



UNIVERSITY OF NOTRE DAME

FACILITIES DESIGN AND OPERATIONS

UNIVERSITY OF NOTRE DAME CONTROL NETWORK CONDENSED REPORT

**CAMPUS-WIDE CONTROL NETWORK COMPRISED OF
GEODETIC CONTROL MONUMENTS
& BENCHMARKS**

GENERAL INFORMATION

CAMPUS-WIDE CONTROL NETWORK AT THE UNIVERSITY OF NOTRE DAME

CONDENSED REPORT

This control point data was prepared for University of Notre Dame Utilities Maintenance Division of Facilities Design and Operations, headquartered at 100 Facilities Building Notre Dame, Indiana 46556. The purpose of this data is to provide the University of Notre Dame with an accurate, stable, maintainable control network to serve as the backbone of the University's CAD-based asset management system. The network is expected to provide the following benefits:

- Create a monumented coordinate system that fosters the perpetual improvement of the location information associated with existing facilities.
- Verify and sustain the vertical datum of existing benchmarks and all campus facilities.
- Provide a published set of datums for all future facility improvements on campus.
- Allow for positional commonality of work by consultants, contractors, and University staff alike.

This data is intended for use with, but not limited to:

- Survey Projects
- Field Engineering Projects
- Design Projects
- As-built Projects

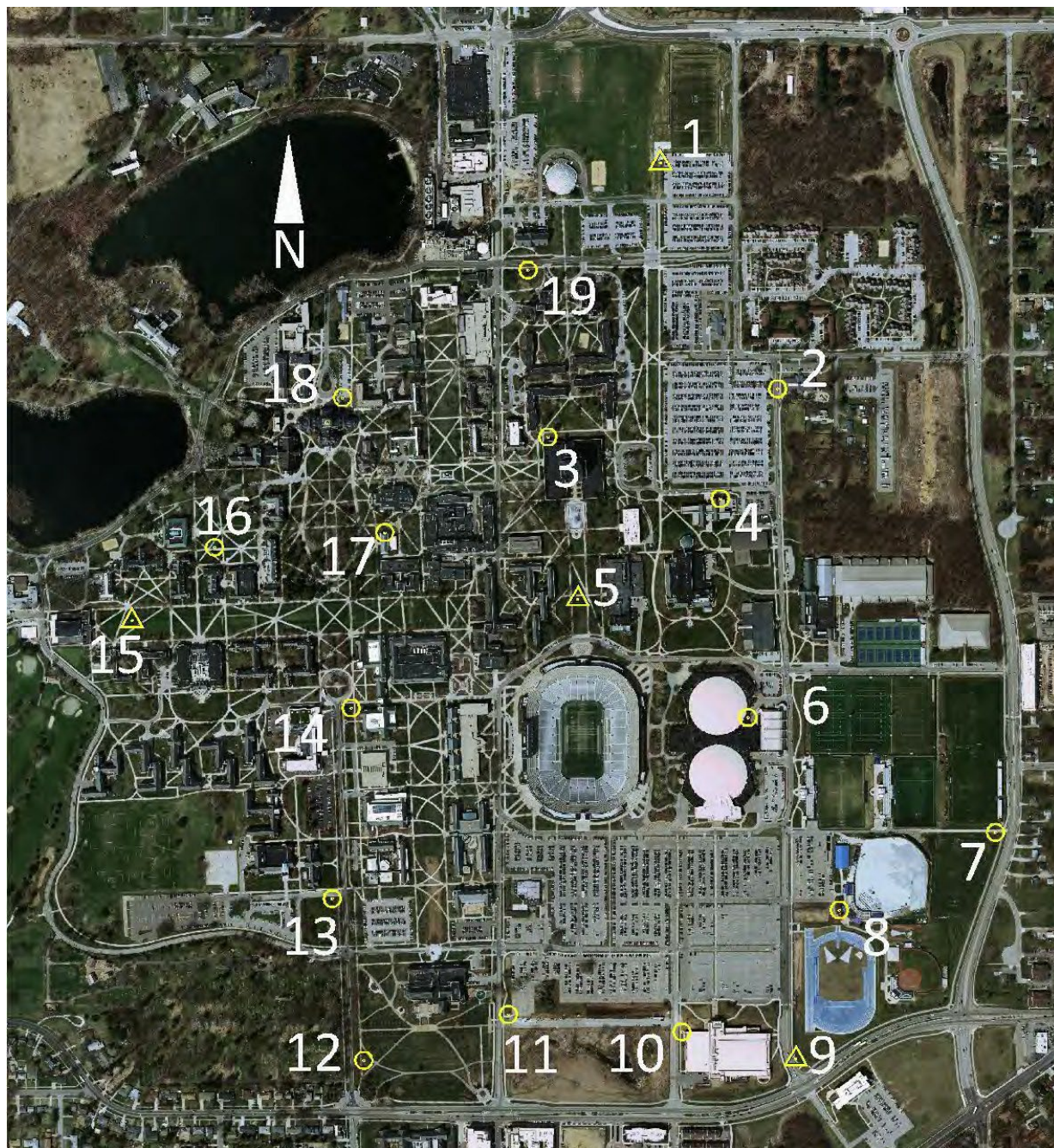
The control network is comprised of nineteen (19) points. Geodetic control points 1, 5, 9, and 15 are represented with X, Y, and Z coordinate values. All other points are benchmarks and are for vertical use only. Benchmarks are represented with a published Z coordinate value only. Details about the location and coordinate values of each point are enclosed. If you have any questions or desire additional information regarding the establishment of the control network, please contact:

