Road Safety Audit
Rochester, NH

Intersection: Old Dover Road and Tebbetts Road

Presented by
VHB

Presented to
City of Rochester,
Strafford Regional Planning Commission,
NHDOT

September 12, 2019

Objective

Identify Issues

- Identify existing and potential safety issues

Develop Strategies

- Develop measures to target identified issues

Hang on... We must be doing something wrong...
How does the saying go again?

Schedule for Today

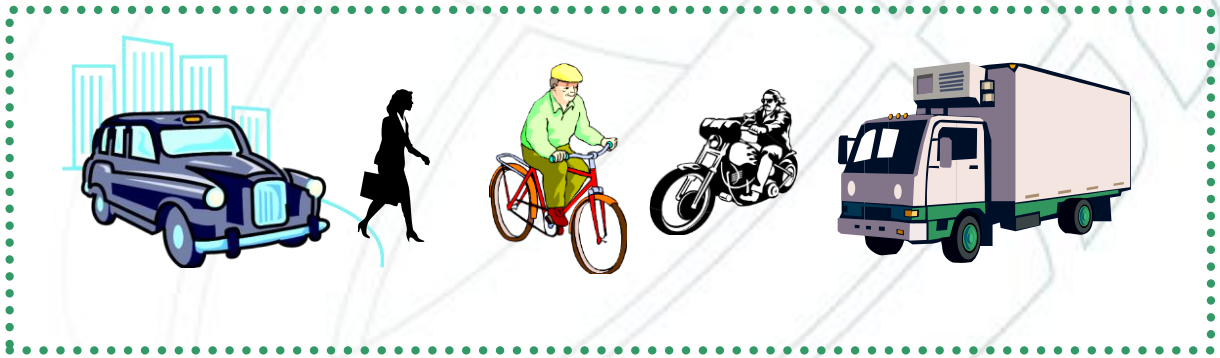
- Kickoff Meeting
  - RSA Process
  - Background Information
- Field Review (Off Peak)
- Discussion of Issues
- Develop Suggestions

Road Safety Audit (RSA)

- A formal safety performance evaluation of an existing or future road or intersection by an independent, multidisciplinary team.

An RSA considers:

- Safety for all road users
- Surrounding environment
- Proactive mitigation measures
  - Anticipate and accommodate driver error



