

TURN LANE STUDY
US 83 & E Jct ND 5
US 83 RP 253.622, ND 5 RP 152.166
HSIP 441804



Prepared By:
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
PROGRAMMING DIVISION
TRAFFIC OPERATIONS SECTION

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May 2014

INTRODUCTION:

The NDDOT Minot District submitted an HSIP project request to install an EB to NB left turn lane at the US 83 & E Jct ND 5 intersection. The application is in **Appendix A**.

INFORMATION/ANALYSIS:

Intersection Sight Distance Analysis

The intersection sight distance is adequate. Calculations and figures are in **Appendix B**.

Crash Analysis

During a 5 year study period, 4/1/09 – 3/31/14, there were zero reported crashes at the intersection.

Traffic Volumes

Traffic volumes were obtained from NDDOT’s Traffic Data Section. Volume info is in **Figure 1** below and in **Appendix C**.

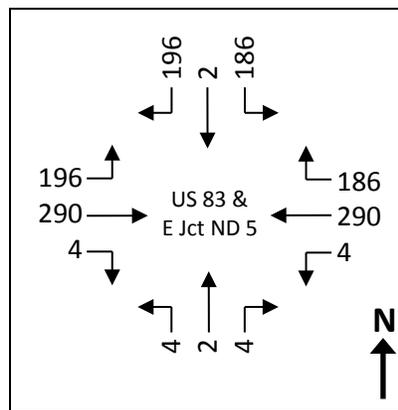


Figure 1 – 2013 Traffic Volumes

Turn Lane Criteria

Turn lane criteria are included in NDDOT’s Guidelines for the Installation of Turn Lanes Along State Highways (2011 Edition). **Table 1** shows volume criteria are satisfied for the EB to NB left turn movement and for the WB to NB right turn movement.

Table 1 - Turn Lane Info for US 83 & E Jct ND 5					
Movement	Volume Criteria	2013 AADT	2013 % Trucks	2013 PCE	Volume Criteria Met?
Major Road Entering AADT	Mainline AADT ≥ 750	970	---	---	Yes
EB to NB Left Turn	Left Turn PCE ≥ 125	196	22%	218	Yes
EB to SB Right Turn	Right Turn PCE ≥ 125	4	25%	5	No
WB to SB Left Turn	Left Turn PCE ≥ 125	4	25%	5	No
WB to NB Right Turn*	Right Turn PCE ≥ 125	186	20%	205	Yes
Notes: PCE = Passenger Car Equivalent Level Terrain (≤2%) was used to calculate PCE. *There is an existing WB to NB right turn lane.					

Capacity Analysis

To determine the L4 storage length for the proposed EB to NB left turn lane, a capacity analysis was performed using future 2033 volumes. For the capacity analysis, the 10% peak hour was analyzed, the peak hour factor was assumed to be 0.88, and HCS 2010 software was used. The capacity worksheet is in **Appendix D**.

The capacity results show an EB to NB left turn lane would have a 95th percentile queue length of zero feet, which is less than NDDOT's default minimum L4 storage length of 100ft.

RECOMMENDATIONS:

It is recommended to advance this HSIP project request forward to the HSIP project prioritization process. If selected for funding, then it is recommended the L4 storage length be 100ft.

Appendices

- A – HSIP Safety Project Application
- B – Intersection Sight Distance Information
- C – Traffic Volume Information
- D – Capacity Analysis Worksheet

Appendix A – HSIP Safety Project Application

Slag, Donovan M.

From: Kuntz, Shawn P.
Sent: Wednesday, November 13, 2013 3:32 PM
To: Slag, Donovan M.
Subject: FW: Solicitation Memorandum for 2015-18 Highway Safety Improvement Program
Attachments: 2015-18 Solicitation for Safety Projects.docx

Follow Up Flag: Follow up
Flag Status: Flagged

FYI
4 turn lane projects for HSIP.
S.K.

From: Redding, Jim L.
Sent: Friday, November 08, 2013 8:25 AM
To: Kuntz, Shawn P.
Subject: FW: Solicitation Memorandum for 2015-18 Highway Safety Improvement Program

Shawn,

Minot District recommendations for 2015-2018 HSIP.