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Control Network Map



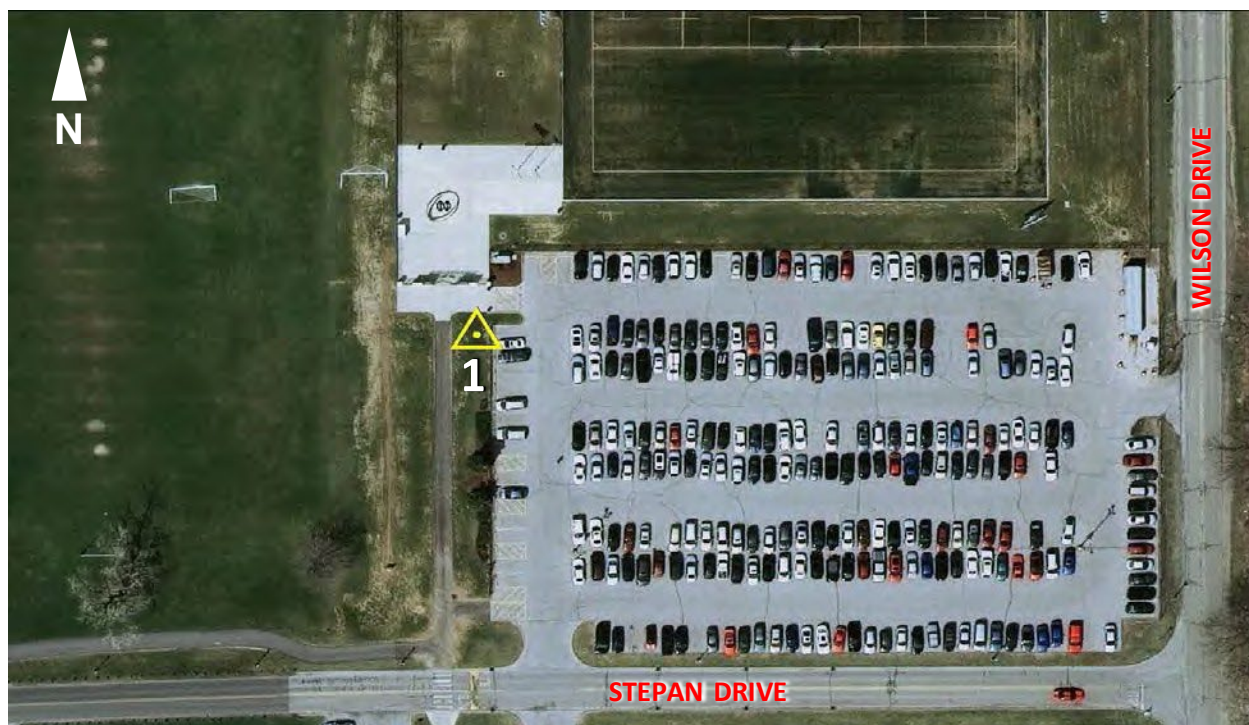
Geodetic control points are designated by a triangle
Benchmarks are designated by a circle