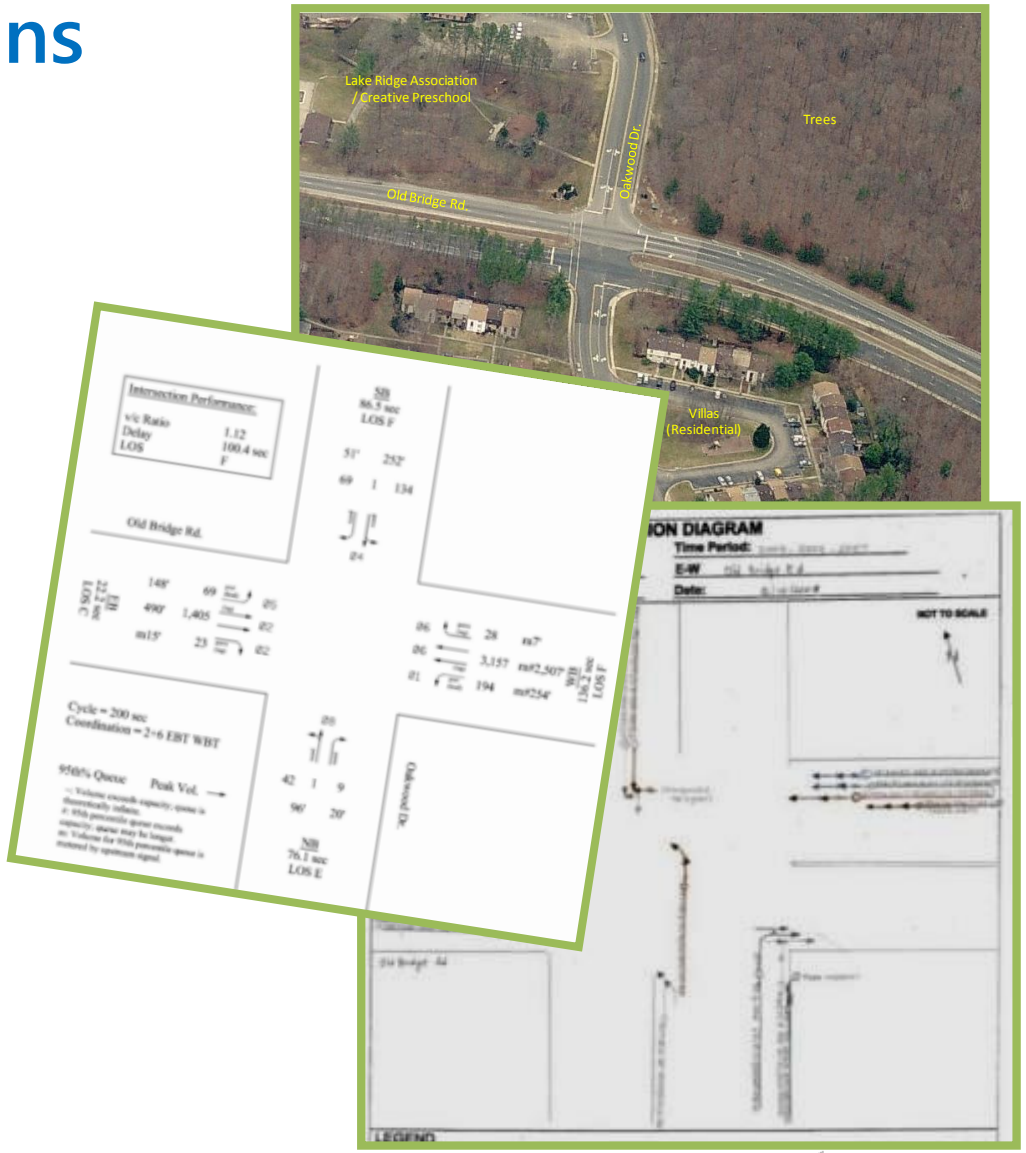
Responsibilities

RSA Team

Design Team / Project Owner

RSA Considerations

- Maps/drawings
- Future plans
- Crash data
- Traffic volume
- Community input



Field Review

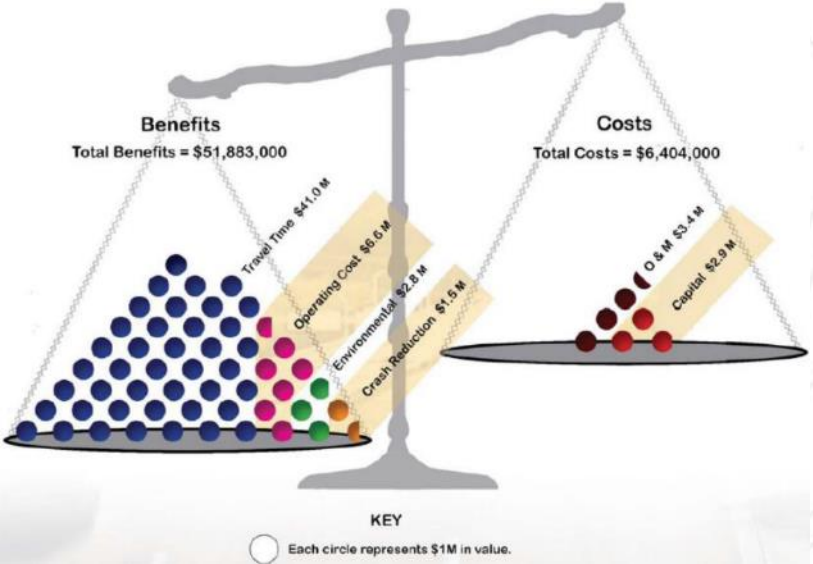
- Observe:
  - Road user behavior
  - General road design
  - Traffic operations
  - Surrounding land use

