US 2/US 81 SKEWED INTERSECTION STUDY

EXISTING and FUTURE CONDITIONS

Grand Forks, ND
February 2019
AGENDA

• Study Goals
• Steering Committee Issues and Concerns
• Existing Conditions
• Future Conditions
• Environmental Conditions
• Alternatives Brainstorming
Known Issues and Conflicts;

- Intersection skew makes turning movements for trucks difficult.
- Mill spur railroad crossing creates traffic blockages and queueing issues.
- Opportunities for improved pedestrian, bicycle and transit conditions.
Existing Conditions
Typical Sections

US 2/Gateway Drive
Typical Section

US 81/N Washington Street
(North of US 2/Gateway Drive)
Typical Section

US 81/N Washington Street
(South of US 2/Gateway Drive)
Typical Section

Principal Arterial
Minor Arterial
Right-Of-Way

- US2/Gateway Drive: 70 feet
- US 81/Washington Street: 20 feet on east side, 60 feet of west side
Unsignalized driveways

- Increase crash rate by 2%
- Reduces corridor travel speed by 0.25 MPH

Desired Access Spacing

- 660 feet
- 8 access/mile

Existing Access Spacing

- 33 accesses
- 66 access/mile (8x Standard)
Mill Spur Crossing

- **Safety**
  - 12 crashes between 1975-1994
  - No crashes since 1994

- **Crossing Exposure**
  - 90,600
  - 500,000 threshold for grade separation

- **Crash Prediction**
  - 0.028 crashes per year (FRA)
  - 5th highest rate in City
  - 7th highest rate in County
4 to 5 trains per day
- Consistent Between City and FRA Data
- 10 MPH average, 20 MPH max
- NDSM to add unit trains

Rail Delay Estimates
- 89 Hours/Day
- 2,670 Hours/Month
- 32,396 Hours/Year
- Meet FHWA Grade Separation Guidance
Average train blockage is 2:31

Brain damage in four to six minutes when heart stops

Altru Hospital provides emergency service to East Grand Forks and surrounding area
Average train blockage is 2:31

- Fires can double every 60 seconds
- Goal to reach every address within four minutes
Pedestrian Amenities

- Only controlled crossing at 3rd Street underpass
- ADA conflicts at crosswalks, utilities and driveways
- Minimal to no buffer
Connections

- 3rd Street and Red River Greenway to the east
- Columbia Road to the west
- No traffic control to cross US 2/Washington Street
- Underpass at 3rd Street
CAT Route 2
- Hourly service
- Stops
  - 5th Street/10th Ave
  - Hugo’s on 20th St
  - Home of Economy when scheduled in advance
- Requires vehicular, pedestrian, and bicycle system efficiency
Traffic Volumes

Existing
Peak Hour Volumes

LEGEND
- Stop Controlled Intersection
- Signal Controlled Intersection
- Average Daily Traffic
- Average Daily Truck Traffic
- AM Turning Movement Count
- PM Turning Movement Count

Traffic Volumes
Traffic Variation

**Monthly Variation**

- January: 28,975.90
- February: 29,053.11
- March: 30,268.12
- April: 30,188.93
- May: 30,427.17
- June: 30,503.00
- July: 31,161.79
- August: 27,003.10
- September: 24,452.01
- October: 23,970.00
- November: 21,981.00
- December: 21,947.01

<table>
<thead>
<tr>
<th>Month</th>
<th>ADT (10^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>28,975.90</td>
</tr>
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**Yearly Variation**

- AADT: 26,957

2013

- AADT: 21,947.01
- Trucks: 1,000.00

2015

- AADT: 21,981.00
- Trucks: 1,000.00

2018

- AADT: 21,947.01
- Trucks: 1,000.00
Daily Volume Profile

Volume Profile Along Gateway Drive (Weekdays)
During 1/1/2017 - 12/30/2017
Effective Number of Days: 260
Truck Traffic

- Level One Freight System with international connections
- Skewed intersections
- 1,200-1,500 trucks per day
  - Trucks per day > 1,500 during sugar beet harvest season
- NDSM processes/ships 5M pounds of products daily