GEODETIC CONTROL POINT DATA SHEET

Control Point: 1

UND Utility Grid: E7
County and State: ST. JOSEPH, IN
Sec., Twp. and Range: 31-T38N-R3E
Size & Type: 4" BRASS TABLET
Monumented: FALL OF 2014
GNSS Obs. Date: 6 MAY 2015
Relationship to Grade: FLUSH

LOCATION AND POSITION DATA	
NORTHEAST SIDE OF CAMPUS NEAR THE SOUTH ENTRANCE OF STINSON RUGBY FIELD.	
Northing: <u>2353077.4447</u>	Latitude(N): <u>41° 42' 24.85042"</u>
Easting: <u>173599.7928</u>	Longitude(W): <u>86° 13' 56.73725"</u>
Elevation: <u>729.124</u>	



REMARKS AND LOCATION DESCRIPTION
<p>NOTRE DAME CONTROL PNT 1 (RUGBY) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED 400' WEST AND 200' NORTH OF THE CENTER OF THE INTERSECTION OF WILSON DR. AND STEPAN DR.; 8.3' WEST OF A 6' CHAIN-LINK FENCE RUNNING NORTH-SOUTH; 13.3' EAST OF AN 8' WIDE PAVED PATH RUNNING NORTH-SOUTH; 17.1' EAST AND 33.8' SOUTH OF THE CENTER OF THE GATE TO THE STINSON RUGBY FIELD</p>

Horizontal Datum: NAD 83 (2011) EPOCH 2010.00
Vertical Datum: NGVD29
Unit of Measurement: US SURVEY FEET
Zone: INDIANA EAST
Observation Method: GNSS - STATIC
Correction Source: NGS OPUS
NGS Tie: G 103 (PID - DG9007)
Instrument Used: TRIMBLE R8 (II)
Crew: TURAY - RIEMKE
Weather: 79°(f) CLEAR, WINDY

GEODETIC CONTROL POINT DATA SHEET

Control Point: 5

UND Utility Grid: I6
County and State: ST. JOSEPH, IN
Sec., Twp. and Range: 31-T38N-R3E
Size & Type: 4" BRASS TABLET
Monumented: FALL OF 2014
GNSS Obs. Date: 7 MAY 2015
Relationship to Grade: FLUSH

LOCATION AND POSITION DATA	
CENTER OF CAMPUS, IN THE MALL NORTH OF NOTRE DAME STADIUM AND SOUTH OF HESBURGH LIBRARY.	
Northing: <u>2350736.4388</u>	Latitude(N): <u>41° 42' 1.69409"</u>
Easting: <u>173154.8101</u>	Longitude(W): <u>86° 14' 2.40039"</u>
Elevation: <u>738.676</u>	



REMARKS AND LOCATION DESCRIPTION
<p>NOTRE DAME CONTROL PNT 5 (DECIO-GALVIN) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED APPROX 330' NORTH OF THE CENTER OF THE KNUTE ROCKNE GATE ON THE NORTH SIDE OF THE FOOTBALL STADIUM; CENTERED EAST-WEST IN THE QUAD AND 10' SOUTH OF THE SOUTH EDGE OF A WALK RUNNING EAST-WEST</p>

Horizontal Datum: NAD 83 (2011) EPOCH 2010.00
Vertical Datum: NGVD29
Unit of Measurement: US SURVEY FEET
Zone: INDIANA EAST
Observation Method: GNSS - STATIC
Correction Source: NGS OPUS
NGS Tie: G 103 (PID - DG9007)
Instrument Used: TRIMBLE R8 (II)
Crew: TURAY - RIEMKE
Weather: 82°(f) CLEAR, WINDY

GEODETIC CONTROL POINT DATA SHEET

Control Point: 9

UND Utility Grid: L7
 County and State: ST. JOSEPH, IN
 Sec., Twp. and Range: 6-T37N-R3E
 Size & Type: 4" BRASS TABLET
 Monumented: FALL OF 2014
 GNSS Obs. Date: 8 MAY 2015
 Relationship to Grade: FLUSH

LOCATION AND POSITION DATA	
SOUTHEAST SIDE OF CAMPUS, NORTHEAST OF LEAHY DRIVE AND EDISON ROAD INTERSECTION, SOUTH OF TRACK FIELD.	
Northing: <u>2348267.2541</u>	Latitude(N): <u>41° 41' 37.37626"</u>
Easting: <u>174326.0906</u>	Longitude(W): <u>86° 13' 46.74752"</u>
Elevation: <u>735.568</u>	



