

NORTH CAROLINA Department of Transportation



Survey Control Sheets Overview Pre-Construction Conference Location & Surveys Unit

May 8-9, 2018

Introduction To NCDOT Plan Changes

- NCDOT Responsibilities (Chapter 89C)
- Issues raised by NCBEES & Surveying Industry Leaders concerning NCDOT plans
- New Legislation/Response (HB 501)
- Overview of Individual Sheets (C, D, E,R/W)
- Property Ties (located on R/W sheets)

Transportation Facilities

Our Primary Product

- Built
- Maintained



Our Other Products

Plan Sheets/ CADD Files Used By •Geotech, Hydro, Biologists, etc. •Tax Offices/GIS Departments •City Planners •Private Land Developers •Other Engineers •Surveyors •Attorneys



Our Other Products

- Not Just Engineering Plans
 anymore
- Now Considered as Documentation of Property Purchases
- And Record of Destroyed Property Monumentation



§ 89C-2. Declarations; prohibitions

In order to safeguard life, health, and property, and to promote the public welfare, the practice of engineering and the practice of land surveying in this State are hereby declared to be subject to regulation in the public interest. It shall be unlawful for any person to practice or to offer to practice engineering or land surveying in this State, as defined in the provisions of this Chapter, or to use in connection with the person's name or otherwise assume or advertise any title or description tending to convey the impression that the person is either a professional engineer or a professional land surveyor, unless the person has been duly licensed. ...

§ 89C-3. Definitions

(6) Practice of engineering. –

b. The term "practice of engineering" shall not be construed to permit the location, description, establishment or reestablishment of property lines or descriptions of land boundaries for conveyance...

§ 89C-3. Definitions

(7) Practice of land surveying. -

- 1. Locating, relocating, establishing, laying out, or retracing any property line, easement, or boundary of any tract of land;
- 2. Locating, relocating, establishing, or laying out the alignment or elevation of any of the fixed works embraced within the practice of professional engineering;
- 3. Making any survey for the subdivision of any tract of land, including the topography, alignment and grades of streets and incidental drainage within the subdivision, and the preparation and perpetuation of maps, record plats, field note records, and property descriptions that represent these surveys;

§ 89C-3. Definitions.

- (7) Practice of land surveying. cont.
- 4. Determining, by the use of the principles of land surveying, the position for any survey monument or reference point, or setting, resetting, or replacing any survey monument or reference point;
- 5. Determining the configuration or contour of the earth's surface or the position of fixed objects on the earth's surface by measuring lines and angles and applying the principles of mathematics or photogrammetry;

§ 89C-19. Public works; requirements where public safety involved.

This State and its political subdivisions such as counties, cities, towns, or other political entities or legally constituted boards,... or officials, or employees of these entities shall not engage in the practice of engineering or land surveying involving either public or private property where the safety of the public is directly involved without the project being under the responsible charge of a professional engineer for engineering projects, or a professional land surveyor for land surveying projects, as provided for the practice of the respective professions by this Chapter.

§ 89C-19. Public works; requirements where public safety involved cont.

Nothing in this section shall be construed to prohibit inspection, maintenance and service work done by employees of the State of North Carolina, any political subdivision of the State, or any municipality including construction, installation, servicing, and maintenance by regular full-time employees of, secondary roads and drawings incidental to work on secondary roads, streets, street lighting, traffic-control signals,...

NCBEES & Surveying Industry Leaders Issues concerning NCDOT plans

- 1. Lack of public availability of plans for NCDOT land acquisition.
- 2. Lack of metadata on plans, including coordinate system, control points set, and closures.
- 3. Complexity of plans (readability, alignments).
- 4. Lack of consistency in locating, documenting, and representing property boundaries.
- 5. Complexity of right of way deeds, based on station/offset.
- 6. Chain of responsible charge for the PLS doing survey/mapping work.
- 7. Proper monumentation of the right of way (not part of the committee discussion but as a result of conversation with NCBEES).

