	Notes
541.425	5	6.00'	pk
497.810	8	5.00'	pk
541.460	5	6.00'	inverse
497.840	8	5.00'	inverse

$\pi @ 8$  B.S. 7  
HI = 5.385'

STA:	H <sub>z</sub>	V <sub>t</sub>
8	00-00-00	89-46-00
	90-31-15	90-43-00
	180-00-40	270-13-30
	270-31-40	269-16-30

$\pi @ 2'$  B.S. 8  
HI = 5.245'

STA:	H <sub>z</sub>	V <sub>t</sub>
2'	00-00-00	89-19-15
	63-59-35	92-02-30
	180-00-10	270-40-35
	243-59-55	267-57-20
	00-00-00	89-19-05
	66-41-40	91-52-06
	180-00-15	270-40-35
	246-41-50	268-07-40
	31-20-10	92-54-05
	252-24-15	89-17-50

Slope	Target	H.T.	Notes
497.855	7	5.00'	pk
508.675	2'	5.00'	pk
497.835	7	5.00'	inverse
508.660	2'	5.00'	inverse

Slope	Target	H.T.	Notes
508.635	8	5.00	pk
288.260	10	5.00	pk 64
508.645	8	5.00	inverse
288.400	10	5.00	inverse
508.655	8	5.00	pk
323.635	1'	5.00	pk close
508.630	8	5.00	inverse
323.620	1'	5.00	inverse
11.110	11	5.00	rr spike
18.850	12	5.18'	KV1464

Note: last shot to BM - plus (+ 2/8 from  $\phi$  disk)  
~ + 0.177'

Rod Height Calibration:  
• when checked rod heights

Green Rod		Yellow Rod	
Read	Actual	Read	Actual
5.00'	4.9375'	5.00'	5.1146'

Lower -0.0625'      Higher +0.1146'

Day 1: B.S. = green rod  
F.S. = yellow rod

Day 2: B.S. = yellow rod  
F.S. = green rod

KV1464 - NGS - Data Sheet  
target to face of brass  
to measured distance

did not measure as reading

Green	Yellow
5.00 = 59 1/4"	5.00 = 61 3/8"

←

P.T. 6 = shot with green rod  
KV1684 = shot with yellow rod  
KV1464 = shot with green rod  
PT. 4 = shot with green rod

Cross-Section Survey  
Bushkill Creek

Dates: 7/16/2010  
7/22/2010  
7/23/2010

Party: A. Bernstein  
M. Thompson  
M. Conlon

Sunny/Warm ~ 85°-90°

Notes

- Cross Sections measured length of Bushkill to tip of island
- TDS Data Collector record position

- Rods checked & calibrated prior to survey

at 50' intervals along Creek from building piers / Logger used to information

Cross Section Survey  
Bushkill Creek

Dates: 11/06/2010

Party: W.T. Barlow  
D. Buckley  
J. Munson  
A. Bernstein

P. Sunny / P. Cloudy Cool ~ 50°

Notes:

- Cross Sections measured length of Bushkill Creek from tip of island to PA Route 22 over pass
- In-fill Section upstream of dam ~ possible erroneous point group ~ verify / checking
- TDS Data Logger / Data Collector used to record position

- Rods checked & calibrated prior to survey

at 50' intervals along Creek from tip of island to PA Route 22 over pass

Vertical Control

<u>X</u>	<u>HI(+)</u>	<u>ΔVb</u>	<u>TG</u>	<u>Elev. (PT)</u>	<u>HI (Elev.)</u>	<u>PT</u>	<u>Elev.</u>
1	5.156			100.000	105.156		
		+10.031	-4.9375			2	110.250
		+2.374	-5.1146			3	102.415
3	5.135			102.415	107.550		
		-2.592	-4.9375			1'	100.02
		+3.337	-5.1146			5	105.772
5	5.391			105.772	111.163		
		-2.332	-6.4375			3'	102.39
		+14.817	-7.1146			7	118.865
7	5.043			111.865	123.928		
		-12.271	-5.9375			5'	105.772
		-2.426	-5.1146			8	116.387
8	5.385			116.387	121.772		
		+1.991	-4.9375			7'	118.825
		-6.399	-5.1146			2'	110.258
2'	5.245			110.258	115.495		
		+6.029	-5.1146			8'	116.409
		-10.562	-4.9375			1"	99.995

<u>X</u>	<u>HI(+)</u>	<u>ΔVt</u>	<u>TG</u>	<u>Elev. (PT)</u>
1	5.156			100.000
		+10.031	-4.9375	
		-6.034	-4.9375	
3	5.135			102.415
		-2.592	-4.9375	
		-0.958	-4.9375	
5	5.391			105.772
		-2.332	-6.4375	
		+28.583	-5.1146	
2	5.245			110.250
		+6.017	-5.1146	
		-10.279	-4.9375	
		-0.562	-5.1146	
		+0.231	-5.1175	

<u>HI (Elev.)</u>	<u>PT</u>	<u>Elev.</u>
105.156		
	2'	110.250
	4'	99.1845
107.550		
	1'	100.02
	6'	101.454
111.163		
	3'	102.39
	KV1684	134.631
115.495		
	8'	116.397
	PK64	100.278
	SPK	109.818
	KV1464	115.726



<u>Elevations :</u>		
<u>PT#</u>	<u>Elev.</u>	
1	100.000	
2	110.250	
3	102.415	
4	94.1845	
5	105.772	
6	101.654	
7	118.865	
8	116.387	
1'	99.996	
2'	110.258	
KV1684	134.63	
PK64	100.278	
KV1464	115.726	
<u>Closure Errors :</u>		
	<u>H<sub>2</sub></u>	<u>Vt</u>
1-1'	0.037'	0.004'
2-2'	0.027'	0.008'



9. Appendix C: Raw Traverse Sketch

RAW Traverse Sketch

Angle Closure:  
 Sum of Interior Angles  $(n-2)180^\circ$   
 $(6-2)180^\circ = 720^\circ$

Survey:  
 199-50-50  
 134-00-30  
 48-42-18  
 180-14-12  
 90-31-08  
 66-41-38

$\Sigma = 720^\circ - 00' - 36''$

$\Delta \text{error} = 36''$

error per set-up =  $00-00-06''$   
 5" instrument

Linear Error Closure:

$0.02684 @ \textcircled{2} - \textcircled{2}'$

Total Perimeter of Traverse:

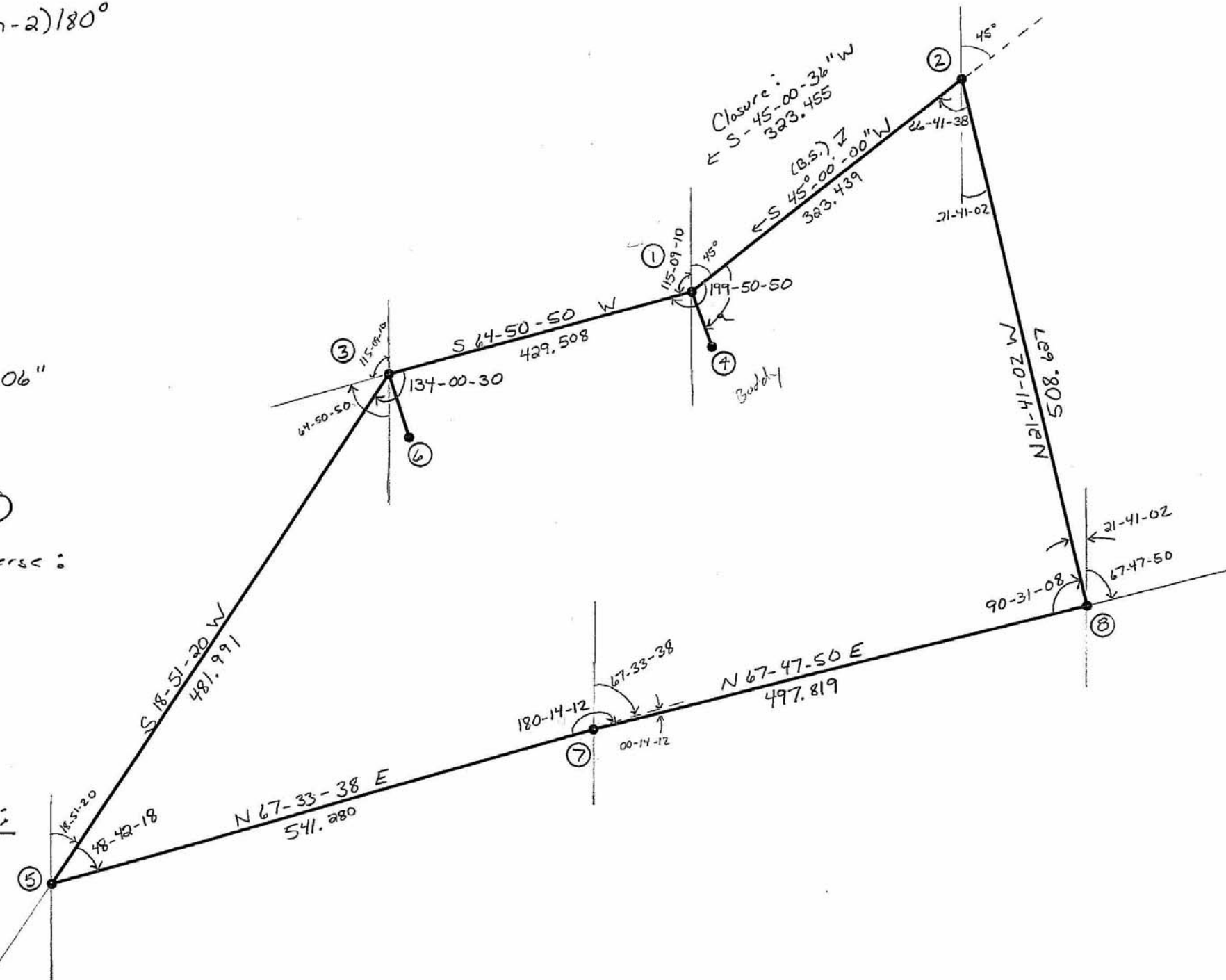
323.439  
 429.508  
 481.991  
 541.280  
 497.819  
 508.627

$\Sigma = 2782.664$

Ratio of Error /  $H_2$  Precision:

$\frac{0.02684}{2782.664} = \frac{1}{103,676.004}$

1ft per 103,676 ft  
 Roughly  
 1ft error per 19.6 miles



10. Appendix D: Compass Rule Adjustment

	Bearing	Distance	Lat	Dep	N	E					CORRECTIONS	Lat	Dep		N	E	Elev	DESC
2	S45°00'00"W	323.439	-228.706	-228.706	5228.706	5228.706					0.002661749	-0.00162727	-228.7033	-228.7076	5228.7033	5228.7076	110.2500	2
1	S64°50'50"W	429.508	-182.555	-388.781	5000	5000					0.003534646	-0.002160919	-182.5515	-388.7832	5000.0000	5000.0000	100.0000	1
3	S18°51'20"W	481.991	-456.1256	-155.7715	4817.445	4611.219					0.003966556	-0.002424969	-456.1216	-155.7739	4817.4485	4611.2168	102.4150	3
5	N67°33'38"E	541.28	206.6102	500.296	4361.319	4455.448					0.004454477	-0.002723261	206.6147	500.2933	4361.3269	4455.4429	105.7720	5
7	N67°47'50"E	497.819	188.1187	460.9068	4567.93	4955.744					0.004096813	-0.002504602	188.1228	460.9043	4567.9416	4955.7362	118.8650	7
8	N21°41'02"W	508.627	472.6348	-187.9303	4756.048	5416.65					0.004185758	-0.002558979	472.639	-187.9329	4756.0644	5416.6405	116.3870	8
							ERRORS											
							Lat	Dep	TOTAL									
2	S45°00'36"W	323.455	-228.677	-228.757	5228.683	5228.72	0.0229	-0.014	0.02684	0.002661881	-0.001627351	-228.6743	-228.7586	5228.7033	5228.7076	110.2500	2	
1					5000.006	4999.963	-0.0061	0.037	0.037499									
	PERIMETER	2782.664																
							ADJUSTMENT											
							Lat	Dep										
							0.0000082	-0.0000050										