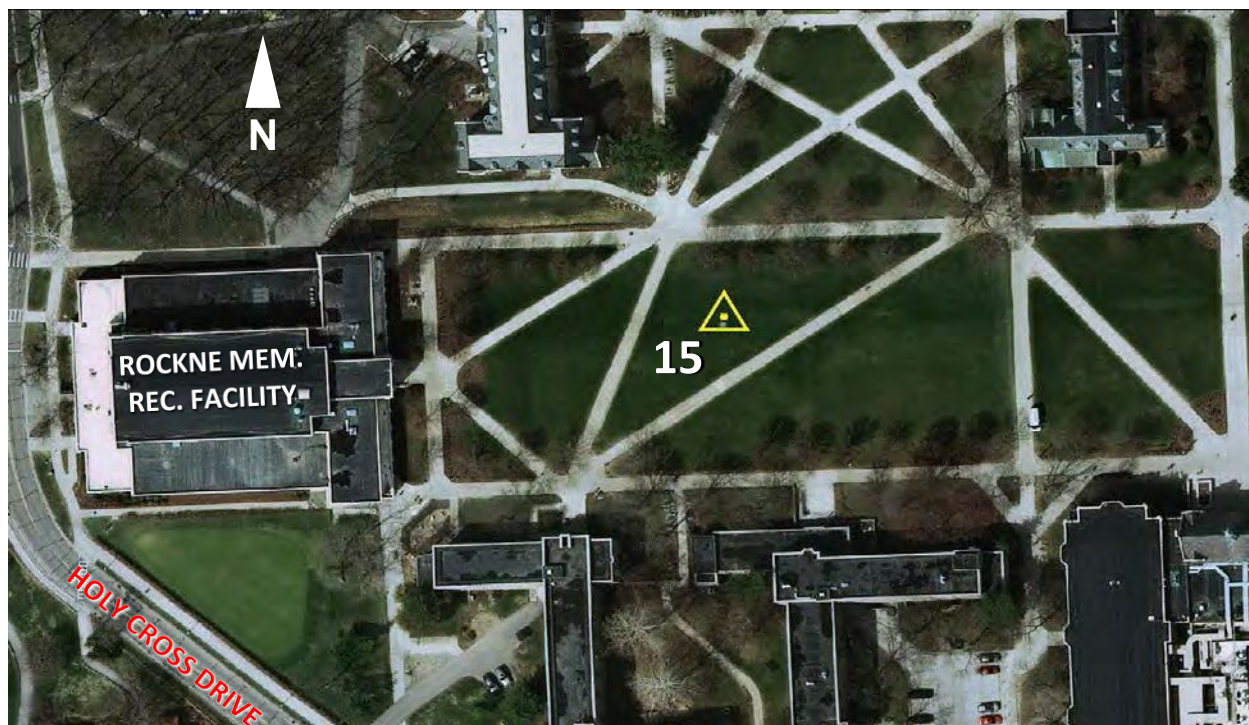
REMARKS AND LOCATION DESCRIPTION
<p>NOTRE DAME CONTROL PNT 9 (EDISON) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED 150' NORTHWEST ALONG LEAHY DR. FROM ITS INTERSECTION WITH THE CENTER OF EDISON RD.; THENCE 33' NORTHEAST FROM THE CENTER OF LEAHY DR.; 7.9' EAST OF THE SOUTHEAST COR. OF A 2' x 2' BRICK FENCE COR. PILLAR; 2.0' SOUTH OF A 6' ALUMINUM PICKET FENCE RUNNING EAST-WEST; 30.5' NORTH-NORTHEAST OF THE NORTHEAST COR. OF A CURB INLET IN THE EAST CURB LINE OF LEAHY DR</p>

Horizontal Datum: NAD 83 (2011) EPOCH 2010.00
 Vertical Datum: NGVD29
 Unit of Measurement: US SURVEY FEET
 Zone: INDIANA EAST
 Observation Method: GNSS - STATIC
 Correction Source: NGS OPUS
 NGS Tie: G 103 (PID - DG9007)
 Instrument Used: TRIMBLE R8 (II)
 Crew: TURAY - RIEMKE
 Weather: 79°(f) CLOUDY, WINDY