Plan to Resolve Issues

As a result of STRONG inquiries by NC Board of Examiners for Engineers and Land Surveyors (NCBEES) and the Survey Industry Leaders (NC Society of Surveyors), NCDOT formed a Survey Plans Committee:

Representatives from:

- Divisions
- Right Of Way
- Preconstruction
- Design-Build
- Attorney General's Office
- NCBELS (non-voting)

Issues were addressed via two methods:

NCDOT Internal Procedure Memo

• New Legislation (HB 501)

Chief Engineer's Memo



STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

ROY COOPER GOVERNOR

JAMES H. TROGDON, III SECRETARY



To:

From:



Mr. Mike L. Holder, PE Chief Engineer, Division of Highways

Mapping Requirements for Transportation Facility Plans Subject:

The following concerns have been expressed by the NC Board of Examiners for Engineers and Surveyors (NCBEES) regarding NCDOT highway and Secondary Road plans:

- 1. Lack of public availability of plans for NCDOT land acquisition.
- 2. Lack of metadata on plans, including coordinate system, control points set, and closures.
- 3. Complexity of plans (readability, alignments).
- 4. Lack of consistency in locating, documenting, and representing property boundaries.
- 5. Complexity of right of way deeds, based on station/offset.
- 6. Chain of responsible charge for the PLS doing survey/mapping work.
- 7. Proper monumentation of the right of way (not part of the committee discussion but as a result of conversation with NCBEES).

House Bill 501

10 "§ 136-19.4A. Required surveying information in certain acquisition plans.

The Department of Transportation shall include in any plan prepared for the purpose of 11 acquiring right-of-way, a permanent easement, or both, that depicts property lines, right-of-way 12 lines, or permanent easements, a set of drawings that clearly identify design alignments, 13 baseline control points, found property-related corner markers, and new right-of-way and 14 permanent easement corner markers. Plans subject to the requirements of this section shall 15 document the localized coordinates for each major control point along the design alignments. 16 The coordinates and associated localization metadata shall be based upon, and tied to, the North 17 18 Carolina State Plane Coordinate system and shall be clearly identified within the plans. All property corner markers found and surveyed shall be clearly identified within the plans in 19 accordance with general surveying standards and procedures. Each property corner marker 20 shall be accurately tied to the design alignment or the North Carolina State Plane Coordinate 21 system, by either a system of bearings and distances or by station and offset." 22

Comments On Property

The NCDOT Surveyor's Role is to establish the property line between Public and Private ownership, and to document:

- Location of Right Of Way (Bought or Borrowed)
- Evidence of Property Ownership we have used or destroyed

IT IS NOT OUR BUSINESS TO DETERMINE THE LOCATION OF PRIVATE PROPERTY LINES





Survey Control Sheets

- History of Control Sheets
- Overview of Individual Sheets
- Property Ties

Survey Control Sheets History

- 2003 Introduction
- 2010 Addition of R/W Tables
- 2017 Addition of R/W sheets

Survey Control Sheets

Control Sheets Breakdown

- "C" Series (Survey Control and Existing Centerlines)
- "D" Series (Design Alignment Cardinal Stations)
- "E" Series (R/W and Easement Tables)
- "RW" Series (Modified Plan Sheets for Clarity)
- * Note: All Sheets will appear directly behind the Design Plan Sheets as a set.

"C" Series Sheets

- Survey Control and Existing Centerlines
- Delivered with Full Surveys
- Produced using ...
 - MicroStation
 - "C" series border cell
 - SurveyTable.ma
 - Other applications