## 11. Appendix E: NGS Data Sheets

### The NGS Data Sheet

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

```

DATABASE = , PROGRAM = datasheet, VERSION = 7.85
1 National Geodetic Survey, Retrieval Date = JUNE 30, 2010
KV1684 *****
KV1684 DESIGNATION - J 269 PADH
KV1684 PID - KV1684
KV1684 STATE/COUNTY- PA/NORTHAMPTON
KV1684 USGS QUAD - EASTON (1994)
KV1684
KV1684 *CURRENT SURVEY CONTROL
KV1684
KV1684* NAD 83(1986)- 40 41 39. (N) 075 12 49. (W) SCALED
KV1684* NAVD 88 - 64.745 (meters) 212.42 (feet) ADJUSTED
KV1684
KV1684 GEOID HEIGHT- -34.07 (meters) GEOID09
KV1684 DYNAMIC HT - 64.715 (meters) 212.32 (feet) COMP
KV1684 MODELED GRAV- 980,157.4 (mgal) NAVD 88
KV1684
KV1684 VERT ORDER - SECOND CLASS 0
KV1684
KV1684.The horizontal coordinates were scaled from a topographic map and have
KV1684.an estimated accuracy of +/- 6 seconds.
KV1684
KV1684.The orthometric height was determined by differential leveling and
KV1684.adjusted in June 1991.
KV1684
KV1684.The geoid height was determined by GEOID09.
KV1684
KV1684.The dynamic height is computed by dividing the NAVD 88
KV1684.geopotential number by the normal gravity value computed on the
KV1684.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
KV1684.degrees latitude (g = 980.6199 gals.).
KV1684
KV1684.The modeled gravity was interpolated from observed gravity values.
KV1684
KV1684; North East Units Estimated Accuracy
KV1684;SPC PA S - 154,180. 814,350. MT (+/- 180 meters Scaled)
KV1684
KV1684 SUPERSEDED SURVEY CONTROL
KV1684
KV1684 NGVD 29 (??/??/??) 64.958 (m) 213.12 (f) ADJUSTED 2 0
KV1684
KV1684.Superseded values are not recommended for survey control.
KV1684.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
KV1684.See file dsdata.txt to determine how the superseded data were derived.
KV1684
KV1684_U.S. NATIONAL GRID SPATIAL ADDRESS: 18TVL819048(NAD 83)
KV1684_MARKER: DD = SURVEY DISK
KV1684_SETTING: 36 = SET IN A MASSIVE STRUCTURE
KV1684_SP_SET: BRIDGE
KV1684_STAMPING: J 269 1960
KV1684_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
KV1684
KV1684 HISTORY - Date Condition Report By
    
```

LAFAYETTE COLLEGE; DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

KV1684 HISTORY - 1960 MONUMENTED PADH  
KV1684 HISTORY - 1961 GOOD CGS  
KV1684 HISTORY - 20021117 GOOD USPSQD

KV1684  
KV1684

STATION DESCRIPTION

KV1684'DESCRIBED BY COAST AND GEODETIC SURVEY 1961  
KV1684'0.5 MI NW FROM EASTON.  
KV1684'0.5 MILE NORTH WEST FROM WHERE U.S. HY. 22 GOES OVER 3RD. ST.  
KV1684'IN EASTON, LOCATED ON TOP OF THE SOUTH WEST WINGWALL OF A 200  
KV1684'FOOT CONCRETE BRIDGE OVER BUSHKILL CREEK AND BLACKTOP ROAD, 19.5  
KV1684'FEET SOUTH OF THE CENTERLINE OF EAST BOUND LANE, 33 FEET SOUTH  
KV1684'EAST OF THE CENTERLINE OF HY. 22, 66 FEET SOUTH WEST OF METAL  
KV1684'LIGHT POLE, ABOUT 1 FOOT ABOVE THE LEVEL OF THE HIGHWAY,  
KV1684'PENNSYLVANIA DEPARTMENT OF HIGHWAYS DISK DRILLED IN HORIZONTAL.  
KV1684'STAMPED J 269 1960.

KV1684  
KV1684  
KV1684

STATION RECOVERY (2002)

KV1684'RECOVERY NOTE BY US POWER SQUADRON 2002 (ML)  
KV1684'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.  
Elapsed Time = 00:00:00

**The NGS Data Sheet**

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

DATABASE = , PROGRAM = datasheet, VERSION = 7.85  
 1 National Geodetic Survey, Retrieval Date = JUNE 30, 2010  
 KV1464 \*\*\*\*\*  
 KV1464 DESIGNATION - GATE  
 KV1464 PID - KV1464  
 KV1464 STATE/COUNTY- PA/NORTHAMPTON  
 KV1464 USGS QUAD - EASTON (1994)  
 KV1464  
 KV1464 \*CURRENT SURVEY CONTROL  
 KV1464  

KV1464*	NAD 83(1986)-	40 41 44.	(N)	075 12 35.	(W)	SCALED
KV1464*	NAVD 88	- 59.580	(meters)	{195.47}	(feet)	ADJUSTED

KV1464	GEOID HEIGHT-	-34.06	(meters)			GEOID09
KV1464	DYNAMIC HT -	59.552	(meters)	195.38	(feet)	COMP
KV1464	MODELED GRAV-	980,159.1	(mgal)			NAVD 88

  
 KV1464 VERT ORDER - FIRST CLASS II  
 KV1464  
 KV1464.The horizontal coordinates were scaled from a topographic map and have  
 KV1464.an estimated accuracy of +/- 6 seconds.  
 KV1464  
 KV1464.The orthometric height was determined by differential leveling and  
 KV1464.adjusted in June 1991.  
 KV1464.WARNING-Repeat measurements at this control monument indicate possible  
 KV1464.vertical movement.  
 KV1464  
 KV1464.Photographs are available for this station.  
 KV1464  
 KV1464.The geoid height was determined by GEOID09.  
 KV1464  
 KV1464.The dynamic height is computed by dividing the NAVD 88  
 KV1464.geopotential number by the normal gravity value computed on the  
 KV1464.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45  
 KV1464.degrees latitude (g = 980.6199 gals.).  
 KV1464  
 KV1464.The modeled gravity was interpolated from observed gravity values.  
 KV1464  

KV1464;		North	East	Units	Estimated Accuracy
KV1464;SPC PA S	-	154,340.	814,670.	MT	{+/- 180 meters Scaled}

  
 KV1464  
 KV1464 SUPERSEDED SURVEY CONTROL  
 KV1464  

KV1464	NGVD 29 (??/??/??)	59.794	(m)	196.17	(f)	ADJUSTED	1 2
--------	--------------------	--------	-----	--------	-----	----------	-----

  
 KV1464  
 KV1464.Superseded values are not recommended for survey control.  
 KV1464.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.  
 KV1464.See file dsdata.txt to determine how the superseded data were derived.  
 KV1464  
 KV1464\_U.S. NATIONAL GRID SPATIAL ADDRESS: 18TVL822049(NAD 83)  
 KV1464\_MARKER: DB = BENCH MARK DISK  
 KV1464\_SETTING: 30 = SET IN A LIGHT STRUCTURE  
 KV1464\_SP\_SET: PILLAR

LAFAYETTE COLLEGE; DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

KV1464 STAMPING: 196.217 GATE 1932  
 KV1464 STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY  
 KV1464 SATELLITE: THE SITE LOCATION WAS REPORTED AS NOT SUITABLE FOR  
 KV1464+SATELLITE: SATELLITE OBSERVATIONS - October 04, 2009

KV1464	HISTORY	- Date	Condition.	Report By
KV1464	HISTORY	- 1932	MONUMENTED	CGS
KV1464	HISTORY	- 1961	GOOD	CGS
KV1464	HISTORY	- 1978	GOOD	NGS
KV1464	HISTORY	- 1984	GOOD	USPSQD
KV1464	HISTORY	- 20020105	GOOD	USPSQD
KV1464	HISTORY	- 20091004	GOOD	GEOCAC

KV1464  
 KV1464 STATION DESCRIPTION

KV1464 DESCRIBED BY COAST AND GEODETIC SURVEY 1932  
 KV1464 AT EASTON.  
 KV1464 AT EASTON, NORTHAMPTON COUNTY, AT THE NORTH END OF NORTH THIRD  
 KV1464 STREET AT ITS JUNCTION WITH COLLEGE AVENUE, AT THE MEMORIAL  
 KV1464 ENTRANCE GATE TO LAFAYETTE COLLEGE, AND IN THE WEST FACE OF THE  
 KV1464 EAST STONE PILLAR. A STANDARD DISK, STAMPED 196.217 GATE 1932  
 KV1464 AND SET VERTICALLY.

KV1464  
 KV1464 STATION RECOVERY (1961)

KV1464  
 KV1464 RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1961  
 KV1464 RECOVERED IN GOOD CONDITION.

KV1464  
 KV1464 STATION RECOVERY (1978)

KV1464  
 KV1464 RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1978  
 KV1464 RECOVERED IN GOOD CONDITION.

KV1464  
 KV1464 STATION RECOVERY (1984)

KV1464  
 KV1464 RECOVERY NOTE BY US POWER SQUADRON 1984  
 KV1464 RECOVERED IN GOOD CONDITION.

KV1464  
 KV1464 STATION RECOVERY (2002)

KV1464  
 KV1464 RECOVERY NOTE BY US POWER SQUADRON 2002 (RCN)  
 KV1464 RECOVERED IN GOOD CONDITION.

KV1464  
 KV1464 STATION RECOVERY (2009)

KV1464  
 KV1464 RECOVERY NOTE BY GEOCACHING 2009 (PR)  
 KV1464 DISK HAS ADDITIONAL STAMPING 196.174

\*\*\* retrieval complete.  
 Elapsed Time = 00:00:00



## 12. Appendix F: Control Survey Points

The screenshot shows the 'List Points' application window. At the top, there is a 'Printing' section with a 'Point List' input field containing '1-12'. Below this are three radio button options: 'Enable Filtering' (unchecked), 'List All Points' (unchecked), and 'Point List Entry' (selected). A 'Case-sensitive Matching' checkbox is checked. To the right are 'Build List' and 'Create Group' buttons. The main area is a table with columns: 'Raw Desc Matching', 'Point Groups', 'Include', 'Exclude', 'Summary', and 'List'. The table data is as follows:

Number	Northing	Easting	Elevation	Raw Desc	Full Desc
1	506266.6114	2672542.8192	180.49	PK-1	PK-1
2	506418.5992	2672828.3224	190.74	PK-2	PK-2
3	506205.4893	2672117.6822	182.91	PK-3	PK-3
4	506223.2169	2672548.7359	174.68	PK-4	PK-4
5	505814.6982	2671835.5567	186.26	PK-5	PK-5
6	506193.0665	2672215.7232	176.96	PK-6	PK-6
7	505866.2876	2672374.3717	199.36	PK-7	PK-7
8	505911.6873	2672870.1154	196.88	PK-8	PK-8
9	505849.5834	2671672.7298	215.12	KV1684	KV1684
10	506271.4068	2672580.6067	180.77	PK-64	PK-64
11	506408.6796	2672823.3501	190.31	RRSPK	RRSPK
12	506425.8211	2672845.9235	196.22	KV1464	KV1464

At the bottom of the window are 'Reset', 'OK', 'Cancel', and 'Help' buttons.