GEODETIC CONTROL POINT DATA SHEET

Control Point: 15

UND Utility Grid: <u>I4</u>	LOCATION AND POSITION DATA	
County and State: <u>ST. JOSEPH, IN</u>	WEST SIDE OF CAMPUS, IN THE MALL EAST OF ROCKNE MEMORIAL RECREATION FACILITY.	
Sec., Twp. and Range: <u>36-T38N-R2E</u>		
Size & Type: <u>2" BRASS TABLET</u>		
Monumented: <u>FALL OF 2014</u>	Northing: <u>2350620.8616</u>	Latitude(N): <u>41° 42' 0.39537"</u>
GNSS Obs. Date: <u>30 APRIL 2015</u>	Easting: <u>170762.0917</u>	Longitude(W): <u>86° 14' 33.93153"</u>
Relationship to Grade: <u>FLUSH</u>	Elevation: <u>728.225</u>	



REMARKS AND LOCATION DESCRIPTION
<p>NOTRE DAME CONTROL PNT 15 (THE ROCK) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTH SIDE OF AN 8" CONC. LIP; NEAR THE CENTER OF THE NORTH SIDE OF SAID LIP; BORDERING A 3' x 3' UTILITY TUNNEL HATCH. LOCATED 495' EAST AND 45' SOUTH OF THE CENTER OF THE INTERSECTION OF HOLY CROSS DR. AND DORR RD; 230' EAST AND 50' SOUTH OF THE NORTHEAST COR. OF THE ROCKNE MEMORIAL RECREATIONAL FACILITY – AKA "THE ROCK"</p>

Horizontal Datum:	<u>NAD 83 (2011) EPOCH 2010.00</u>
Vertical Datum:	<u>NGVD29</u>
Unit of Measurement:	<u>US SURVEY FEET</u>
Zone:	<u>INDIANA EAST</u>
Observation Method:	<u>GNSS - STATIC</u>
Correction Source:	<u>NGS OPUS</u>
NGS Tie:	<u>G 103 (PID - DG9007)</u>
Instrument Used:	<u>TRIMBLE R8 (II)</u>
Crew:	<u>TURAY - RIEMKE</u>
Weather:	<u>52°(f) CLEAR, WINDY</u>

Repeatable Position Analysis Based on Different Observation Methods

Control Network Point #1

Observation Style	Duration	Northing (US ft)	Easting (US ft)
OPUS Precise	6 hr	2353077.4447	173599.7928
RTK Rapid	1 sec	2353077.3737	173599.7320
RTK Topo	5 sec	2353077.3884	173599.7408
RTK Observed Control Point	180 epoch (3 min)	2353077.4066	173599.7957

Observed coordinate differences (US ft)