FINAL C	SAMPLE : 7	PLANS			30					
JULI 2017					W/ EXIST	ING CENTI	ERLINE AL	IGNMENTS	S PRIOR 1	IO CONSTRUCTION
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS	3
	760233.044	1628511.613	N 01*42′16.2* W	528.21						
CURVE	760761.019	1628493.901	N Ø1*47′35.2*W	117.55	00"10'38.1"(LT)	00.03.05'8	117.549	58.775	38000.000	
LINE	761735.626	1628464,064	N 01'52'54.2" W	857.56						
PT	761938.443	1628458.773	N Ø1*29'39.1" W	202,91	00*46'30.2*(RT)	00°22′55.1°	202.907	101.455	15000.000	
LINE PC	762115.785	1628455.347	N 01'06'24.0' W	177.38	0015 3105 000 X	AVE 1/25 51	40.040	24.022	2222.022	
	762165.628	1628453.971	N 02*03/30 9*W	224.37	00'57'06.4'(LT)	01.24.32.2.	47.842		3000.000	-
POT	762389.829	1628445.911	14 82 83 38.4 W	224.37						
										POT 762120.233 1628455.258
EY										POT 762127.488 1628686.589
PC TYPE	NDRTH 761050.384	EAST 1626995.448	BEARING	DISTANCE	DELTA	000	LENGTH 2242 JE4	IANGENT	FRAULUS	
PT	761179.814	1629999,798	N 67 31 54.0 E	3007.14	30 35 22.0 (11)	01 00 10.7	3643124	1556.779	5700,000	
EY1										EY6 TYPE NORTH EAST BEARING DISTANCE
PC	NORTH 760934.128	EAST 1627738.897	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS	POT 762138.459 1628064.092 LINE S 87*44'7.6' E 391.41
PT	760885.122	1627847.415	S 65'41'47.2'E	119.07	42"18'03.8"(L1)	34-43-29.0	121.818	63.835	165.000	POT762122,9931628455,1991
	760876.578	1628002.517	5 86'50'49.0'E	119.40	03*25/16 1*(PT)	02*51/53.2*	119 421	59 728	2000 000	
	760866.455	1628121.490	5 83'25'32.9'F	38.87	03 23 16.1 (417	82 51 53.2	117,421		2000.000	-
PC	760862.005	1628160.101	S 78'19'41.4' E	204.36	10"11'42.9"(RT)	Ø4*58/56.1*	204.632	102,587	1150.000	
PT	760820.661	1628360.237	S 73*13'50.0" E	141.10						
POT	760779.952	1628495.333								EY7 TYPE NORTH EAST BEARING DISTANCE
EXO										POT 761484.504 1628824.594 LINE NØ2'19'20.3' W 449.68
TYPE	NORTH 760929.095	EAST 1628490.561	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS	
LINE	760727.602	1628651.260	S 38*34'25.1' E	257.73						
TYPE	NORTH	EAST	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS	PDT 761450.090 1629163.664 01514402
	760166.602	1628768 651	N 14*07'35.4* E	88.94						POT 761872.361 1629147.922
CURVE	761123.537	1628761.311	N 06*05'42.2' W	69.13	40°26'35.3'(LT)	57*17/44.8*	70.587	36.836	100.000	
POT	761135.515	1628755.411	N 26*18/59.9* W	13.31						
EV.										
	NORTH 761728.481	EAST 1628464 298	BEARING	DISTANCE	DELTA	DOC	LENGTH	TANGENT	RADIUS	
LÎNE	761734,587	1628561.390	N 86*24'4.4* E	97,28						
CURVE PT	761736,515	1628614.776	N 87*55′54.5*E	53.42	03"03'40.3"(RT)	Ø5*43'46.5*	53.428	26.720	1000.000	
LINE PC	761737.282	1628696.556	N 89*27'44.7* E	81.78		0511 0-01 F	55.364	14.100	1100.005	
<u>CURVE</u> PT	761738.058	1628728.809	N 88*37/19.7*E	32.26	01*40'50.0'(LT)	.05'12'31.3'	32.264	16.133	1100.000	
POT	761756.678	1629209.541	N 8/ 46 54./ E	401.09						∃
										NOTES:

NOTE: DRAWING NOT TO SCALE

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

"D" Series Sheets

- Design Alignment Cardinal Stations
- Coordinates for Cardinal Station
- Produced using ...
 - MicroStation
 - "D" series border cell
 - RWTable.ma application for table



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"E" Series Sheets

- R/W and Easement Tables
- Signed and Sealed by PLS
- Produced using ...
 - MicroStation
 - "E" series border cell & Surveyors Seal
 - RWTable.ma application
 - Surveyors Attestation from NCMAP-Loc