## 13. Appendix G: Complete List of Topographic Points

Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
◆	1	506266.6114	2672542.8192	180.49	PK-1	PK-1	
◆	2	506418.5992	2672828.3224	190.74	PK-2	PK-2	
◆	3	506205.4893	2672117.6822	182.91	PK-3	PK-3	
◆	4	506223.2169	2672548.7359	174.68	PK-4	PK-4	
◆	5	505814.6982	2671835.5567	186.26	PK-5	PK-5	
◆	6	506193.0665	2672215.7232	176.96	PK-6	PK-6	
◆	7	505866.2876	2672374.3717	199.36	PK-7	PK-7	
◆	8	505911.6873	2672870.1154	196.88	PK-8	PK-8	
◆	9	505849.5834	2671672.7298	215.12	KV1684	KV1684	
◆	10	506271.4068	2672580.6067	180.77	PK-64	PK-64	
◆	11	506408.6796	2672823.3501	190.31	RRSPK	RRSPK	
◆	12	506425.8211	2672845.9235	196.22	KV1464	KV1464	
◆	14	506134.8690	2672668.5135	181.43	CS1 tb	CS1 tb	
◆	15	506139.2528	2672669.4446	176.32	CS1	CS1	
◆	16	506145.1111	2672667.7727	169.14	CS1 fp	CS1 fp	
◆	17	506151.6943	2672668.3666	165.90	CS1 fp	CS1 fp	
◆	18	506160.3550	2672668.7246	165.27	CS1 fp	CS1 fp	
◆	19	506166.8434	2672669.7441	164.10	CS1 ew	CS1 ew	
◆	20	505998.2157	2671966.0837	174.76	hub	hub	
◆	21	505998.2157	2671966.0837	174.75	TR	TR	
◆	22	506170.1950	2672670.0583	163.25	CS1	CS1	
◆	23	506174.8054	2672671.0269	164.16	CS1	CS1	
◆	24	506181.4264	2672671.4170	162.89	CS1	CS1	
◆	25	506184.8457	2672670.8467	162.29	CS1	CS1	
◆	26	506188.9168	2672670.5018	162.19	CS1	CS1	
◆	27	506192.2332	2672670.3763	161.95	CS1	CS1	
◆	28	506196.6951	2672668.5192	161.92	CS1	CS1	
◆	29	506199.6728	2672668.5261	161.84	CS1	CS1	
◆	30	506202.9520	2672668.8679	162.59	CS1 eb	CS1 eb	
◆	31	506206.4044	2672668.9549	163.14	CS1	CS1	
◆	32	506210.0306	2672668.1757	166.22	CS1	CS1	
◆	33	506217.8114	2672688.6487	167.85	CS2	CS2	
◆	34	506214.2840	2672688.2380	167.86	CS2	CS2	
◆	35	506214.0134	2672688.2218	168.59	CS2	CS2	
◆	36	506212.5442	2672688.2798	168.54	CS2 tw	CS2 tw	
◆	37	506212.1007	2672687.6552	164.24	CS2 bw	CS2 bw	
◆	38	506206.4310	2672687.3628	164.41	CS2 bw	CS2 bw	
◆	39	506206.1396	2672687.7361	168.44	CS2 tw	CS2 tw	
◆	40	506203.1627	2672688.2142	161.55	CS2 bw	CS2 bw	
◆	41	506201.7766	2672688.3509	163.56	CS2	CS2	
◆	42	506199.7017	2672687.2760	161.60	CS2	CS2	
◆	43	506196.3716	2672686.8970	162.61	CS2	CS2	
◆	44	506194.3670	2672687.0674	163.03	CS2	CS2	
◆	45	506193.1383	2672686.9145	161.63	CS2	CS2	
◆	46	506190.3648	2672685.4288	161.93	CS2	CS2	
◆	47	506187.0680	2672685.5139	162.29	CS2	CS2	
◆	48	506184.0077	2672686.1532	162.42	CS2	CS2	
◆	49	506180.9812	2672685.8717	162.39	CS2	CS2	
◆	50	506179.0355	2672686.7702	163.08	CS2 islad	CS2 islad	
◆	51	506178.1754	2672686.5859	164.70	CS2 islad	CS2 islad	
◆	52	506171.1089	2672687.9303	165.02	CS2 islad	CS2 islad	
◆	53	506166.7555	2672689.4641	161.70	CS2 sb	CS2 sb	
◆	54	506159.5283	2672687.8708	162.95	CS2 eb	CS2 eb	
◆	55	506158.3247	2672687.2748	164.27	CS2 tb	CS2 tb	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List
Number		Northing	Easting	Elevation	Raw Desc	Full Desc
56		506155.1873	2672686.8637	164.29	CS2 tb	CS2 tb
57		506144.4757	2672686.3883	168.04	CS2	CS2
58		506126.8847	2672676.5668	187.88	CS2 ts	CS2 ts
59		506268.4940	2672460.1489	180.31	CS3 top rd	CS3 top rd
60		506254.2156	2672462.7358	180.08	CS3 top bank	CS3 top bank
61		506250.3387	2672463.5355	179.46	CS3 top slope	CS3 top slope
62		506243.1260	2672465.2258	176.04	CS3 tree	CS3 tree
63		506235.2735	2672465.9166	174.28	CS3 mid slope	CS3 mid slope
64		506226.2048	2672467.9246	172.31	CS3 bottom s	CS3 bottom slope
65		506220.7657	2672467.9553	170.40	CS3 w edge	CS3 w edge
66		506266.6369	2672542.8157	180.52	bs	bs
90		506223.2169	2672548.7360	174.68	Start	Start
91		506223.2169	2672548.7360	174.68	Start	Start
92		506193.0665	2672215.7232	176.97	Start	Start
95		506193.1381	2672215.5530	177.03	bschk	bschk
96		506193.0665	2672215.7232	177.04	bschk	bschk
97		506266.6380	2672542.7973	180.50	bschk	bschk
98		506266.6387	2672542.7972	180.50	bschk	bschk
102		506250.0439	2672578.8189	181.09	ER	ER
103		506234.4432	2672581.0203	172.47	EC	EC
104		506223.8029	2672581.3837	172.26	EC	EC
105		506289.1728	2672576.6809	180.69	ER	ER
106		506220.8847	2672582.1865	168.92	EC	EC
107		506219.7754	2672580.3755	161.85	EB	EB
108		506216.0978	2672581.3848	161.05	CHAN	CHAN
109		506210.5901	2672582.2486	161.05	CHAN	CHAN
110		506209.7819	2672582.5048	160.78	CHAN	CHAN
111		506204.7158	2672582.7820	160.66	CHAN	CHAN
112		506204.0344	2672582.7436	161.00	CHAN	CHAN
113		506198.0971	2672583.5378	161.01	CHAN	CHAN
114		506192.0688	2672583.0498	160.97	CHAN	CHAN
115		506163.1926	2672584.3353	160.76	EB	EB
116		506162.7404	2672584.3839	161.70	EB	EB
117		506160.2528	2672584.2474	162.00	EB	EB
118		506160.3834	2672578.9465	160.76	SP	SP
119		506159.4340	2672557.9105	160.98	SP	SP
120		506213.3262	2672554.6908	161.37	Slope 6' fr wz	Slope 6' fr wall
121		506212.5257	2672584.0062	159.66	SP	SP
122		506207.1109	2672584.5814	159.12	EP	EP
123		506196.8881	2672584.8867	158.63	EP	EP
124		506188.7892	2672585.1359	158.84	EP	EP
125		506187.8089	2672585.3263	158.45	EP	EP
126		506183.5993	2672585.2540	158.56	EP	EP
127		506180.4456	2672585.7320	158.18	EP	EP
128		506176.6536	2672585.7970	158.82	EP	EP
129		506173.5925	2672586.0297	159.99	EP	EP
130		506170.0729	2672585.9582	160.45	EP	EP
131		506165.1515	2672586.2671	160.47	EP	EP
132		506159.6391	2672583.8397	173.65	PIPE INV	PIPE INV
133		506157.8292	2672584.0672	181.89	CNC	CNC
134		506156.1968	2672583.9377	181.94	CNC	CNC
135		506156.1985	2672584.0114	181.94	CNC	CNC
136		506156.0435	2672584.1450	179.42	CNC	CNC
137		506150.2331	2672574.4762	179.80	UP	UP