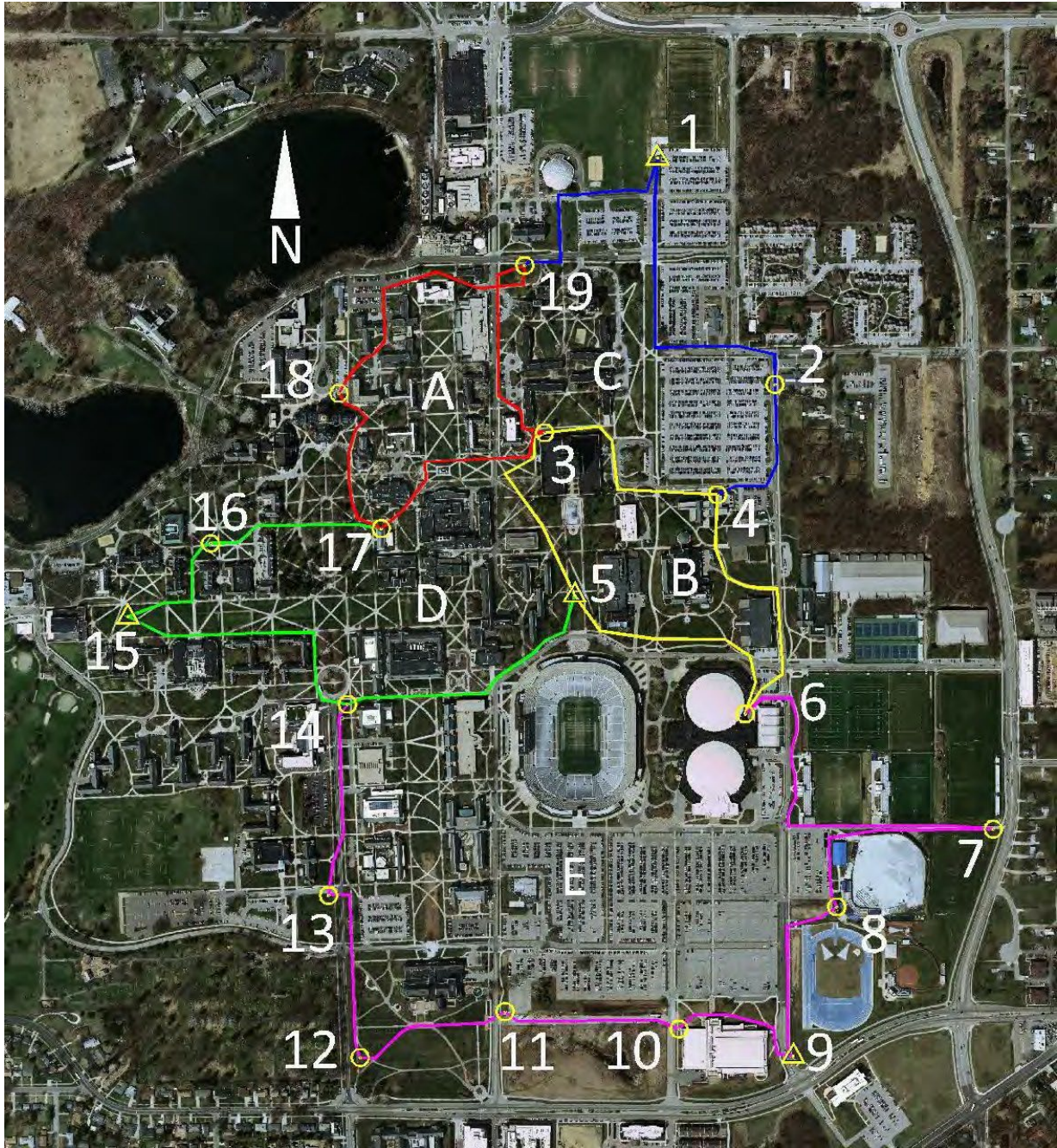
Maximum (obs. style independent)	0.0711	0.0637
OPUS vs. RTK OCP	0.0381	0.0029

Note: All RTK observations were made using the Midwest RTK network maintained by Seiler Instruments.

QA/QC Control Point NGS G103

Observation Style	Duration	Northing (US ft)	Easting (US ft)
OPUS Precise	27 min	2360616.1340	145370.0714
NGS Data Sheet	N/A	2360616.0700	145370.1300
Observed coordinate differences (US ft)		0.0640	0.0586

Vertical Control Loop Map





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525 WEST WASHINGTON AVENUE
SOUTH BEND, INDIANA 46601

Job # : 201471.00

By: SST

Ck'd: AWB

Subject: Level Notes // Vertical Control

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Date: 27 March 2015

Date: 14 May 2015

Project: University of Notre Dame – Campus-Wide Vertical Control

NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
1	729.124	NOTRE DAME CONTROL PNT 1 (RUGBY) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED 400' WEST AND 200' NORTH OF THE CENTER OF THE INTERSECTION OF WILSON DR. AND STEPAN DR.; 8.3' WEST OF A 6' CHAIN-LINK FENCE RUNNING NORTH-SOUTH; 13.3' EAST OF AN 8' WIDE PAVED PATH RUNNING NORTH-SOUTH; 17.1' EAST AND 33.8' SOUTH OF THE CENTER OF THE GATE TO THE STINSON RUGBY FIELD.
2	735.523	NOTRE DAME BM 2 (ECDC) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHWEST COR. OF AN 8" CONC LIP BORDERING A 3.3' x 3.3' UTILITY TUNNEL HATCH. LOCATED 175' SOUTH AND 18.5' EAST OF THE CENTER OF THE INTERSECTION OF BULLA RD AND LEAHY DR.; 11.7' WEST AND 17.5' NORTH OF A FIRE HYDRANT; 11.5' NORTH AND 22.4' WEST OF THE SOUTHWEST COR. OF THE EARLY CHILDHOOD DEVELOPMENT CENTER (ECDC) BUILDING.
3	740.540	NOTRE DAME BM 3 (HESBURGH LIBRARY) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET NEAR THE NORTHWEST COR. OF A 22' x 15' AIR EXCHANGE STRUCTURE WITH 12" CONC. WALLS. LOCATED 30' EAST AND 28' NORTH OF THE NORTHWEST COR. OF THE HESBURGH MEMORIAL LIBRARY.