- US 52 RP 103.32 West Logan intersection, add EB left turn lane
- US 52 RP 104.24 East Logan intersection, add EB left turn lane
- US 83/ND 5/ND 256 US 83 RP 237.02 intersection improvements to include left turn lanes for NB and WB traffic
- East Jct US 83 /ND 5 US 83 RP 253.62 intersection improvements to include EB left turn lane

Will HSIP funding be available for funding safety improvements such as signals and street lighting? For example, US 2 & 42nd St, US 83 Bypass & 21st Ave NW, etc?

Jim

From: Kuntz, Shawn P.
Sent: Tuesday, October 29, 2013 11:24 AM
To: Levi, Kevin J.; Gangl, Larry J.; Peterson, Walt A.; Redding, Jim L.; Semenko, Greg J.; Noehre, Les W.; Walton, Bob R.; Thompson, John E.; Mongeon, Karin L.
Cc: Slag, Donovan M.; Berger, Jane E.; Orn, Chad M.
Subject: Solicitation Memorandum for 2015-18 Highway Safety Improvement Program

Appendix B – Intersection Sight Distance Information

Calculations..... 7
Intersection Sight Triangles..... 8

Intersection Sight Distance Calculations

$ISD = 1.47 \times V_{major} \times t_g$ <-- Equation 9-1 from 2011 AASHTO Green Book.
 $V_{major} = 65$ mph

23 USC § 409 Documents
NDDOT Reserves All Objections

Case B1 (left turn from stop)			
Vehicle Type	t_g	ISD (ft)	ISD (rounded)
PC	7.5	717	720 ft
SU	9.5	908	910 ft
COMB	11.5	1099	1100 ft

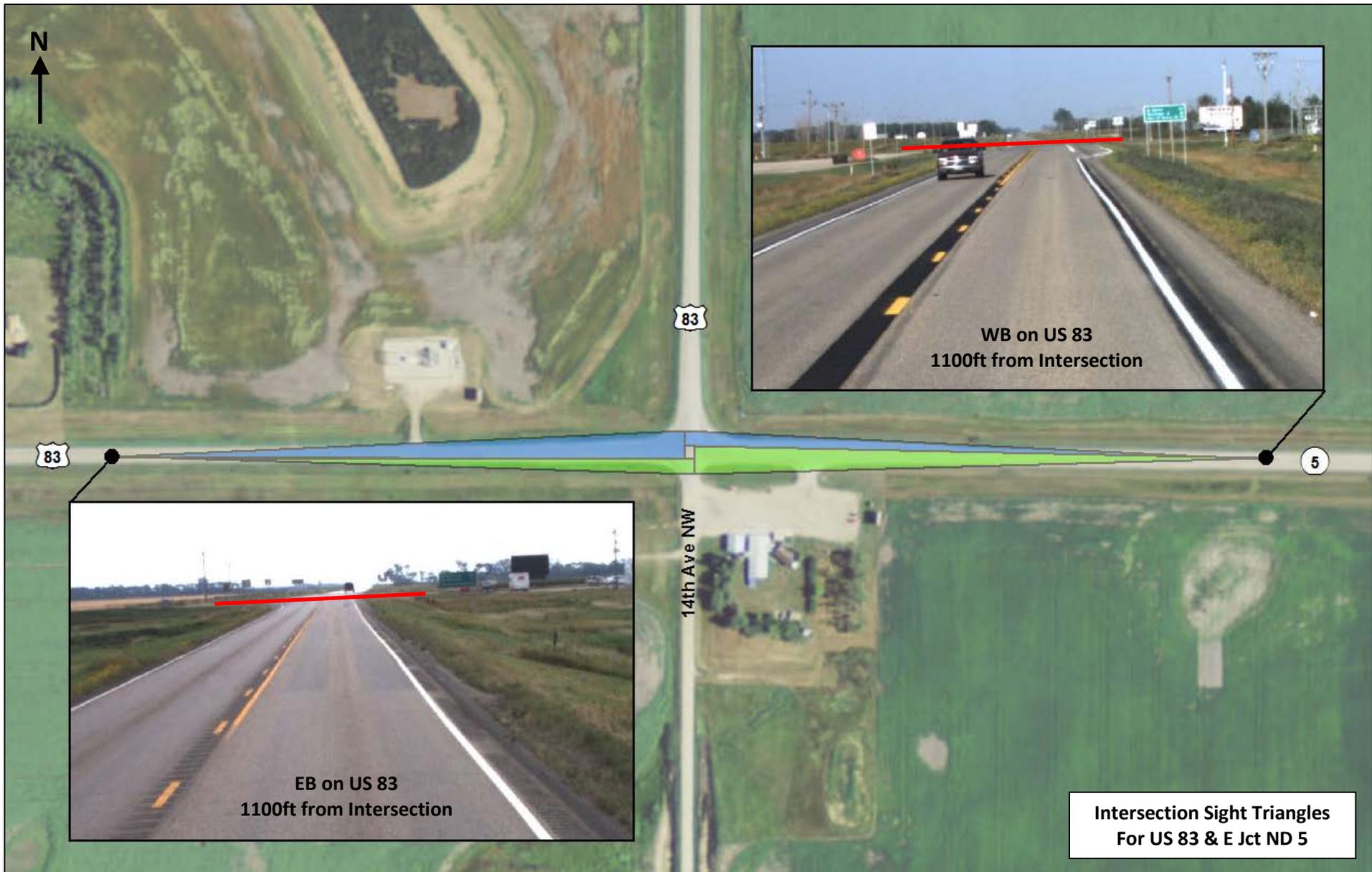
Base t_g values for Case B1 from 2011 AASHTO Green Book Table 9-5.