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
138		506117.4794	2672576.5124	180.53	CB	CB	
139		506115.8063	2672544.6029	181.02	CB	CB	
140		506137.9065	2672543.3488	180.75	CB	CB	
141		506136.6544	2672515.2557	180.78	CB	CB	
142		506157.1625	2672574.3539	181.69	cw	cw	
143		506155.4125	2672574.5760	179.72	cw	cw	
144		506186.6306	2672680.4562	163.80	cbp	cbp	
145		506187.4585	2672698.5664	164.67	cbp	cbp	
146		506188.2437	2672715.2037	163.44	cbp	cbp	
147		506188.8666	2672731.8529	163.48	cbp	cbp	
148		506189.5691	2672744.5092	163.64	cbp	cbp	
149		506186.7323	2672837.6202	159.62	3 brg	3 brg	
150		506178.9292	2672838.3168	159.52	3 brg	3 brg	
151		506291.2145	2672593.0293	180.75	cross 1	cross 1	
152		506251.3843	2672595.2933	181.02	cross 1	cross 1	
153		506251.3291	2672595.3269	181.02	cross 1	cross 1	
154		506234.5297	2672594.5327	171.78	cross 1	cross 1	
155		506225.4980	2672594.2806	171.50	cross 1	cross 1	
156		506224.9724	2672594.6530	164.47	cross 1	cross 1	
157		506217.5445	2672594.7442	164.07	cross 1	cross 1	
158		506217.0353	2672594.6946	158.69	cross 1	cross 1	
159		506217.0353	2672594.6946	158.69	cross 1	cross 1	
160		506213.9634	2672594.8380	157.96	cross 1	cross 1	
161		506207.3310	2672595.8170	156.20	cross 1	cross 1	
162		506199.9157	2672598.5145	156.02	cross 1	cross 1	
163		506192.1722	2672597.9903	157.68	cross 1	cross 1	
164		506186.9182	2672598.2069	158.52	cross 1	cross 1	
165		506181.9258	2672598.5805	159.16	cross 1	cross 1	
166		506176.1533	2672599.6674	161.93	cross 1	cross 1	
167		506171.2219	2672599.7185	162.47	cross 1	cross 1	
168		506171.0722	2672599.5957	164.96	cross 1	cross 1	
169		506165.9952	2672600.2094	167.85	cross 1	cross 1	
170		506159.6943	2672601.2201	169.51	cross 1	cross 1	
171		506152.3919	2672602.6479	168.67	cross 1	cross 1	
172		506145.6319	2672617.4727	170.81	cross 2	cross 2	
173		506173.2490	2672617.1768	157.57	cross 2	cross 2	
174		506174.2120	2672617.3835	158.33	cross 2	cross 2	
175		506179.9715	2672616.6046	157.22	cross 2	cross 2	
176		506185.8515	2672617.8674	156.34	cross 2	cross 2	
177		506190.3569	2672617.1557	159.44	cross 2	cross 2	
178		506195.6257	2672618.8922	158.32	cross 2	cross 2	
179		506200.9095	2672619.9035	158.28	cross 2	cross 2	
180		506207.4416	2672619.2896	158.93	cross 2	cross 2	
181		506214.0985	2672617.9764	160.37	cross 2	cross 2	
182		506217.5170	2672617.9500	160.87	cross 2	cross 2	
183		506217.6014	2672617.9720	163.25	cross 2	cross 2	
184		506221.5746	2672617.1173	163.49	cross 2	cross 2	
185		506221.6774	2672617.2626	166.08	cross 2	cross 2	
186		506230.7369	2672617.9057	165.82	cross 2	cross 2	
187		506231.0307	2672618.0127	170.67	cross 2	cross 2	
188		506236.4720	2672616.8445	170.49	cross 2	cross 2	
189		506253.9765	2672616.5129	181.81	cross 2	cross 2	
190		506297.2188	2672611.3543	181.00	cross 2	cross 2	
191		506150.8318	2672657.9565	176.06	cross 3	cross 3	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
192		506164.4684	2672655.1611	167.34	cross 3	cross 3	
193		506176.0624	2672652.9790	166.13	cross 3	cross 3	
194		506176.7591	2672652.3403	162.71	cross 3	cross 3	
195		506185.2609	2672651.7617	161.66	cross 3	cross 3	
196		506194.3915	2672651.1657	161.80	cross 3	cross 3	
197		506202.2043	2672651.4604	162.04	cross 3	cross 3	
198		506208.2140	2672651.4098	162.91	cross 3	cross 3	
199		506213.6642	2672650.5142	163.62	cross 3	cross 3	
200		506221.4688	2672650.3530	164.25	cross 3	cross 3	
201		506229.5099	2672652.1853	170.52	cross 3	cross 3	
202		506252.8802	2672648.1569	182.33	cross 3	cross 3	
302		506279.7035	2672531.0961	180.79	CS 1 rd	CS 1 rd	
303		506265.1634	2672534.9652	180.52	CS 1 rd	CS 1 rd	
304		506248.5785	2672539.7060	180.52	CS 1	CS 1	
305		506236.4105	2672541.4089	174.86	CS 1	CS 1	
306		506219.0635	2672545.0629	174.79	CS 1	CS 1	
307		506218.4761	2672545.1878	169.74	CS 1 dam	CS 1 dam	
308		506276.9545	2672522.1776	180.72	CS 2	CS 2	
309		506262.7586	2672527.1588	180.50	CS 2	CS 2	
310		506251.1487	2672528.4860	180.10	CS 2	CS 2	
311		506228.4434	2672536.1615	170.40	CS 2	CS 2	
312		506159.7100	2672557.9878	169.80	CS 1 dam	CS 1 dam	
313		506221.8761	2672535.1386	168.69	CS 2	CS 2	
314		506216.3956	2672536.9408	167.15	CS 2	CS 2	
315		506164.9342	2672549.1680	167.07	CS 2	CS 2	
316		506158.3214	2672550.3721	169.57	CS 2	CS 2	
317		506159.3424	2672558.1663	174.68	CS 1 cnc	CS 1 cnc	
318		506155.9081	2672550.0672	174.44	CS 2 cnc	CS 2 cnc	
319		506216.6874	2672533.9732	166.35	CS 3	CS 3	
320		506210.6274	2672536.1189	166.05	CS 3	CS 3	
321		506203.7130	2672537.4109	166.34	CS 3	CS 3	
322		506195.8435	2672539.9509	166.37	CS 3	CS 3	
323		506190.2218	2672541.0070	166.54	CS 3	CS 3	
324		506183.1059	2672543.1253	166.50	CS 3	CS 3	
325		506177.8016	2672543.6595	166.60	CS 3	CS 3	
326		506170.6476	2672545.1289	166.46	CS 3	CS 3	
327		506165.6515	2672546.1189	166.60	CS 3	CS 3	
328		506163.4913	2672547.2196	168.21	CS 3	CS 3	
329		506158.1533	2672549.4328	169.82	CS 3 eb	CS 3 eb	
330		506155.5669	2672549.0407	174.60	CS 3 cnc	CS 3 cnc	
331		506267.9774	2672492.6075	180.45	CS 4	CS 4	
332		506253.3247	2672496.1860	180.43	CS 4	CS 4	
333		506243.2842	2672498.5966	178.95	CS 4	CS 4	
334		506237.2177	2672499.7805	174.99	CS 4	CS 4	
335		506219.4502	2672506.9518	167.28	CS 4	CS 4	
336		506212.4560	2672509.6534	165.12	CS 4	CS 4	
337		506203.7146	2672510.3221	166.31	CS 4	CS 4	
338		506196.7255	2672510.7964	166.52	CS 4	CS 4	
339		506187.7782	2672510.3796	166.33	CS 4	CS 4	
340		506180.3330	2672510.3144	166.18	CS 4	CS 4	
341		506172.8598	2672511.3011	165.78	CS 4	CS 4	
342		506167.2672	2672511.1409	165.60	CS 4	CS 4	
343		506158.4522	2672511.8901	170.71	CS 4	CS 4	
344		506154.1996	2672515.0322	177.65	CS 4	CS 4	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
◆	345	506254.8329	2672498.7089	179.99	tele	tele	
◆	346	506270.4162	2672461.5144	180.25	CS 5	CS 5	
◆	347	506255.7060	2672463.9591	180.05	CS 5	CS 5	
◆	348	506250.3491	2672465.6855	178.89	CS 5	CS 5	
◆	349	506237.5687	2672466.4708	174.37	CS 5	CS 5	
◆	350	506221.6347	2672466.9318	170.46	CS 5	CS 5	
◆	351	506220.0430	2672467.0361	169.12	CS 5	CS 5	
◆	352	506219.2929	2672467.0347	165.25	CS 5	CS 5	
◆	353	506211.8874	2672468.0628	165.23	CS 5	CS 5	
◆	354	506203.2492	2672468.2660	166.17	CS 5	CS 5	
◆	355	506198.3703	2672468.2196	166.25	CS 5	CS 5	
◆	356	506189.6745	2672467.9780	166.77	CS 5	CS 5	
◆	357	506183.2506	2672467.8545	166.99	CS 5	CS 5	
◆	358	506174.4451	2672467.4894	167.25	CS 5	CS 5	
◆	359	506165.2872	2672468.2328	166.91	CS 5	CS 5	
◆	360	506157.3359	2672468.7599	167.00	CS 5	CS 5	
◆	361	506151.4511	2672469.1322	170.09	CS 5	CS 5	
◆	362	506146.1265	2672469.5037	174.65	CS 5	CS 5	
◆	363	506137.5720	2672467.7292	179.60	CS 5	CS 5	
◆	364	506261.1603	2672403.9644	179.81	CS 6	CS 6	
◆	365	506245.8717	2672406.6842	179.68	CS 6	CS 6	
◆	366	506225.1084	2672410.9349	172.82	CS 6	CS 6	
◆	367	506218.8584	2672411.5092	171.47	CS 6	CS 6	
◆	368	506217.8206	2672411.5434	170.39	CS 6	CS 6	
◆	369	506216.2383	2672411.6855	170.24	CS 6	CS 6	
◆	370	506215.9998	2672411.5219	168.82	CS 6	CS 6	
◆	371	506212.6840	2672411.8393	168.03	CS 6	CS 6	
◆	372	506210.6109	2672411.5381	167.06	CS 6	CS 6	
◆	373	506205.6756	2672413.9010	164.77	CS 6	CS 6	
◆	374	506198.7661	2672413.7604	165.99	CS 6	CS 6	
◆	375	506192.6578	2672414.4374	166.02	CS 6	CS 6	
◆	376	506180.9992	2672416.3374	165.70	CS 6	CS 6	
◆	377	506176.6690	2672416.7482	165.79	CS 6	CS 6	
◆	378	506169.8315	2672416.9963	166.47	CS 6	CS 6	
◆	379	506166.2625	2672416.8750	166.10	CS 6	CS 6	
◆	380	506161.8416	2672415.9566	166.32	CS 6	CS 6	
◆	381	506158.1000	2672415.2659	167.46	CS 6	CS 6	
◆	382	506153.7027	2672414.3410	170.19	CS 6	CS 6	
◆	383	506151.9934	2672414.4214	172.26	CS 6	CS 6	
◆	384	506139.0804	2672412.5797	184.34	CS 6	CS 6	
◆	403	506247.6359	2672342.2496	180.28	cs1 rd	cs1 rd	
◆	404	506234.3927	2672344.6367	179.74	cs1 rd	cs1 rd	
◆	405	506199.8073	2672349.5841	170.04	cs1	cs1	
◆	406	506199.1829	2672350.0141	166.61	cs1	cs1	
◆	407	506193.9526	2672350.8000	164.73	cs1	cs1	
◆	408	506187.8174	2672353.3695	164.28	cs1	cs1	
◆	409	506177.8008	2672352.1362	164.96	cs1	cs1	
◆	410	506172.3957	2672352.2146	165.41	cs1 log	cs1 log	
◆	411	506169.7983	2672350.8730	166.82	cs1 log	cs1 log	
◆	412	506165.7429	2672352.8205	165.48	cs1	cs1	
◆	413	506158.2567	2672353.9891	164.82	cs1	cs1	
◆	414	506151.9650	2672355.7826	165.99	cs1	cs1	
◆	415	506149.8792	2672355.6301	169.32	cs11	cs11	
◆	416	506147.0456	2672355.9325	169.31	cs1	cs1	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
417		506128.5697	2672356.9363	185.30	cs 1	cs 1	
418		506121.4430	2672357.6641	185.21	cs 1 bldg	cs 1 bldg	
419		506116.8309	2672299.5278	186.55	wall	wall	
420		506128.4254	2672298.2973	186.12	wall	wall	
421		506128.4017	2672297.5932	176.35	wall	wall	
422		506131.8036	2672297.2419	173.61	cs2	cs2	
423		506135.5718	2672297.0997	171.41	cs2	cs2	
424		506136.0855	2672297.1324	170.29	cs2	cs2	
425		506139.3229	2672296.1714	168.75	cs2	cs2	
426		506143.5546	2672295.4034	166.68	cs2	cs2	
427		506150.9936	2672294.8582	166.17	cs2	cs2	
428		506158.0348	2672294.0661	165.58	cs2	cs2	
429		506164.8452	2672295.3233	165.45	cs2	cs2	
430		506172.4189	2672294.4161	165.13	cs2	cs2	
431		506180.1086	2672294.5956	164.45	cs2	cs2	
432		506186.6058	2672292.4736	164.72	cs2	cs2	
433		506192.1542	2672292.6203	165.13	cs2	cs2	
434		506192.7625	2672292.4708	165.23	cs2	cs2	
435		506193.3538	2672292.3827	171.04	cs2	cs2	
436		506197.7369	2672290.4893	171.41	cs2	cs2	
437		506217.4110	2672289.3783	178.81	cs2	cs2	
438		506223.8552	2672288.2538	179.78	cs2 rd	cs2 rd	
439		506239.4478	2672284.7544	180.54	cs2 rd	cs2 rd	
440		506232.3623	2672217.0510	181.28	cs3 rd	cs3 rd	
441		506216.9260	2672220.1329	180.60	cs3 rd	cs3 rd	
442		506201.8664	2672223.3255	178.24	cs3	cs3	
443		506184.8756	2672223.5843	170.18	cs3	cs3	
444		506184.0174	2672224.4570	167.24	cs3	cs3	
445		506181.2693	2672224.6573	165.74	cs3	cs3	
446		506177.2626	2672226.5599	164.49	cs3	cs3	
447		506171.4201	2672224.8290	164.07	cs3	cs3	
448		506164.7630	2672226.6112	164.90	cs3	cs3	
449		506156.0333	2672228.4653	165.95	cs3	cs3	
451		506147.6036	2672229.7366	167.43	cs3	cs3	
452		506138.3302	2672230.0682	168.66	cs3	cs3	
453		506126.9245	2672231.9362	169.14	cs3	cs3	
454		506125.5182	2672233.5695	172.13	cs3	cs3	
455		506121.7388	2672233.3999	178.04	cs3	cs3	
456		506107.3877	2672235.5794	188.26	cs3	cs3	
457		506102.4454	2672236.1908	188.29	cs3	cs3	
458		506122.6187	2672186.9951	169.71	cnc wall	cnc wall	
459		506126.2642	2672213.9311	168.80	cnc wall	cnc wall	
460		506127.1529	2672214.0765	167.54	cnc wall	cnc wall	
461		506122.8138	2672186.7384	168.60	cnc wall	cnc wall	
462		506120.4663	2672186.7925	170.01	cnc wall	cnc wall	
463		506120.4219	2672186.4724	169.28	cnc wall	cnc wall	
464		506090.1787	2672176.8497	188.44	cs4	cs4	
465		506090.5381	2672176.6329	186.65	cs4	cs4	
466		506107.8466	2672165.5098	171.38	cs4	cs4	
467		506108.3021	2672165.3203	169.89	cs4	cs4	
468		506112.7183	2672162.5043	169.39	cs4	cs4	
469		506125.8995	2672156.7374	168.28	cs4	cs4	
470		506137.5171	2672151.4461	167.23	cs4	cs4	
471		506141.0847	2672149.3441	168.59	cs4	cs4	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Eastng	Elevation	Raw Desc	Full Desc	
472		506146.5681	2672146.3215	168.15	cs4	cs4	
473		506147.4456	2672144.5345	166.54	cs4	cs4	
474		506155.9641	2672140.2269	165.07	cs4	cs4	
475		506160.2544	2672138.0070	165.14	cs4	cs4	
476		506164.6341	2672136.5300	166.36	cs4	cs4	
477		506167.7253	2672135.4638	169.06	cs4	cs4	
478		506170.0832	2672134.4160	170.22	cs4	cs4	
479		506170.6250	2672134.7226	171.35	cs4	cs4	
480		506184.9455	2672129.7358	182.71	cs4	cs4	
481		506193.3235	2672126.9476	182.61	cs4 rd	cs4 rd	
482		506205.7521	2672122.5520	182.67	cs4 rd	cs4 rd	
483		506180.2749	2672204.0375	167.33	wood strctr	wood strctr	
484		506179.7872	2672204.3026	166.05	wood strctr	wood strctr	
485		506173.6134	2672194.8780	166.38	wood strctr	wood strctr	
486		506169.6084	2672189.0182	166.39	wood strctr	wood strctr	
487		506181.6105	2672193.5837	166.95	wood strctr	wood strctr	
488		506163.2020	2672179.6332	166.39	wood strctr	wood strctr	
489		506163.2694	2672180.0416	166.02	wood strctr	wood strctr	
490		506165.5886	2672183.3551	165.87	wood strctr	wood strctr	
491		506169.7339	2672189.6711	165.56	wood strctr	wood strctr	
492		506177.3929	2672201.3928	165.14	wood strctr	wood strctr	
493		506174.4748	2672197.2174	165.10	wood strctr	wood strctr	
494		506173.0656	2672194.1804	164.90	wood strctr	wood strctr	
495		506179.2278	2672187.1523	166.46	wood strctr	wood strctr	
496		506170.9108	2672174.8976	166.14	wood strctr	wood strctr	
497		506171.0729	2672174.9136	165.77	wood strctr	wood strctr	
498		506170.2968	2672175.6720	166.25	wood strctr	wood strctr	
499		506170.2383	2672175.8216	165.83	wood strctr	wood strctr	
500		506136.0513	2672141.3434	167.38	rocks	rocks	
501		506137.3094	2672142.9005	168.48	rocks	rocks	
502		506139.7482	2672141.1672	167.26	rocks	rocks	
503		506138.0033	2672145.1665	167.43	rocks	rocks	
504		506143.9083	2672141.4282	167.26	rocks	rocks	
505		506139.2836	2672146.5828	168.47	rocks	rocks	
506		506143.4257	2672142.0375	167.80	rocks	rocks	
507		506139.5717	2672149.7234	167.54	rocks	rocks	
508		506147.3164	2672144.8635	166.57	rocks	rocks	
509		506140.3685	2672149.3922	168.37	rocks	rocks	
510		506146.2610	2672145.0509	168.86	rocks	rocks	
511		506140.6075	2672153.6847	167.43	rocks	rocks	
512		506150.2897	2672149.1610	166.35	rocks	rocks	
513		506141.4642	2672153.3270	168.50	rocks	rocks	
514		506148.4973	2672149.2497	167.79	rocks	rocks	
515		506142.1393	2672158.7797	166.99	rocks	rocks	
516		506148.5309	2672152.6535	167.15	rocks	rocks	
517		506142.2920	2672158.8396	167.92	rocks	rocks	
518		506147.2801	2672153.3627	167.86	rocks	rocks	
519		506144.9855	2672162.8200	166.50	rocks	rocks	
520		506149.3682	2672158.3771	167.29	rocks	rocks	
521		506145.1179	2672162.6201	167.62	rocks	rocks	
522		506148.3037	2672159.0424	168.54	rocks	rocks	
523		506144.2904	2672164.9747	166.47	rocks	rocks	
524		506150.6770	2672160.9588	167.56	rocks	rocks	
525		506144.4475	2672164.7316	168.39	rocks	rocks	