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
4	740.526	NOTRE DAME BM 4 (PASQUERILLA CENTER) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHEAST COR. OF A 15' x 4.3' AIR EXCHANGE STRUCTURE WITH 12" CONC. WALLS. LOCATED 10' WEST AND 5' NORTH OF THE NORTHEAST COR. OF THE PASQUERILLA CENTER.
5	738.676	NOTRE DAME CONTROL PNT 5 (DECIO-GALVIN) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED APPROX 330' NORTH OF THE CENTER OF THE KNUTE ROCKNE GATE ON THE NORTH SIDE OF THE FOOTBALL STADIUM; CENTERED EAST-WEST IN THE QUAD AND 10' SOUTH OF THE SOUTH EDGE OF A WALK RUNNING EAST-WEST.
6	742.322	NOTRE DAME BM 6 (JOYCE) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE SOUTHEAST COR. OF A 22' x 8' AIR EXCHANGE STRUCTURE WITH 12" CONC. WALLS. LOCATED 62' NORTH OF THE JOYCE CENTER'S GATE 5 DOORS; EAST OF THE EAST SIDE OF THE JOYCE CENTER AND WEST OF THE WEST SIDE OF ROLFS AQUATIC CENTER.



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
7	738.667	NOTRE DAME BM 7 (TWYCKENHAM) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE SOUTHEAST SIDE OF A 24" DIAMETER CONC LIGHT POLE FOOTING. LOCATED 355' SOUTH AND 90' WEST OF THE CENTER OF THE INTERSECTION TWYCKENHAM DR. AND VANESS ST.; 41' WEST AND 18.5' NORTH OF PWP (J212/155); 3.7' SOUTH OF THE SOUTH EDGE OF A PAVED WALK THAT RUNS EAST-WEST.
8	740.367	NOTRE DAME BM 8 (BASEBALL) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE WEST SIDE OF A 36" DIAMETER CONC STRAIN POLE FOOTING. LOCATED 460' SOUTH AND 295' EAST OF THE CENTER OF THE INTERSECTION OF MOOSE KRAUSE CIR DR. AND LEAHY DR.; 34' WEST AND 45' NORTH OF THE ENTRANCE TO THE FRANK ECK BASEBALL STADIUM; 9' SOUTH AND 26' EAST OF A FIRE HYDRANT.
9	735.568	NOTRE DAME CONTROL PNT 9 (EDISON) 4" BRASS TABLET STAMPED "UNIV. OF NOTRE DAME SURVEY CONTROL POINT" SET IN A 12" x 48" BOTTOM FLARED CONC. POST – FLUSH WITH THE GROUND. LOCATED 150' NORTHWEST ALONG LEAHY DR. FROM ITS INTERSECTION WITH THE CENTER OF EDISON RD; THENCE 33' NORTHEAST FROM THE CENTER OF LEAHY DR.; 7.9' EAST OF THE SOUTHEAST COR. OF A 2' x 2' BRICK FENCE COR. PILLAR; 2.0' SOUTH OF A 6' ALUMINUM PICKET FENCE RUNNING EAST-WEST; 30.5' NORTH-NORTHEAST OF THE NORTHEAST COR. OF A CURB INLET IN THE EAST CURB LINE OF LEAHY DR.



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
10	740.739	NOTRE DAME BM 10 (COMPTON) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN AN 18" THICK CONC. STAIRWELL RETAINING WALL LOCATED 8.6' WEST OF THE WEST-NORTHWEST COR. OF THE COMPTON FAMILY ICE ARENA.
11	735.177	NOTRE DAME BM 11 (DPAC) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHWEST COR. OF A 6" CONC. LIP BORDERING A 4' x 4' UTILITY TUNNEL HATCH. LOCATED 366' SOUTH AND 58' EAST OF THE CENTER OF THE INTERSECTION OF HOLY CROSS DR. AND EDDY ST.; 245' EAST AND 63' SOUTH OF THE SOUTHEAST COR. OF THE DEBARTOLO PERFORMING ARTS CENTER; 10' NORTH AND 41' EAST OF A FIRE HYDRANT.
12	740.075	NOTRE DAME BM 12 (IRISH GREEN) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHEAST COR. OF A 6" CONC. LIP BORDERING A 4' x 4' UTILITY TUNNEL HATCH. LOCATED 276' NORTH AND 77' EAST OF THE CENTER OF THE INTERSECTION OF NOTRE DAME AVE. AND ANGELA BLVD; 63' NORTH AND 8.5' EAST OF A FIRE HYDRANT; 18.4' EAST OF THE EAST EDGE. OF AN 8' CONC. WALK RUNNING NORTH-SOUTH.