Case B2 (crossing) and B3 (right turn from stop)			
Vehicle Type	t_g	ISD (ft)	ISD (rounded)
PC	6.5	621	625 ft
SU	8.5	812	815 ft
COMB	10.5	1003	1005 ft

Base t_g values for Cases B2 and B3 from 2011 AASHTO Green Book Table 9-7.

Case F (major road left turn)			
Vehicle Type	t_g	ISD (ft)	ISD (rounded)
PC	5.5	526	530 ft
SU	6.5	621	625 ft
COMB	7.5	717	720 ft

t_g values for Case F from 2011 AASHTO Green Book Table 9-13.



Intersection Sight Triangles
For US 83 & E Jct ND 5

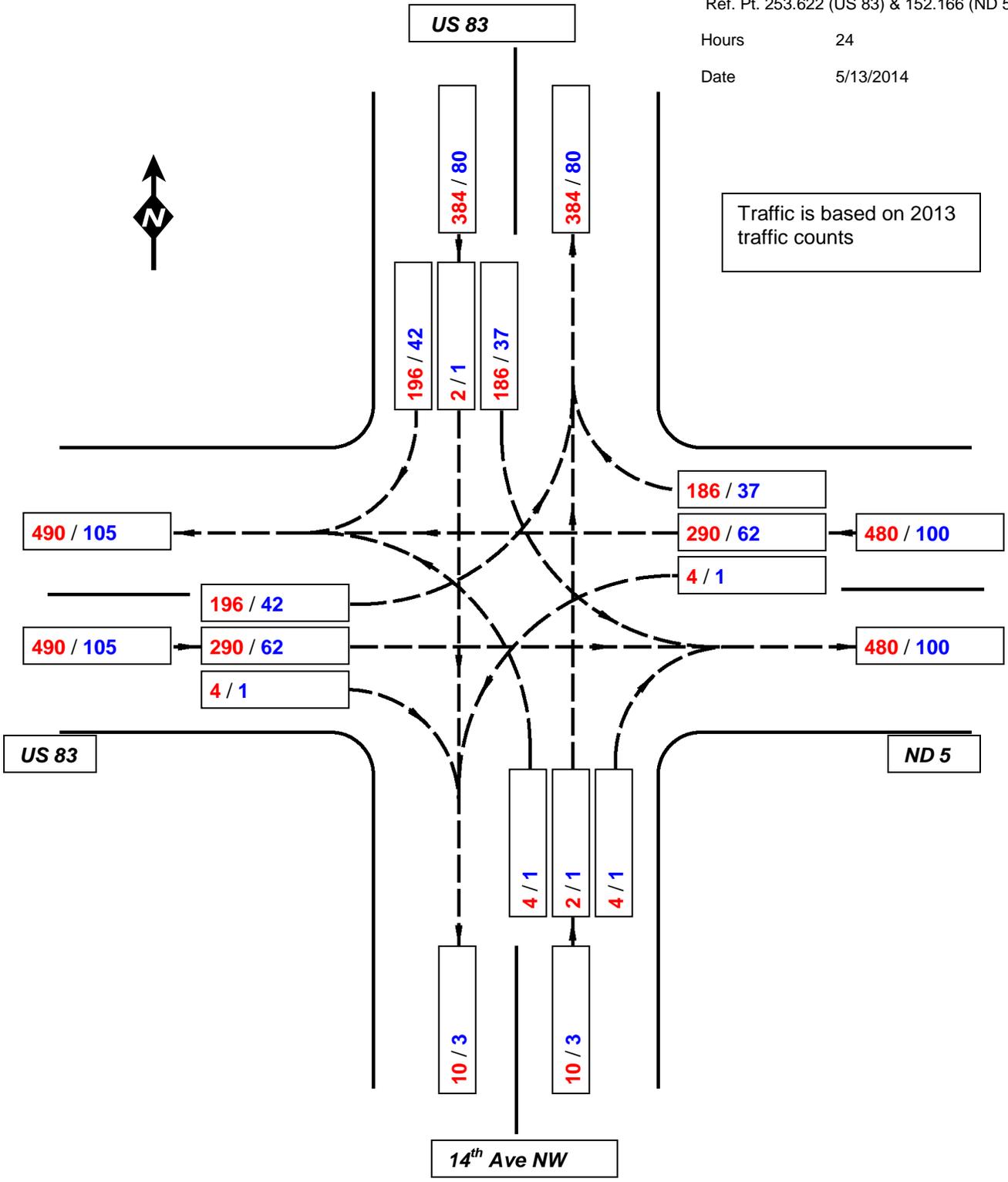
Appendix C – Traffic Volume Information



Intersection Traffic Volumes
 North Dakota Department of Transportation
 SFN 7921 (Rev. 4-85)

**23 USC § 409 Documents
 NDDOT Reserves All Objections**

Intersection No. 1
 Description **Int. US 83 & ND 5**
 Ref. Pt. 253.622 (US 83) & 152.166 (ND 5)
 Hours 24
 Date 5/13/2014