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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Eastng	Elevation	Raw Desc	Full Desc	
526		506151.5048	2672161.4679	166.78	rocks	rocks	
527		506145.3017	2672166.0897	166.83	rocks	rocks	
528		506151.9084	2672162.7277	166.68	rocks	rocks	
529		506145.7393	2672166.2067	168.33	rocks	rocks	
530		506149.8484	2672167.1868	167.19	rocks	rocks	
531		506147.0839	2672168.5221	166.83	rocks	rocks	
532		506149.3795	2672167.4411	168.03	rocks	rocks	
533		506148.0987	2672168.7118	168.09	rocks	rocks	
534		506150.1915	2672170.7929	167.64	rocks	rocks	
535		506150.6110	2672172.0876	166.47	rocks	rocks	
536		506147.2780	2672164.2877	168.10	rocks	rocks	
537		506147.6793	2672159.4396	168.37	rocks	rocks	
538		506145.2022	2672164.8360	168.40	rocks	rocks	
539		506147.5180	2672156.6116	168.44	rocks	rocks	
540		506146.3485	2672160.2972	168.26	rocks	rocks	
541		506144.6822	2672157.0851	168.54	rocks	rocks	
542		506147.2955	2672154.8529	168.00	rocks	rocks	
543		506143.4794	2672156.0706	167.93	rocks	rocks	
544		506145.5214	2672152.5638	168.49	rocks	rocks	
545		506142.5518	2672152.5563	168.60	rocks	rocks	
546		506146.8757	2672148.4962	167.36	rocks	rocks	
547		506142.1351	2672148.1676	168.55	rocks	rocks	
548		506148.4830	2672146.4901	167.81	rocks	rocks	
549		506143.6873	2672146.4200	168.86	rocks	rocks	
550		506146.7506	2672145.5206	167.31	rocks	rocks	
551		506142.1603	2672145.5052	168.38	rocks	rocks	
552		506146.2702	2672145.1986	168.90	rocks	rocks	
553		506139.6534	2672145.2533	168.86	rocks	rocks	
554		506143.8788	2672145.1763	168.04	rocks	rocks	
555		506139.4757	2672144.4427	168.14	rocks	rocks	
556		506141.4529	2672141.8765	168.76	rocks	rocks	
557		506138.4995	2672142.5922	168.37	rocks	rocks	
558		506137.8836	2672140.3200	167.55	rocks	rocks	
559		506126.1152	2672120.1344	168.90	rocks	rocks	
560		506122.9985	2672112.6674	169.26	rocks	rocks	
561		506125.6288	2672120.0878	168.30	rocks	rocks	
562		506122.7863	2672112.4631	168.65	rocks	rocks	
563		506129.9826	2672117.8235	168.77	rocks	rocks	
564		506127.0268	2672111.8817	169.08	rocks	rocks	
565		506130.2424	2672117.7215	168.05	rocks	rocks	
566		506126.8894	2672111.4928	168.23	rocks	rocks	
567		506128.7035	2672119.5617	168.41	rocks	rocks	
568		506124.6456	2672110.8080	168.91	rocks	rocks	
569		506124.7782	2672110.8002	168.91	rocks	rocks	
570		506075.8574	2672115.5857	169.91	cs5	cs5	
571		506083.9882	2672110.9461	168.86	cs5	cs5	
572		506090.9776	2672106.2866	168.67	cs5	cs5	
573		506097.3927	2672101.9927	168.86	cs5	cs5	
574		506103.0856	2672098.5730	169.82	cs5	cs5	
575		506108.3464	2672095.4367	169.18	cs5	cs5	
576		506115.1237	2672092.5396	170.31	cs5	cs5	
577		506124.1031	2672089.9949	168.93	cs5	cs5	
578		506132.7340	2672086.9807	168.29	cs5	cs5	
579		506143.6391	2672082.0100	167.05	cs5	cs5	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List
Number		Northing	Easting	Elevation	Raw Desc	Full Desc
580		506150.1570	2672078.8640	166.83	cs5	cs5
581		506155.6795	2672078.3742	169.49	cs5	cs5
582		506177.6595	2672073.6945	183.70	cs5	cs5
583		506187.7810	2672069.1136	183.69	cs5	cs5
600		506187.4301	2672058.0599	183.98	eopk	eopk
601		506175.1893	2672062.2414	183.36	eop	eop
602		506175.1413	2672062.3320	183.84	eop	eop
603		506175.8641	2672066.7823	183.28	tb	tb
604		506160.1870	2672069.5713	171.49	bb	bb
605		506150.7106	2672071.2142	166.92	left Bank	left Bank
606		506140.5752	2672073.3127	167.73	bc	bc
607		506118.9012	2672079.3676	170.09	bc	bc
608		506109.0755	2672082.6472	170.09	left Bank	left Bank
609		506102.3306	2672085.5228	169.46	bc	bc
610		506088.7745	2672094.1186	168.66	bc	bc
611		506073.2199	2672104.7961	169.65	right Bank	right Bank
612		506059.5290	2672112.2435	174.07	bb	bb
613		506036.7563	2672122.9990	188.65	tb	tb
614		506010.4320	2672090.7182	187.69	tb	tb
615		506168.7736	2671996.1722	184.22	bp	bp
616		506155.4720	2672000.5365	183.92	fp	fp
617		506151.1249	2672002.6466	183.58	tb	tb
618		506024.3140	2672082.3029	176.88	bb	bb
619		506134.8925	2672007.2600	170.36	bb	bb
620		506044.2227	2672074.7357	170.14	bb	bb
621		506129.1250	2672007.1828	167.55	left Bank	left Bank
622		506060.1981	2672061.0104	169.04	bc	bc
623		506124.7187	2672007.7485	166.76	bc	bc
624		506071.5302	2672050.5521	170.12	bc	bc
625		506120.2966	2672009.0200	167.33	bc	bc
626		506082.3719	2672032.9393	173.72	is	is
627		506110.4077	2672014.6025	168.45	bc	bc
628		506099.4579	2672020.5666	170.19	right Bank	right Bank
629		506081.8368	2671997.9375	170.34	right Bank	right Bank
630		506107.3190	2671972.7154	167.35	left Bank	left Bank
631		506074.2269	2672003.8330	171.24	right Bank	right Bank
632		506113.3295	2671968.8395	170.04	left Bank	left Bank
633		506065.2088	2672010.6814	173.43	is	is
634		506119.1035	2671966.3340	175.25	bb	bb
635		506046.4121	2672030.0437	169.66	left Bank	left Bank
636		506129.9459	2671961.5616	182.62	tb	tb
637		506039.0763	2672036.6601	169.33	bc	bc
638		506132.9354	2671960.4648	182.95	fp	fp
639		506025.2246	2672047.3698	170.22	rp	rp
640		506146.6225	2671952.8548	183.19	bp	bp
641		506011.6103	2672057.6107	177.35	bb	bb
642		506103.0113	2671977.9964	167.56	bc	bc
643		506094.6195	2671985.7908	168.63	bc	bc
644		505992.6510	2672065.2988	189.60	tb	tb
645		506049.4831	2671980.4815	170.46	right Bank	right Bank
646		505971.0692	2672050.3240	187.88	tb	tb
647		506058.5778	2671968.2391	169.15	bc	bc
648		505993.4680	2672026.2171	172.01	right Bank	right Bank
649		506067.8483	2671958.5660	169.07	bc	bc