Signed and Sealed

RIGHT OF WAY CONTROL SHEET B-3159

FINAL SAMPLE PLANS **IULY 2017**

ROW MARKER CONCRETE OR GRANITE-E							
ALIGN	STATION	OFFSET	NORTH	EAST			
L	7+67.51	73.04	760746.1612	1628603.1075			
L	7+68.15	73.90	760746.8307	1628603.9470			
L	7+95.38	-3.60	760771.5113	1628525.6012			
L	8+10.63	40.87	760788.2050	1628569.5427			
L	8-53.81	116.27	760826.2284	1628411.0815			
L	18+37.00	42.00	761816.9023	1628535.6425			
L	19+17.07	-51.34	761878.5459	1628430.0417			
L	19+28.79	42.00	761914.0613	1628517.1354			
L	20-64.72	-40.00	762036.0113	1628416.8809			
L	20+64.72	40.00	762037.5566	1628496.8709			
L	20+92.00	-40.00	762263.2837	1628416 3541			

1/26, //2

-99.00

-90.00

-85.00

OFFSET

-145.00

-130.00

ROW MARKER CONCRETE OR GRANITE-E						
ALIGN	STATION	OFFSET	NORTH	EAST		
¥7	12+35.00	40.00	761411.0691	1629566.9451		
¥7	12+85.00	40.00	761420.2856	1629517 8018		
¥7	13+97.95	60.00	761460.7629	1629410.4751		
¥7	17+28.59	-60.00	761573.2311	1629116.5316		
¥7	18+02.23	60.00	761687.5835	1629214.8859		
¥7	18+02.23	-60.00	761683.0501	1629094.9715		
¥7	18+51.37	-60.00	761732.1538	1629093.1152		
¥7	18+51.48	60.00	761736.7983	1629213.0253		

DOM MADINED CONCRETE OD CRANTTE F

	NUW MHA	KEN CUNCHET	E UN UNHNLIE-	E
ALIGN	STATION	OFFSET	NORTH	
RPA	13-88.67	55.00	761461.5250	
RPA	16+84.67	70.00	761658.0081	
RPA	20+63.28	70.00	761786.2616	

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
RPC	11+25.00	88.73	761070.0452	1627575.0204
RPC	12+59.00	95.00	761077.0570	1627695.4399
RPC	14+40.28	95.00	761057.0859	1627845.4522
RPC	16+24.28	115.00	760974.2391	1627992.8873
RPC	17+36.28	105.00	760935.2136	1628098.3423
RPC	19+08.96	93.00	760894.9024	1628304.6267
RPC	20-19-00	91.01	760890 8868	1628414 6133

19.11 760833.2012 1628599.0177 10-70.07 10+70.07 20.00 760833.7577 1628599.7149 11+92.47 20.00 760935.0903 1628558.3303

<u>} GRANITE</u>-NORTH

761397.7160

761385.3381

761350.3463

761321.2552

761367.6155

761352.8706

1629327,0805

1629376.9452

1629577.4187

1629726,9963

1629807.9299

1629805.1749

EAST

TE OR

CONCRETE OR GRANITE-FFSET NORTH

	ROW MAR	KER CONCRETE	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
¥5	10+85.00	20.01	762102.8942	1628540.8437

	ROW MAR	KER CONCRET	E OR GRANITE-	E
ALIGN	STATION	OFFSET	NORTH	EAST
Y6	11+50.00	22.42	762103.9065	1628370.5051

_____, a ProfessionalLand Surveyor in the state of North Carolina hereby certify to the best of my knowledge and belief that the following work item(s) (R/W Staking) performed under my responsible charge meet NCDOT Survey Standards as directed in the NCDOT Location & Surveys guidelines and procedures.

I further certify that the data compiled came from available surveys/mapping performed by others and provided to me by NCDOT and do not certify to the accuracy or quality of the individual data sources.

