

Addressing Data Gaps in Pedestrian Safety at Bus Stops: A Review of Datasets and Case Study of Minnesota

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Introduction

- Transit passengers are a vulnerable group of pedestrians
- Research in the US that utilizes crash data to identify safety concerns of transit passengers during the pedestrian stages of their trips remains limited [1]
- Research Question:** What types of data are currently available in the United States to analyze pedestrian safety at bus stops?

Study Method

1. Review of Transit Bus Stop-Related Safety Databases

- Crash typing frameworks
- Crash databases and additional databases not primarily focused on crashes
- National, state, and local level data

2. Case Study: "Going to or from Public Transit" Pedestrian Crashes in Minnesota

- $n = 38$ pedestrian crashes (2016-2023)
- Full injury severity range (KABCO)
- Descriptive analysis
- Analysis of crash narratives (crash categorization based on language used in the crash narrative)

Review of Transit Bus Stop-Related Safety Databases

Crash typing frameworks

Pedestrian and Bicyclist Crash Analysis Tool (PBCAT) [2,3]

Version 2.0 "Commercial bus-related"

Version 3.0 "Transit-related"

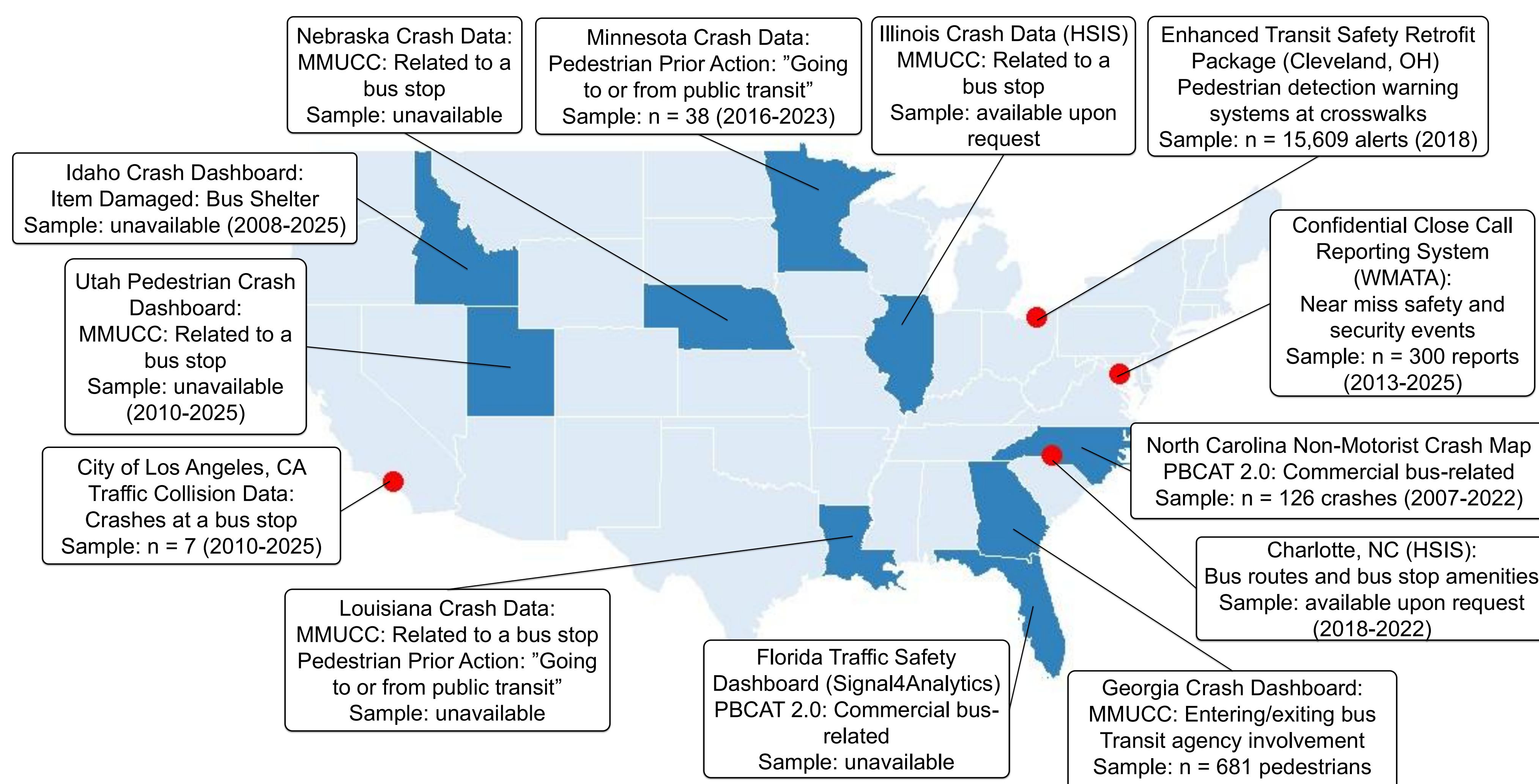
- transitObstructedView:** Non-motorist struck crossing in front of a bus stopped at a bus stop.
- transitOther:** Non-motorist struck while going to, from, or waiting at a bus stop.
- transitBusPullover:** Non-motorist struck by a transit bus pulling into/away from the curb or loading area

Model Minimum Uniform Crash Criteria (MMUCC) [4,5]

"Related to a bus stop": crash related to the use of a location set aside for, or customarily used for, boarding and disembarking passengers onto or from a **bus of any kind** (not exclusive to transit)

State and Local Databases with Transit Bus Stop -Related Information

Obtained from crash databases, data dictionaries, and crash dashboards publicly available on the internet