Traffic is based on 2013 traffic counts

LEGEND: **AAADT / TRUCKS** - 2013

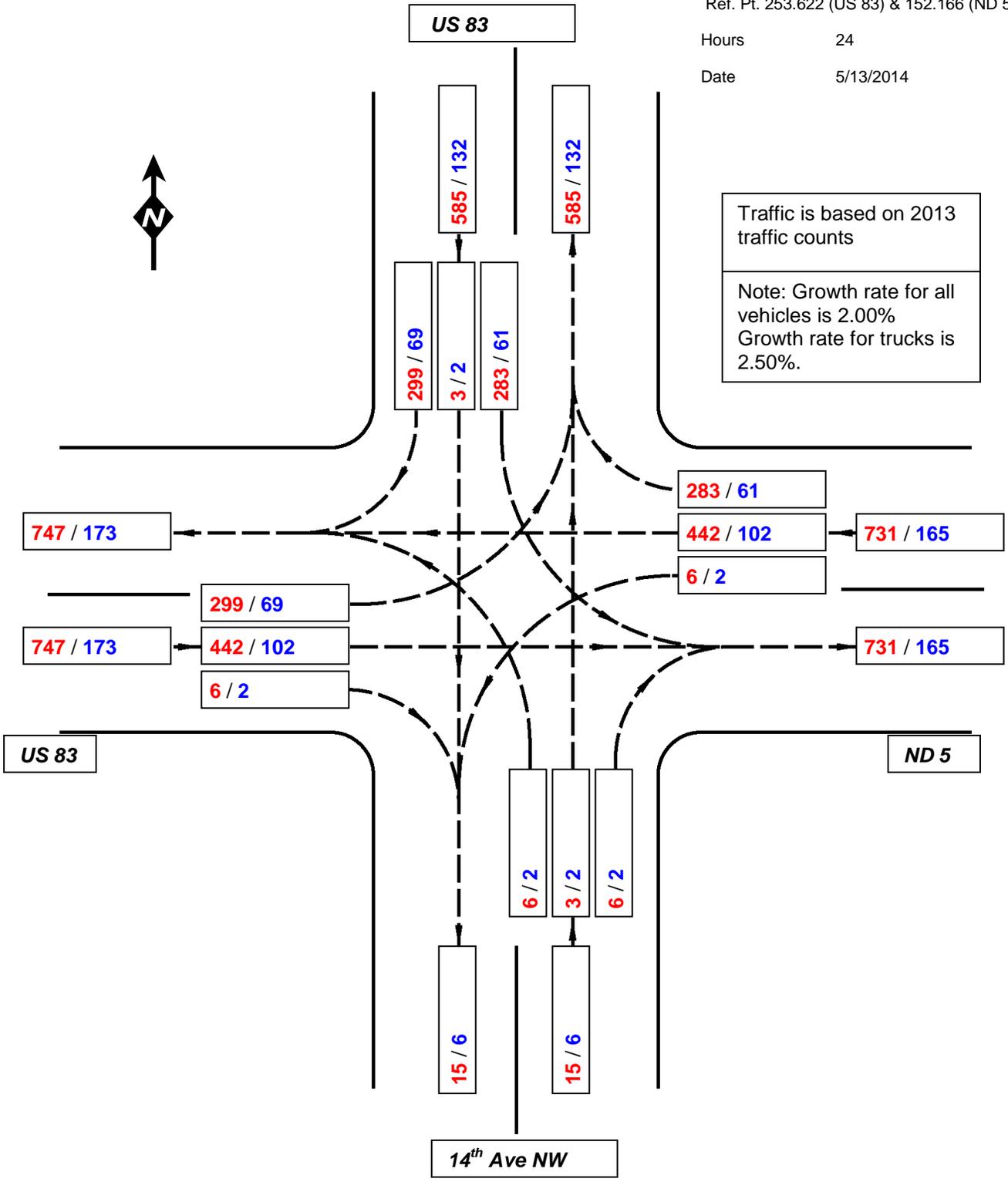
Completed by NR



Intersection Traffic Volumes
 North Dakota Department of Transportation
 SFN 7921 (Rev. 4-85)

23 USC § 409 Documents
NDDOT Reserves All Objections

Intersection No. 1
 Description **Int. US 83 & ND 5**
 Ref. Pt. 253.622 (US 83) & 152.166 (ND 5)
 Hours 24
 Date 5/13/2014



Traffic is based on 2013 traffic counts

Note: Growth rate for all vehicles is 2.00%
 Growth rate for trucks is 2.50%.

LEGEND: **AAADT / TRUCKS** - 2033

Completed by NR

Appendix D – Capacity Analysis Worksheet

TWO-WAY STOP CONTROL SUMMARY

Analyst: CLH
 Agency/Co.: NDDOT
 Date Performed: 5/23/2014
 Analysis Time Period: 10% Peak
 Intersection: US 83 & E Jct ND 5
 Jurisdiction: Rural
 Units: U. S. Customary
 Analysis Year: 2033
 Project ID: 2033 Traffic, Proposed Geometry
 East/West Street: US 83 / ND 5
 North/South Street: US 83 / 14th Ave NW
 Intersection Orientation: EW

**23 USC § 409 Documents
 NDDOT Reserves All Objections**

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound				Westbound		