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
13	736.660	NOTRE DAME BM 13 (ECK VISITOR) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHWEST COR. OF A 6" CONC. LIP BORDERING A 4' x 4' UTILITY TUNNEL HATCH. LOCATED 291' NORTH AND 60' WEST OF THE CENTER OF THE INTERSECTION OF NOTRE DAME AVE. AND HOLY CROSS DR.; 73' SOUTH AND 80' EAST FROM THE SOUTHEAST COR. OF THE ECK VISITOR CENTER.
14	734.764	NOTRE DAME BM 14 (ECK LAW) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHEAST COR. OF A 6" CONC LIP BORDERING A 4' x 4' UTILITY TUNNEL HATCH. LOCATED 125' SOUTH AND 80' EAST OF THE CENTER OF THE TRAFFIC CIRCLE AT THE NORTH END OF NOTRE DAME AVE.; 74' NORTH OF THE CENTER OF THE WEST ENTRANCE TO THE ECK HALL OF LAW; 80' EAST OF THE CENTER OF NOTRE DAME AVE.
15	728.225	NOTRE DAME CONTROL PNT 15 (THE ROCK) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTH SIDE OF AN 8" CONC. LIP; NEAR THE CENTER OF THE NORTH SIDE OF SAID LIP; BORDERING A 3' x 3' UTILITY TUNNEL HATCH. LOCATED 495' EAST AND 45' SOUTH OF THE CENTER OF THE INTERSECTION OF HOLY CROSS DR. AND DORR RD; 230' EAST AND 50' SOUTH OF THE NORTHEAST COR. OF THE ROCKNE MEMORIAL RECREATIONAL FACILITY – AKA "THE ROCK".



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
16	731.465	NOTRE DAME BM 16 (BOND) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHEAST COR. OF A 10" CONC. LIP BORDERING A 34" x 20" UTILITY TUNNEL HATCH. LOCATED 137' EAST OF THE SOUTHEAST COR. OF BOND HALL; 133' WEST AND 10' NORTH OF A STATUE OF A HUSBAND AND WIFE WITH A BABY.
17	733.124	NOTRE DAME BM 17 (CROWLEY HALL) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHWEST QUADRANT OF A 4' x 3.5' CONC. PAD WITH A 24" TUNNEL ACCESS MANHOLE. LOCATED 10' WEST AND 3.3' NORTH OF THE NORTHEAST COR. OF THE NORTH-MOST FACE OF CROWLEY HALL AND ALSO BEING 5.5' EAST OF A FIRE DEPT. CONNECTION IN THE NORTH-MOST FACE OF CROWLEY HALL.
18	734.850	NOTRE DAME BM 18 (DOME) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET IN THE NORTHEAST COR. OF A 5" CONC. LIP BORDERING A 6.3' x 4.3' UTILITY TUNNEL HATCH. LOCATED 60' NORTH AND 61' EAST OF THE NORTHEAST COR. OF THE NORTH-MOST FACE OF THE MAIN ADMINISTRATION BUILDING (NOT THE COR. OF THE PORCH STRUCTURE); 2.3' SOUTH OF THE SOUTH BACK OF CURB OF A PARKING AREA; 50' EAST AND 21' NORTH OF A FIRE HYDRANT.



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NOTRE DAME - BENCHMARK SUMMARY

STA	ADJ ELEV (NGVD29)	REMARKS
19	728.449	NOTRE DAME BM 19 (HAMMES MOWBRAY) 2" BRASS TABLET WITH RAISED DOME STAMPED "UNIV. OF NOTRE DAME BENCHMARK" SET 1.65' NORTH OF THE SOUTHEAST COR. OF AN 8" CONC. LIP BORDERING A 3.2' x 2.7' UTILITY TUNNEL HATCH. LOCATED 45.5' SOUTH OF THE CENTERLINE OF HOLY CROSS DRIVE; 135' SOUTH AND 64' EAST OF THE SOUTHWEST COR. OF HAMMES MOWBRAY HALL.