National databases

1. Fatality Analysis Reporting System (FARS) (2014-2023)

- NHTSA; census of fatalities in the US; utilizes adapted PBCAT 2.0 def'n. "transit bus stop-related"; $n = 216$

2. Crash Report Sampling System (CRSS) (2016-2023)

- NHTSA; survey weighted sample of crashes in the US; utilizes adapted PBCAT 2.0 def'n. "transit bus stop-related"; $n = 95$ (unweighted)

3. National Transit Database (NTD) – Safety & Security (2014-2024)

- FTA; agency-reported safety events occurring within transit systems, (i.e., those involving transit vehicles, facilities, or within right-of-way; $n = 5,270$ pedestrian-involved safety events)

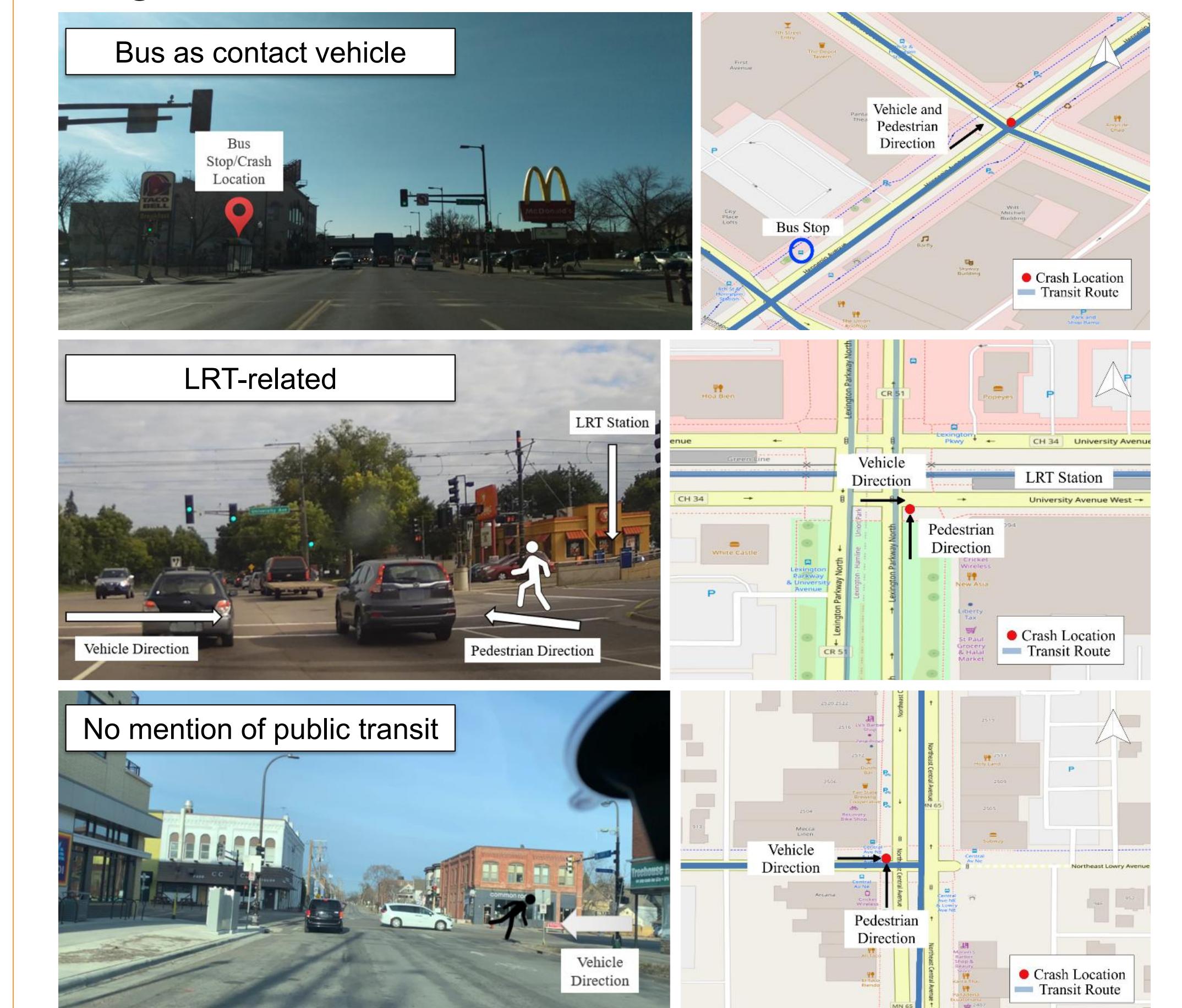
"Going to or from public transit" pedestrian crash characteristics ($n = 38$) [6]:

- Most crashes involved non-incapacitating (39%) and serious (29%) injuries
- Most occurred on 30-39 mph roadways (58%) and at intersections (55%)
- Darting/dashing into the roadway was the leading pedestrian circumstance (18%)

Analysis of crash narratives:

Pedestrian Accessing/Egressing from Public Transit	16 (43%)
Bus as Contact Vehicle	4 (11%)
LRT-Related	3 (8%)
Pedestrian Waiting at Bus Stop	2 (5%)
Bus Driver Witness	1 (3%)
No Mention of Public Transit	11 (30%)

Images obtained from KartaView and QGIS:



Conclusion

- Most prior research assumes correlation between pedestrian crashes near bus stops
- Limited data exists on transit bus stop-related crashes
- "Going to/from transit" pedestrian crashes in Minnesota provided a unique opportunity to study transit passenger-related crashes
- Unstructured text data, such as narratives, showed strong potential to address gaps in pedestrian safety data at bus stops