NDSM processes/ships 5M pounds of products daily
Existing Traffic Control Analysis

- Traffic Control Warrants based on MUTCD
- Removal of unwarranted signals reduces
  - All crashes by 24%
  - Injury crashes by 54%
  - Right angle crashes by 24%
  - Rear end crashes by 29%

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<th>Existing Traffic Control</th>
<th>Warrants Met (Hours Met/Required)</th>
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<tr>
<td>20th Street</td>
<td>Signal</td>
<td>0/8 0/8 0/4 0/1</td>
</tr>
<tr>
<td>US 81/ Washington Street</td>
<td>Signal</td>
<td>8/8 8/8 4/4 1/1</td>
</tr>
<tr>
<td>Mill Road/5th Street</td>
<td>Signal</td>
<td>0/8 8/8 4/4 1/1</td>
</tr>
<tr>
<td>4th Street</td>
<td>Thru/Stop</td>
<td>0/8 0/8 0/4 0/1</td>
</tr>
<tr>
<td>3rd Street/11th Ave</td>
<td>Signal</td>
<td>0/8 1/8 1/4 0/1</td>
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Warrant 1a: Minimum Vehicular Volume
Warrant 1b: Interruption of Continuous Traffic
Warrant 2: Four-Hour Vehicular Volume
Warrant 3: Peak Hour Vehicular Volume
Warrant 9: Intersection Near a Grade Crossing

Legend:
- Red: Unwarranted Traffic Control
- Green: Warranted Traffic Control
- Black: BNSF Mill Spur

Pg. 13
<table>
<thead>
<tr>
<th>CAPACITY</th>
<th>TRAFFIC FLOW</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Under</strong></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS A - FREE FLOW</strong>&lt;br&gt;Low volumes and no delays.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS B - STABLE FLOW</strong>&lt;br&gt;Low volumes and speeds dictated by travel conditions.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS C - STABLE FLOW</strong>&lt;br&gt;Speeds and maneuverability closely controlled due to higher volumes.</td>
</tr>
<tr>
<td><strong>Approaching</strong></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS D - RESTRICTED FLOW</strong>&lt;br&gt;Higher density traffic restricts maneuverability and volumes approaching capacity.</td>
</tr>
<tr>
<td><strong>At</strong></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS E - UNSTABLE FLOW</strong>&lt;br&gt;Low speeds, considerable delays, and volumes at or slightly over capacity.</td>
</tr>
<tr>
<td><strong>Over</strong></td>
<td><img src="image" alt="Traffic Flow Image" /></td>
<td><strong>LOS F - FORCED FLOW</strong>&lt;br&gt;Very low speeds, volumes exceed capacity, and long delays with stop-and-go traffic.</td>
</tr>
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Existing Traffic Operations

2018 Traffic Operations

Queueing Between Washington Street and N 5th Street/Mill Road
One 2:31 train event causes 4 hours of delay under current traffic conditions.
Travel Time and Reliability

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Morning Eastbound</th>
<th>Morning Westbound</th>
<th>Evening Eastbound</th>
<th>Evening Westbound</th>
<th>Train Event (10 Min) Eastbound</th>
<th>Train Event (10 Min) Westbound</th>
<th>Train Event (1 Hour) Eastbound</th>
<th>Train Event (1 Hour) Westbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time (Seconds)</td>
<td>30</td>
<td>51</td>
<td>31</td>
<td>60</td>
<td>66</td>
<td>30</td>
<td>30</td>
<td>60</td>
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<tbody>
<tr>
<td>Eastbound With Train</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Westbound With Train</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>Eastbound No Train</td>
<td>92</td>
<td>92</td>
</tr>
<tr>
<td>Westbound No Train</td>
<td>108</td>
<td>108</td>
</tr>
</tbody>
</table>

- **Free Flow**
- **Additional Travel Time**
28 Crashes/Year
78% Intersection Crashes
52% Rear-End Crashes
38% Peak Hour Crashes
20th Street Intersection

- 12 crashes in last five years
- 33% rear end crashes on east approach
- 25% westbound left-turn crashes (Protected/Permitted)