ALIGN

33+50.00

34+00.00

36+00.00

37+50.00

38+20.00 38+20.00

STATION

I further certify that the right of way and permanent easement points shown herein and outlined in the tables shown hereon (localized coordinates, station/offset) have been checked and are accurate representations of the right of way and permanent easement points depicted on the corresponding highway plans. I loso certify that the right of way and permanent easement points shown herein have been field monumented under my supervision from existing survey controlprovided by others; that the depicted property data shown herein were surveyed by others; and these monuments denote the right of way and easement boundaries at the time of staking which may be subject to change due to right of way revisions (See deeds for final determination).

Witness my original signature, registration number and seal this 31st day of July, 2017.



L-----PLS #

NOTE: DRAWING NOT TO SCALE

Statement and Seal

EAS 1629232 3022

1629023.0697

(placement may vary according to available space on sheet)

NOTES:

I. IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.



PERMANENT EASEMENT CONTROL SHEET B-3159

ALIGN RPA

RPA

RPA

RPC

16.06.38

16+84.67

20+63.28

12.59.00

13.05.00

13-58.93

13.65.00

14.40.28

14.48.24

16+24.28

17.36.28

19+08.96

20.19.00

FINAL SAMPLE PLANS

JULY 2017



	PERMANENT EASEMENT MARKER-E							
ALIGN	STATION	OFFSET	NORTH	EAST				
L	6+84.80	136.03	760665.5550	1628668.7673				
L	7+58.83	·63.7Ø	760733.0147	1628466.7215				
L	7+97.03	-73.08	760770.8844	1628456.1057				
L	8.00.04	10.00	760776.6163	1628539.0386				
L	18.01.78	-83.53	761774.4828	1628412.8145				
L	18+58.00	62.00	761842.2086	1628552.6898				
L	19+28.79	·72.00	761883.1774	1628407.3984				
L	19+28.79	62.00	761919.4783	1628536.3831				
L	20.64.72	62.00	762037.9814	1628518.8619				
L	20.96.08	62.00	762069.3323	1628518.2563				
L	21-05.41	-57.51	762076.3530	1628398.5883				

PERMANENT EASEMENT MARKER-E

ALIGN	STATION	OFFSET	NORTH	EAST
Y	14.50.00	130.00	761043.9961	1627458.7392
Y	34-49.00	129.39	761152.8466	1629399.2092
Y	34+49.00	146.00	761136.3526	1629397.2267
Y	34-58.69	146.00	761135.2179	1629406.6000
Y	34+68.95	146.00	761133.9986	1629416.5255
Y	34-78.00	129.33	761149.4531	1629427.3472
Y	34-78.00	146.00	761132.9090	1629425.2732

PERMANENT EASEMENT MARKER-E

ALIGN	STATION	OFFSET	NORTH	EAST
Y6	10-40.00	22.60	762108.0715	1628260.5838
Y6	10.40.00	29.00	762101.6765	1628260.3310
Y6	11.54.89	29.00	762097.1368	1628375.1299

PERMANENT EASEMENT MARKER-E

ALIGN	STATION	UFFSEI	NURTH	EAST
¥7	12.35.00	64.00	761434.6578	1629571.3690
¥7	13-04.00	118.00	761500.4513	1629513.5053
¥7	13.55.00	52.39	761445.3714	1629451.2861

I,, a Professional Land Surveyor in the state of North Carolina hereby certify to the best of my knowledge and belief that the following work item(s) (Base map Compilation, R/W Staking) performed under my responsible charge meet NCDOT Survey Standards as directed in the NCDOT Location & Surveys guidelines and procedures.

I further certify that the data compiled came from available surveys/mapping performed by others and provided to me by NCDOT and do not certify to the accuracy or quality of the individual data sources.

I further certify that the right of way and permanent easement points shown herein and outlined in the tables shown hereon (localized coordinates, station/offset) have been checked and are accurate representations of the right of way and permanent easement points depicted on the corresponding highway plans. Laiso certify that the right of way and permanent easement points shown herein have been field monumented under my supervision from existing survey control provided by others; that the depicted property data shown herein were surveyed by others; and these monuments denote the right of way and easement boundaries at the time of staking which may be subject to change due to right of way revisions (See deeds for final determination).