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
650		506076.5652	2671948.4597	168.92	bc	bc	
651		505993.3219	2672021.1539	170.34	right Bank	right Bank	
652		506080.9020	2671938.8433	168.56	bc	bc	
653		506001.9776	2672011.9263	170.17	bc	bc	
654		506084.2897	2671934.4488	170.95	left Bank	left Bank	
655		506005.7308	2672002.3607	169.21	left Bank	left Bank	
656		506091.5025	2671927.0090	173.76	bb	bb	
657		506011.7561	2671990.6561	174.01	is	is	
658		506020.5246	2671977.7110	173.93	is	is	
659		506101.3450	2671919.2010	181.72	tb	tb	
660		506103.8496	2671917.3188	182.09	fb	fb	
661		506117.2236	2671908.9775	182.74	bp	bp	
662		506031.7389	2671967.5184	170.20	right Bank	right Bank	
663		506074.6806	2671863.4381	182.07	right Bank	right Bank	
664		506074.6853	2671863.4890	182.04	eop	eop	
665		506064.7531	2671875.8229	181.26	eop	eop	
666		506058.5354	2671884.1078	180.87	tb	tb	
667		506007.2855	2671949.7098	170.65	eow	eow	
668		506050.3314	2671897.9071	172.55	bb	bb	
669		505999.9454	2671962.2004	174.19	isl	isl	
670		506043.4392	2671906.2678	170.24	eow	eow	
671		505994.5796	2671968.5035	174.07	isl	isl	
672		506034.2331	2671919.6515	169.54	bc	bc	
673		505985.2638	2671980.7976	171.05	bc	bc	
674		506022.6728	2671931.5905	169.07	bc	bc	
675		505975.8337	2671992.9974	170.03	bc	bc	
676		506013.5562	2671941.7411	168.93	bc	bc	
677		505969.6320	2671998.5146	170.45	bc	bc	
678		506007.1194	2671949.8989	170.63	bc	bc	
679		505963.3507	2672006.1730	172.47	bb	bb	
680		505970.9864	2671928.7022	170.95	eow	eow	
681		505971.3236	2671921.6591	169.34	bc	bc	
682		505945.6066	2672019.0707	183.43	slope	slope	
683		505979.3484	2671909.0600	168.94	bc	bc	
684		505983.4785	2671901.5691	169.84	bc	bc	
685		505991.3020	2671891.3304	170.36	bc	bc	
686		505934.3772	2672026.9639	196.05	tb	tb	
687		505996.3282	2671884.5269	170.95	eow	eow	
688		505949.5337	2672028.9122	187.51	tw	tw	
689		506001.1902	2671877.0350	174.08	bb	bb	
690		505922.7712	2671981.6629	198.18	tw	tw	
691		506010.2353	2671863.1075	177.51	tb	tb	
692		505949.9812	2672028.5752	186.01	bw	bw	
693		506010.0263	2671853.1457	181.01	slp	slp	
694		505937.4684	2672005.5830	178.05	bw	bw	
695		506011.9040	2671841.4437	181.45	eop	eop	
696		505924.0384	2671981.5607	174.43	bw	bw	
697		506015.4474	2671825.8676	182.03	eop	eop	
698		505931.8808	2671980.7639	173.45	bb	bb	
699		505935.2984	2671974.2950	170.58	eow	eow	
700		505936.7643	2671970.7981	170.25	bc	bc	
701		505972.6977	2671804.4008	183.39	eop	eop	
702		505967.5545	2671817.9642	183.39	eop	eop	
703		505939.3607	2671967.1133	169.85	bc	bc	

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
704		505960.2206	2671841.5002	182.26	eop	eop	
705		505941.2612	2671961.1629	172.31	isl	isl	
706		505958.7608	2671854.7657	175.53	tb	tb	
707		505952.8756	2671950.2078	172.13	isl	isl	
708		505959.0215	2671867.8050	170.86	bb	bb	
709		505963.3718	2671941.9599	173.52	isl	isl	
710		505947.3938	2671879.4962	170.09	bc	bc	
711		505966.3480	2671934.0604	173.12	isl	isl	
712		505936.9483	2671891.6891	170.62	bc	bc	
713		505972.2455	2671930.1734	171.18	bb	bb	
714		505930.1152	2671905.0657	170.77	bc	bc	
715		505922.7397	2671915.4286	171.58	isl	isl	
716		505902.8359	2671963.4765	171.38	bw	bw	
717		505919.4253	2671921.8475	173.16	isl	isl	
718		505905.8056	2671958.6702	171.07	bc	bc	
719		505914.1014	2671932.2193	172.63	isl	isl	
720		505907.4574	2671956.7106	170.88	bc	bc	
721		505910.3316	2671942.7443	172.23	bc	bc	
722		505893.8409	2671883.7790	171.34	pier	pier	
723		505912.5291	2671898.2761	170.26	pier	pier	
724		505916.0080	2671897.7210	170.57	pier	pier	
725		505915.1624	2671894.6906	171.50	pier	pier	
726		505912.8451	2671871.3282	171.35	bc	bc	
727		505909.4713	2671851.5925	171.01	bc	bc	
728		505906.7026	2671832.7693	171.10	bc	bc	
729		505906.2603	2671814.8568	171.65	pier	pier	
730		505889.6515	2671802.2301	170.46	pier	pier	
731		505913.2559	2671819.7378	173.85	inv	inv	
732		505928.6916	2671832.4152	173.43	inv	inv	
733		505909.5170	2671808.5848	181.66	tb	tb	
734		505908.9880	2671802.9707	184.05	eop	eop	
735		505907.8832	2671760.5115	186.20	pier	pier	
736		505907.8887	2671760.5241	186.12	pier	pier	
800		506250.2167	2672544.5600	180.64	tb	tb	
801		506238.2978	2672544.9532	174.90	bb	bb	
802		506237.7267	2672542.7129	174.87	tw	tw	
803		506237.5413	2672541.8928	174.30	bw	bw	
804		506229.9836	2672542.7617	174.88	tw	tw	
805		506229.2740	2672542.6952	170.05	bw	bw	
806		506219.8511	2672543.4689	169.27	bw	bw	
807		506218.0563	2672473.3714	166.14	bc	bc	
808		506210.0946	2672474.2460	164.28	bc	bc	
809		506191.8090	2672477.8990	165.89	bc	bc	
810		506179.2129	2672477.6856	166.31	bc	bc	
811		506173.2047	2672477.6689	166.32	bc	bc	
812		506164.8102	2672478.0521	165.73	bc	bc	
813		506219.0126	2672546.3417	174.79	tq	tq	
814		506153.1619	2672477.0259	168.15	bb	bb	
815		506219.8106	2672543.7550	174.79	tw	tw	
816		506220.7351	2672580.6408	171.65	tw	tw	
817		506220.1377	2672589.6407	164.88	bw	bw	
818		506218.7682	2672604.4570	162.65	bc	bc	
819		506223.5223	2672580.7560	172.33	tw	tw	
820		506238.3807	2672636.8764	170.50	tw	tw	