Un warranted signal control increases
- All crashes by 24%
- Injury crashes by 53%
- Right angle crashes by 24%
- Rear end crashes by 29%
20th Street to Washington Street

- 17 crashes in last five years
- Above critical crash rate
- 41% during AM/PM peak hours
- Long queues and dense access spacings
- Queues block sight lines
US 81/Washington Street Intersection

- 45 crashes in last five years
- 60% rear end crashes
  - 30% during AM or PM peak hour
  - 30% between 11 AM to 1 PM
- 8 crashes involving trucks
- 0 Crashes involving Pedestrians or Bikes
- Long queues and dense access spacings
- 30% rear end crashes during peak hours
Mill Road/5th Street Intersection

- 41 crashes in last five years
- Above critical crash rate

- 50% rear end crashes
- 65% During AM or PM peak hours
- 52% occurred on east approach
Future Conditions
MPO Travel Demand Model

No train increases projected

2030 Traffic Forecasts

2030 Peak Hour Volumes
MPO Travel Demand Model

No train increases projected

2045 Traffic Forecasts

2045 Peak Hour Volumes
### Future Traffic Control Analysis

**YEAR 2030**

<table>
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<tr>
<th>Intersection</th>
<th>Existing Traffic Control</th>
<th>Warrants Met (Hours Met/Required)</th>
<th>1A</th>
<th>1B</th>
<th>2</th>
<th>3</th>
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**YEAR 2045**

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**LEGEND**

- **Red** Unwarranted Traffic Control
- **Green** Warranted Traffic Control
- **Orange** Potentially Warranted Traffic Control
- **Black** BNSF Mill Spur

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YEAR 2030

YEAR 2045
Heavy Queuing on Several Approaches
One 2:31 train event causes 7 hours of delay under current traffic conditions.
Travel Time and Reliability

- **Train Event (1 hour) Westbound**
  - 91 seconds
- **Train Event (1 hour) Eastbound**
  - 61 seconds
- **Train Event (10 Min) Westbound**
  - 128 seconds
- **Train Event (10 Min) Eastbound**
  - 65 seconds
- **Evening Westbound**
  - 61 seconds
- **Evening Eastbound**
  - 174 seconds
- **Morning Westbound**
  - 63 seconds
- **Morning Eastbound**
  - 50 seconds

**Graph:**
- **X-axis:** Travel Time (Seconds)
- **Y-axis:** Devices

- **Legend:**
  - Free Flow
  - Additional Travel Time
One train event:
- 4 hours of vehicle delay today
- 7 hours by 2045
- Future unit trains
2045 Queuing Issues

PM Peak

Train Event
Funding Availability

- >$150,000,000 in Unfunded Grand Forks Projects
- 42nd Street and DeMers Avenue (~$25-30M)
- Gateway Drive/US 2 and Glasston (~$28M)
Purpose and Need Statement

- **Capacity**
  - Corridor travel time
  - Intersection delays and queueing
  - Travel time reliability

- **Social Demands and Economic Development**
  - NDSM unit trains
  - Critical truck movement

- **Roadway Deficiencies**
  - At-grade rail crossing
  - 8X recommended access spacings

- **Modal Interrelationships**
  - Gaps in pedestrian and bicycle facilities

- **Safety**
  - Intersection and link crash rates
  - EMS response time
  - Rail crossing exposure
Unlikely Impacts

- Floodplains
- Surface Water
- Section 6F

Affected Environment

Land Use
Potential Impacts

- Hazardous Waste Sites
- Social and Economic Impacts
- Noise

Pedestrians and Bicyclists
- Environmental Justice
- Historic and Archaeological Preservation

Section 4f
Potential Positive Impacts

- Social and Economic Impacts
- Pedestrians and Bicyclists
- Environmental Justice
Alternative Brainstorming
Rerouting Skewed Movements

Grand Forks-East Grand Forks Freight Rail Access Study
Reroute the Mill Spur

2010 Grand Forks Mill Spur Feasibility Study

2016 Glasston Subdivision Railroad Crossings Mitigation Study
Grade Separated Crossing

Grand Forks-East Grand Forks Freight Rail Access Study