Witness my original signature, registration number and sealthis 1st day of August, 2017.

I. IF FURTHER INFORMATION REGARDING PROJECT CONTROL IS NEEDED, PLEASE CONTACT THE LOCATION AND SURVEYS UNIT.

PERMANENT EASEMENT MARKER-E STATION OFFSET NORTH

100.00

100.00

100.00 PERMANENT EASEMENT MARKER-E

115.00

226.19

115.00

115.00

243.55

135.00

113.00

112.00

125.00

115.00

NORTH 761627,9321

761057.0619

761056.4287

760942.0307

761037.9026

760913.2328

761051.2587

761680.3071 1629843.1384

761816.0462 1628614.1424

760956.1730 1627984.3074 760917.1462 1628089.7594

760874.9321 1628303.5359 760869.9287 1628413.4686

EAS

1629101.3340

EAST

1627732.8542

1627780.8006

1627807.9663

1627695.8810

1627759.5620

1627839.7953

ProfessionalLand Surveyor

L-.... PLS #

NOTE: DRAWING NOT TO SCALE

2. PROJECT CONTROL WAS ESTABLISHED USING GNSS, THE GLOBAL NAVIGATION SATELLITE SYSTEM.

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"RW" Series Sheets

- Modified Plan Sheets for Clarity
- Property Ties Now on RW Sheets
- Produced from original plan sheets using MicroStation filters and cell library
- Each sheet matches area covered by corresponding plan sheet (i.e. 4 = RW4)



Signed and Sealed



Possible cell replacement-to reflect Rebar and Cap





Report of Final R/W and Permanent Easement Survey

(Replacement and /or Re-establishing Verification of Right of Way and Permanent Easement Markers for the North Carolina Department of Transportation)

TIP No.:

Project No.:

County:

Project Description:

Plans Recorded in: <County Highway Plan Book designation, i.e. Map Book, Page>

I certify that this survey was done under my responsible charge in accordance with the <u>NCDOT Survey</u> <u>Standards</u> as directed in the <u>NCDOT Location & Surveys Guidelines and Procedures</u> and the <u>Manual for</u> <u>Construction Layout</u> for the purpose of (re-establishing/replacement) of R/W and/or permanent easement markers. That per the Project Plans of Record the following list of markers were either reestablished or replaced at the following station/offset locations:

	Line Descriptor (-L-,-Y-, etc.)	Station	Offset	Northing	Easting	Re-placed or Re- established	Type and Material of Original Marker	Type and Material of New Marker
	Examples L	28+56.23	148.66, Rt.	878,948.23	2,456,128.92	Re-placed	R/W, Iron Pin & Cap	R/W, Concrete
	Y	58+72.66	167.89, Lt.	868,785.45	2,456,849.88	Re- established	Easement, Iron Pin & Cap	Easement, Iron Pin & Cap

All bearings and coordinates are referenced to the North Carolina State Plane Coordinate System per Plans of Record.

Witness my signature, registration number and seal this _____day of ______,20

21 NCAC 56 .1602 SURVEYING PROCEDURES

(f) The results of a survey shall be reported to the user of that survey as a map or report of survey and, whether in written or graphic form, shall be prepared in a clear and factual manner. All reference sources shall be identified. Artificial monuments called for in such reports shall be described as found or set. When no monument is found or set for points described in Paragraph (e) of this Rule, that fact shall be noted.

Map or Report of Survey

Table shows monuments replaced or reset along with the type of monument.

Property Ties

- Now located on R/W Sheets
- Using information on "D" sheets, coordinates can be easily computed.

**All Property Ties NOW Shown on RW Sheets - NOT On Plan Sheets

Easily Compute Coordinates For Any Property Corner

Survey Control Sheets Review

- NCDOT Responsibilities (Chapter 89C)
- New Legislation/Response (HB 501)
- Overview of Individual Sheets (C, D, E,R/W)
- Property Ties (located on R/W sheets)

Questions/Discussion