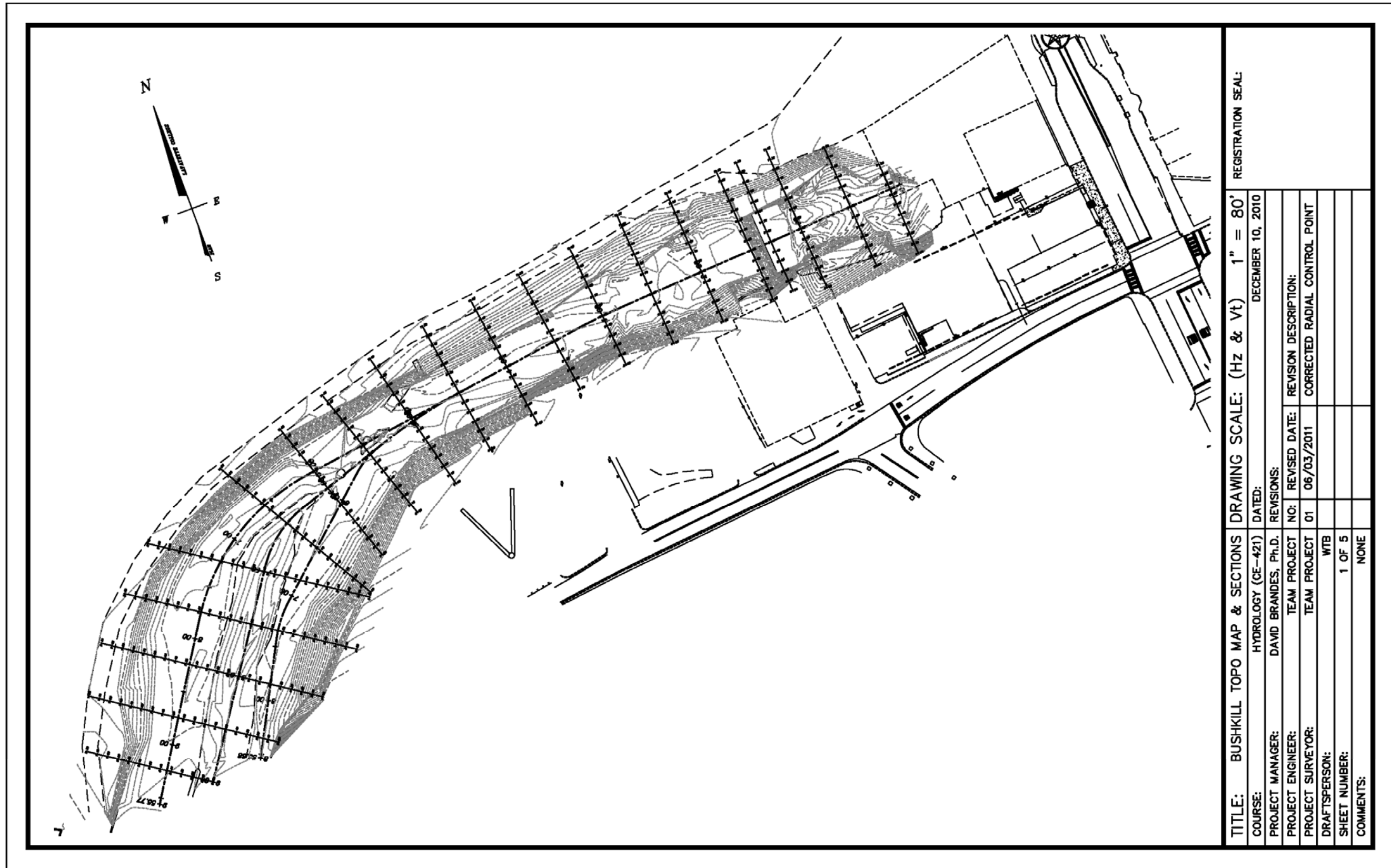
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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List	
Number		Northing	Easting	Elevation	Raw Desc	Full Desc	
821	506223.1215	2672502.0846	167.48	bc	bc		
822	506219.9783	2672500.8613	165.13	bc	bc		
823	506209.6501	2672502.4968	165.14	bc	bc		
824	506193.6774	2672502.6335	165.22	bc	bc		
825	506193.6326	2672502.7137	165.20	bc	bc		
826	506265.1590	2672542.6927	180.46	eop	eop		
827	506176.1901	2672504.0212	165.57	bc	bc		
828	506281.3814	2672538.7337	180.80	eop	eop		
829	506167.2476	2672504.4821	165.04	bc	bc		
830	506275.6141	2672503.9485	180.65	eop	eop		
831	506262.0973	2672507.4142	180.50	eop	eop		
832	506251.9724	2672509.7718	179.76	tb	tb		
833	506232.5126	2672513.3644	171.68	bb	bb		
834	506230.6433	2672513.1774	169.95	eow	eow		
835	506270.1214	2672467.5024	180.29	eop	eop		
836	506255.2659	2672471.4931	180.14	eop	eop		
837	506250.8540	2672473.6409	179.57	tb	tb		
838	506224.7157	2672477.9707	172.27	bb	bb		
839	506222.7747	2672478.9530	170.25	eow	eow		
840	506220.0846	2672479.2891	170.12	bc	bc		
841	506215.5697	2672443.0368	169.67	bc	bc		
842	506225.6421	2672441.3633	171.83	bb	bb		
843	506250.0644	2672439.8156	179.89	tb	tb		
844	506249.9266	2672439.7611	179.89	eop	eop		
845	506246.6462	2672440.8601	179.64	tb	tb		
846	506215.5287	2672415.9247	170.39	bb	bb		
847	506264.3031	2672437.3721	180.04	eop	eop		
848	506232.1139	2672413.1749	175.30	tb	tb		
849	506239.3106	2672411.7259	179.36	tb	tb		
850	506244.1818	2672411.1631	179.65	eop	eop		
851	506212.4403	2672400.7289	168.42	bc	bc		
852	506259.0382	2672409.3281	179.86	eop	eop		
853	506215.6854	2672400.5174	172.17	bb	bb		
854	506256.9014	2672394.8472	179.73	eop	eop		
855	506231.6215	2672395.9228	176.10	tb	tb		
856	506241.0229	2672395.9979	179.65	tb	tb		
857	506160.6698	2672585.8500	174.00	inv	inv		
858	506150.3667	2672475.4160	170.33	bb	bb		
859	506135.1224	2672471.5411	181.54	tb	tb		
860	506149.5877	2672447.1530	170.75	bb	bb		
861	506132.4413	2672446.4800	183.62	tb	tb		
862	506151.1000	2672420.1844	171.27	bb	bb		
863	506134.2845	2672418.6466	185.38	tb	tb		
864	506137.7884	2672396.5250	185.64	tb	tb		
865	506152.4287	2672400.3569	171.70	bb	bb		
866	506137.8669	2672396.4574	185.63	tb	tb		
867	506153.8133	2672407.6582	167.89	bc	bc		
868	506160.9433	2672408.4042	165.84	bc	bc		
869	506159.6500	2672432.3837	166.34	bc	bc		
870	506170.0058	2672433.9451	165.85	bc	bc		
871	506152.8285	2672453.9262	169.09	bc	bc		
872	506168.1835	2672454.8994	166.73	bc	bc		
873	506184.9915	2672456.2007	166.40	bc	bc		
874	506198.4259	2672455.4409	165.94	bc	bc		

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Raw Desc	Matching	Point Groups	Include	Exclude	Summary	List
Number		Northing	Easting	Elevation	Raw Desc	Full Desc
875		506153.7970	2672384.0219	166.46	bc	bc
876		506149.6465	2672349.1567	164.98	bc	bc
877		506132.5627	2672360.4920	184.81	tb	tb
878		506178.9928	2672445.8250	165.74	bc	bc
879		506136.7272	2672378.9741	187.65	tb	tb
880		506189.8183	2672446.7654	165.70	bc	bc
881		506138.2425	2672402.7467	184.64	tb	tb
882		506203.1111	2672446.3792	165.32	bc	bc
883		506211.3444	2672446.0028	166.85	bc	bc
884		506183.7246	2672425.1702	165.52	bc	bc
885		506194.8722	2672424.6919	165.54	bc	bc
886		506203.0208	2672422.6750	164.90	bc	bc
887		506209.1806	2672422.1987	167.20	bc	bc
888		506176.3691	2672404.2722	164.71	bc	bc
889		506186.2811	2672408.1865	165.12	bc	bc
890		506198.5768	2672402.6546	167.18	bc	bc
891		506149.4716	2672350.1375	165.67	bc	bc
1001		506266.6113	2672542.8193	180.49	pk	pk
1003		506205.4782	2672117.4550	182.91	pk	pk
1004		506223.2169	2672548.7360	174.68	Start	Start
1006		506193.0323	2672215.6794	176.96	pk	pk
1010		506266.6351	2672542.7977	180.52	BS	BS
2001		506223.2169	2672548.7359	328.08	oc1	oc1
2002		506266.6307	2672542.8164	332.71	bschk	bschk
2003		506425.6200	2672845.9526	349.60	archchk	archchk
3001		506184.0617	2672480.9073	321.00	core1	core1
3002		506235.7657	2672542.2303	320.58	core2	core2
3003		506163.2281	2672334.9862	319.79	core3	core3
3004		506175.6110	2672329.1752	319.64	core4	core4
3005		506148.2363	2672267.7767	322.00	core5	core5
3006		506140.9126	2672224.0445	322.39	core6	core6
3007		506179.4378	2672492.4316	320.02	core7	core7
3008		506194.7078	2672496.3329	319.71	core8	core8
3009		506178.5495	2672506.7280	319.67	core9	core9
3010		506168.7827	2672429.2698	319.79	core10	core10
3011		506123.6590	2672287.7500	319.87	core11	core11

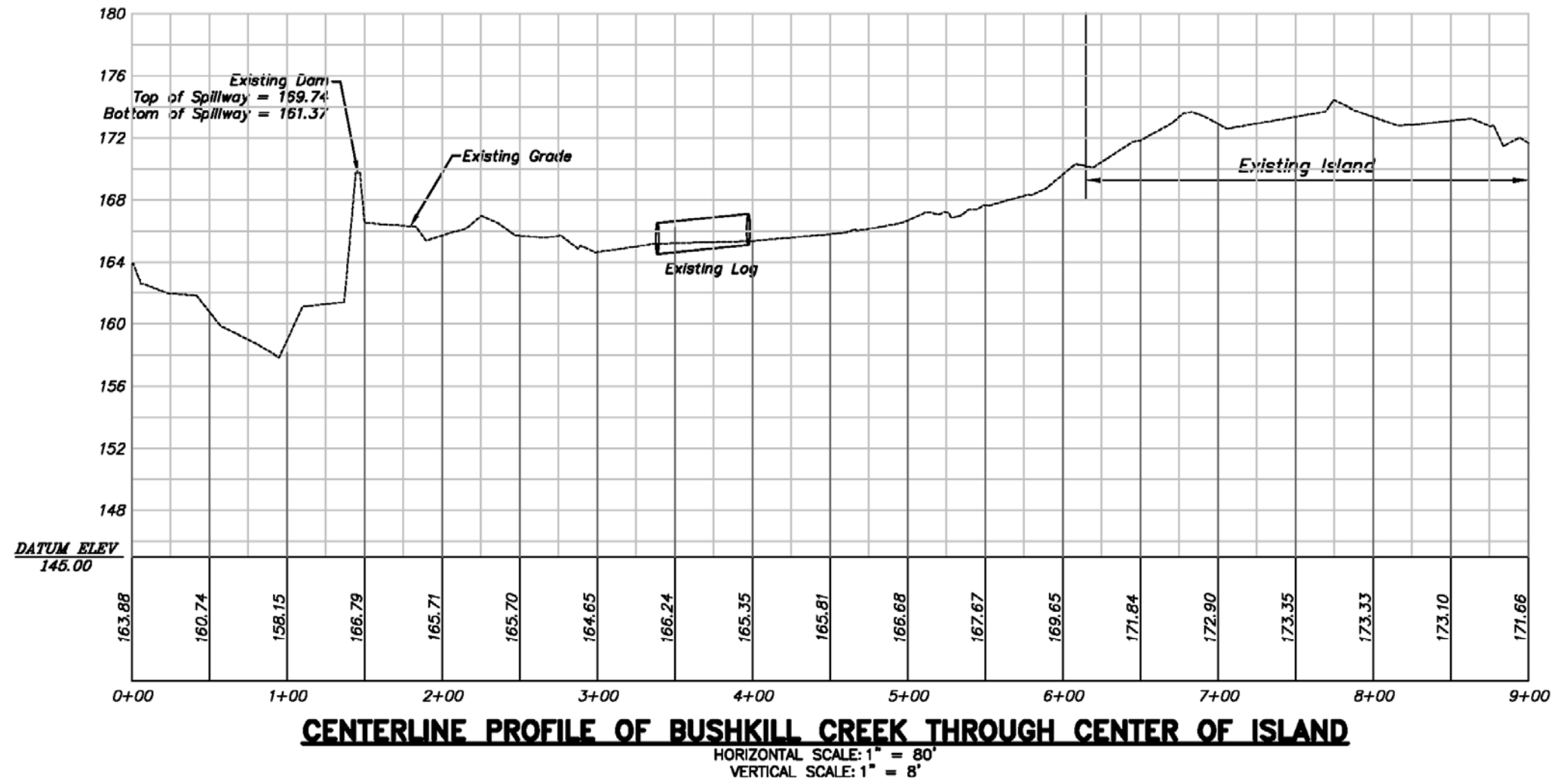
14. Appendix H: Topographic Map



TITLE: BUSHKILL TOPO MAP & SECTIONS DRAWING SCALE: (Hz & Vt) 1" = 80' REGISTRATION SEAL: DECEMBER 10, 2010

COURSE:	HYDROLOGY (CE-421)	DATED:	DECEMBER 10, 2010
PROJECT MANAGER:	DAVID BRANDES, Ph.D.	REVISIONS:	
PROJECT ENGINEER:	TEAM PROJECT	NO:	REVISION DESCRIPTION:
PROJECT SURVEYOR:	TEAM PROJECT	01	06/03/2011
DRAFTSPERSON:	WTB		CORRECTED RADIAL CONTROL POINT
SHEET NUMBER:	1 OF 5		
COMMENTS:	NONE		