		1 L	2 T	3 R		4 L	5 T	6 R
Volume		30	44	1		1	44	28
Peak-Hour Factor, PHF		0.88	0.88	0.88		0.88	0.88	0.88
Hourly Flow Rate, HFR		34	50	1		1	50	31
Percent Heavy Vehicles		22	--	--		25	--	--
Median Type/Storage		Undivided						
RT Channelized?						No		
Lanes		1	1	0		0	1	1
Configuration		L		TR		LT		R
Upstream Signal?		No				No		

Minor Street:	Approach Movement	Northbound				Southbound		
		7 L	8 T	9 R		10 L	11 T	12 R
Volume		1	1	1		28	1	30
Peak Hour Factor, PHF		0.88	0.88	0.88		0.88	0.88	0.88
Hourly Flow Rate, HFR		1	1	1		31	1	34
Percent Heavy Vehicles		25	50	25		20	50	22
Percent Grade (%)		0				0		
Flared Approach: Exists?/Storage		No				No		
Lanes		0	1	0		0	1	0
Configuration		LTR				LTR		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound				Southbound			
			7	8	9		10	11	12	
Movement	1	4		7	8	9		10	11	12
Lane Config	L	LT		LTR	LTR	LTR		LTR	LTR	LTR
v (vph)	34	1		3				66		
C(m) (vph)	1399	1420		715				836		
v/c	0.02	0.00		0.00				0.08		
95% queue length	0.07	0.00		0.01				0.26		
Control Delay	7.6	7.5		10.1				9.7		
LOS	A	A		B				A		
Approach Delay				10.1				9.7		
Approach LOS				B				A		