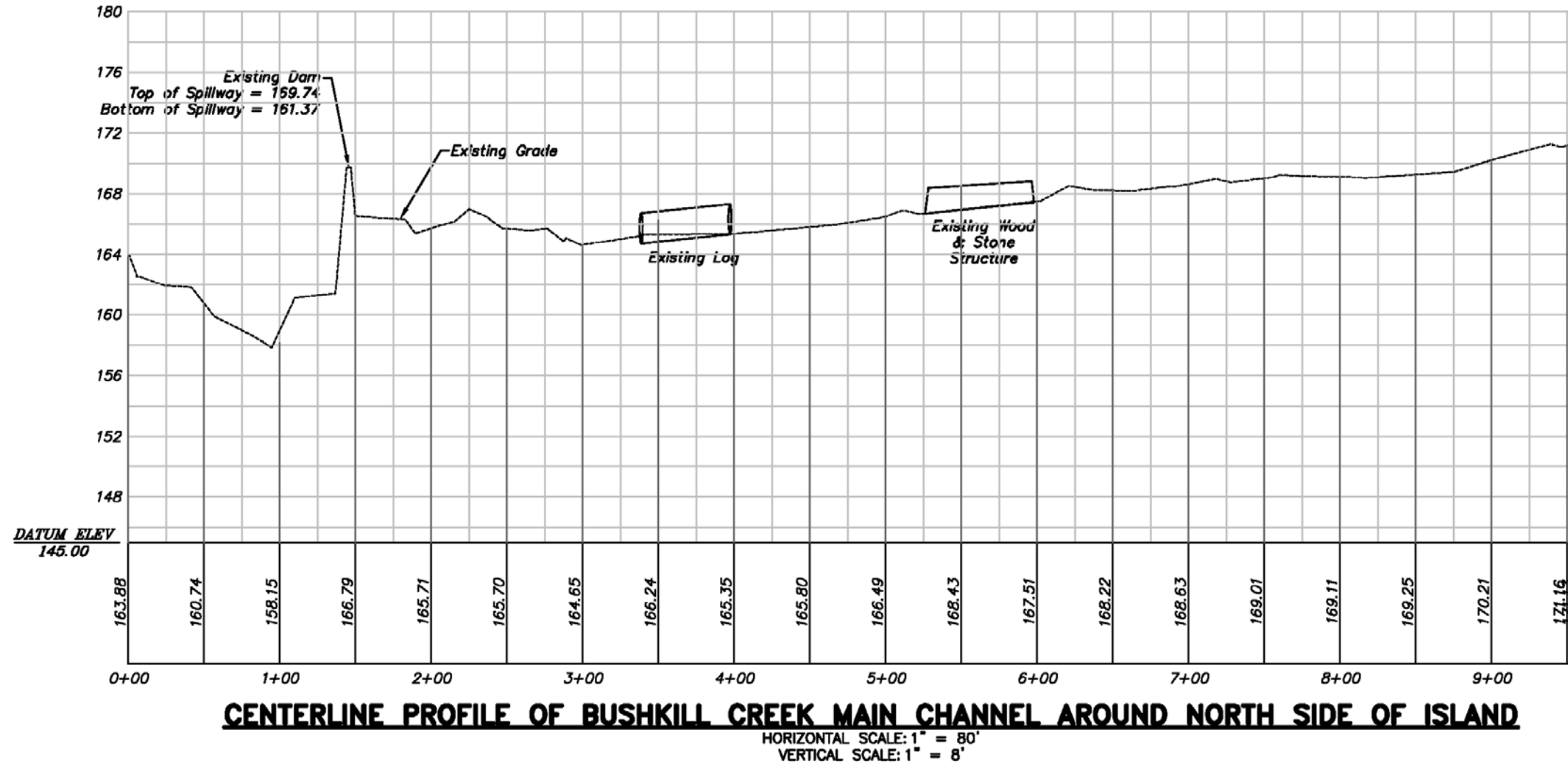
15. Appendix I: Centerline Profile of Bushkill Creek through the Center of the Island



REGISTRATION SEAL:	
TITLE:	BUSHKILL PROFILE DRAWING SCALE: (Hz & Vt) AS NOTED
COURSE:	HYDROLOGY (CE-421) DATED: DECEMBER 10, 2010
PROJECT MANAGER:	DAVID BRANDES, Ph.D. REVISIONS:
PROJECT ENGINEER:	TEAM PROJECT NO: REVISED DATE: REVISION DESCRIPTION:
PROJECT SURVEYOR:	TEAM PROJECT 01 03/08/2011 REVISED PER UPDATED SURVEY
DRAFTSPERSON:	WTB
SHEET NUMBER:	2 OF 5
COMMENTS:	NONE

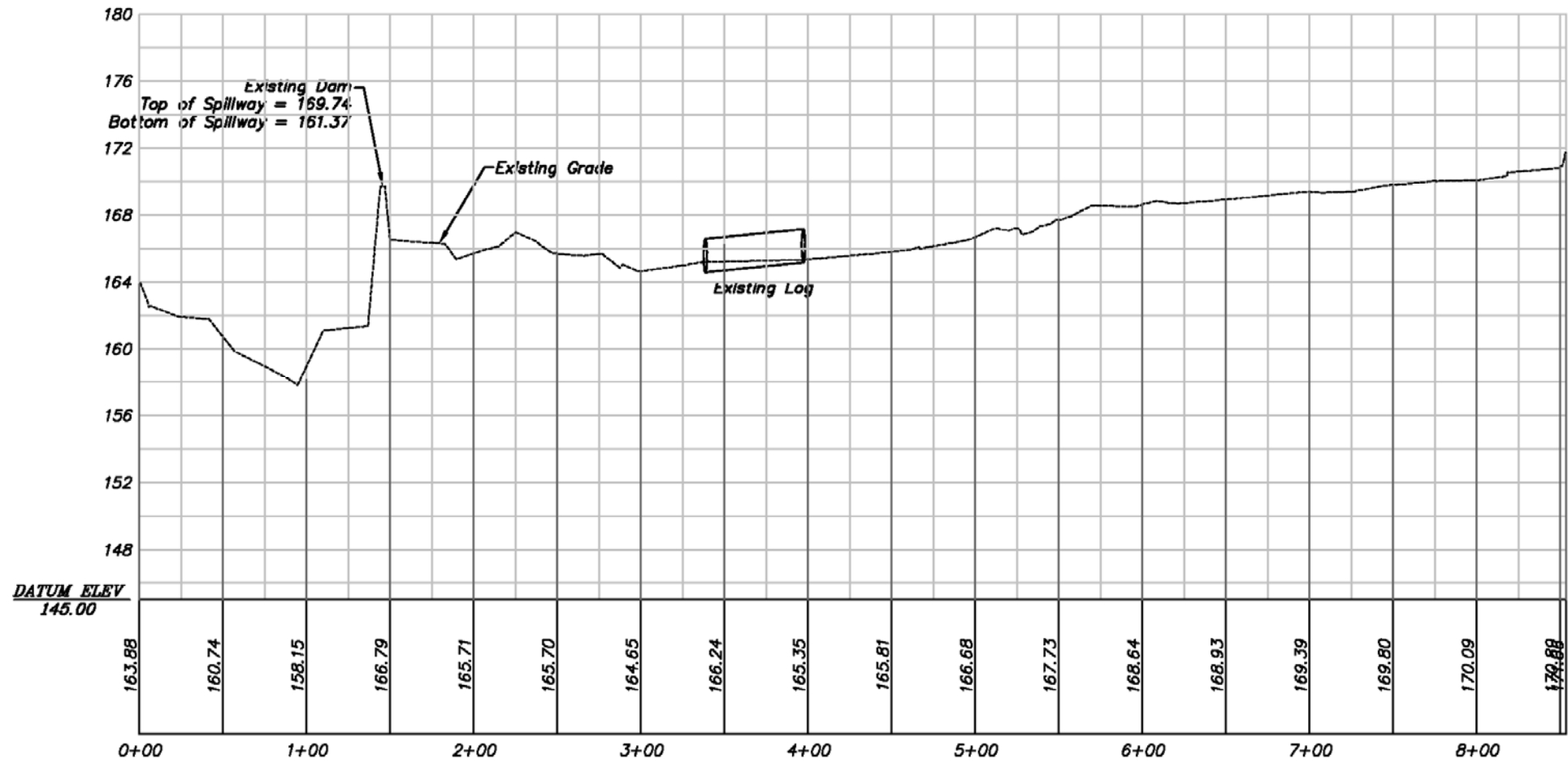


16. Appendix J: Profile of Bushkill Creek Main Channel (North Side of the Island)



REGISTRATION SEAL:	
TITLE:	BUSHKILL PROFILE DRAWING SCALE: (Hz & Vt) AS NOTED
COURSE:	HYDROLOGY (CE-421) DATED: DECEMBER 10, 2010
PROJECT MANAGER:	DAVID BRANDES, Ph.D. REVISIONS:
PROJECT ENGINEER:	TEAM PROJECT NO: 01 REVISION NO: 01 REVISION DATE: 03/08/2011 REVISION DESCRIPTION: REVISED PER UPDATED SURVEY
PROJECT SURVEYOR:	TEAM PROJECT NO: 01 REVISION NO: 01 REVISION DATE: 03/08/2011 REVISION DESCRIPTION: REVISED PER UPDATED SURVEY
DRAFTSPERSON:	WTB
SHEET NUMBER:	3 OF 5
COMMENTS:	NONE

17. Appendix K: Profile of Bushkill Creek Secondary Channel (South Side of the Island)



**CENTERLINE PROFILE OF BUSHKILL CREEK SECONDARY CHANNEL AROUND SOUTH SIDE OF ISLAND**

HORIZONTAL SCALE: 1" = 80'  
VERTICAL SCALE: 1" = 8'

TITLE: BUSHKILL PROFILE DRAWING SCALE: (Hz & Vt) AS NOTED  
REGISTRATION SEAL: DECEMBER 10, 2010

COURSE:	HYDROLOGY (CE-421)	DATED:	DECEMBER 10, 2010
PROJECT MANAGER:	DAVID BRANDES, Ph.D.	REVISIONS:	
PROJECT ENGINEER:	TEAM PROJECT	NO:	REVISION DESCRIPTION:
PROJECT SURVEYOR:	TEAM PROJECT	01	03/08/2011
DRAFTSPERSON:	WTB		REVISED PER UPDATED SURVEY
SHEET NUMBER:	4 OF 5		
COMMENTS:	NONE		

18. Appendix L: Composite Plan View and Centerline Profiles of Bushkill Creek