RSA Analysis

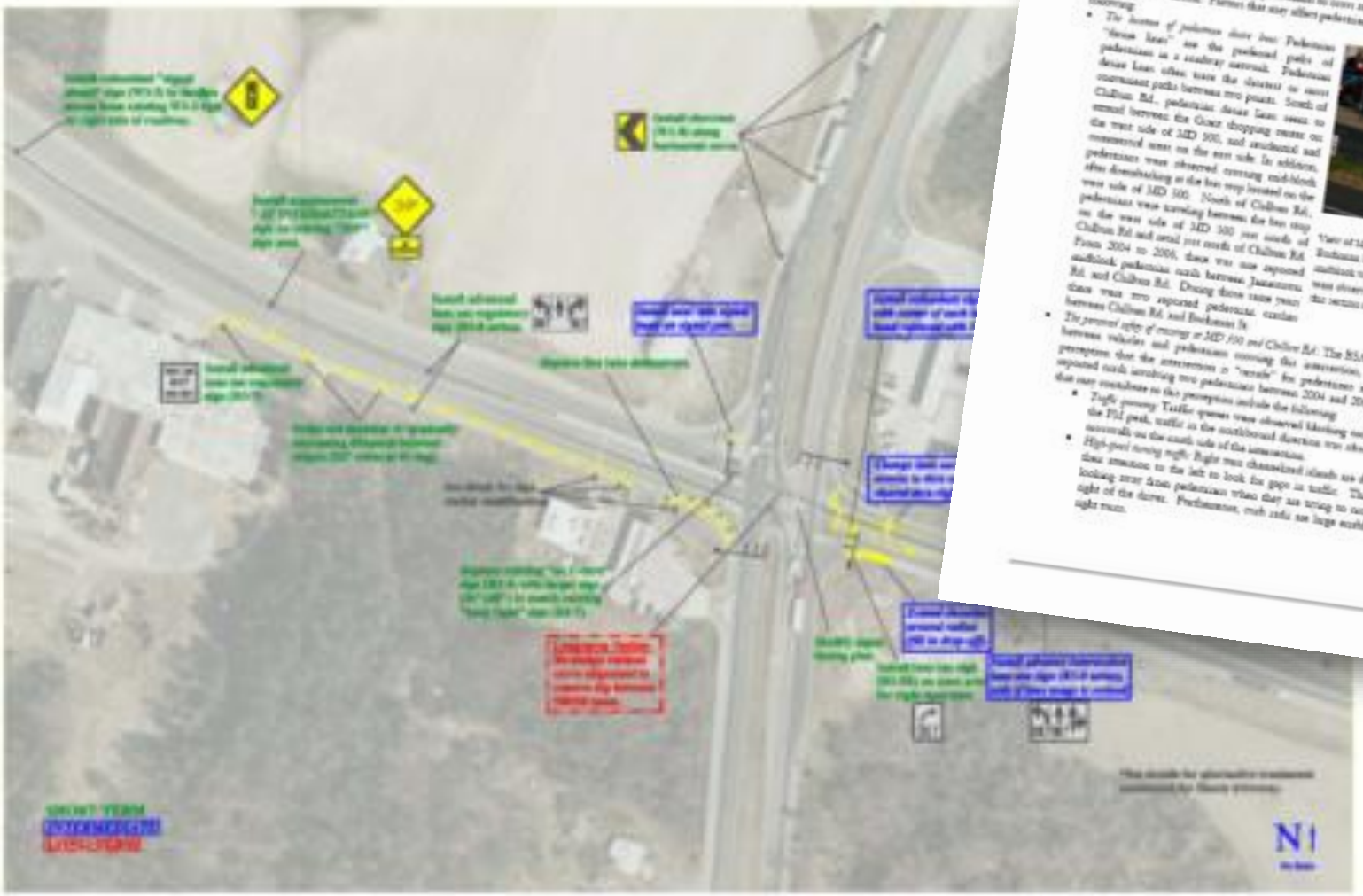
- Workshop setting
- Review background reports and design criteria
- Identify, prioritize and mitigate safety issues

RSA Report

- Document results of RSA
- Identify and prioritize safety issues
- Include study option alternative plans
- Include benefit/cost analyses



RSA Report



Issue 2: Frequency of Midblock Crossings

Safety Issue Description: There are a high number of midblock pedestrian crossings (i.e., pedestrians are crossing between intersections) where there is no formal pedestrian crossing) on MD 500 both south and north of Chillum Rd. to access bus stops, convenience stores, and residential properties. Drivers may not expect pedestrians to cross at these locations which may increase the likelihood of a collision. Factors that may affect pedestrians' decisions to cross midblock include the following:

- *The location of pedestrian desire lines:* Pedestrian "desire lines" are the preferred paths of pedestrians in a roadway network. Pedestrian desire lines often trace the shortest or most convenient paths between two points. South of Chillum Rd., pedestrian desire lines seem to extend between the Giant shopping center on the west side of MD 500, and residential and commercial uses on the east side. In addition, pedestrians were observed crossing midblock after disembarking at the bus stop located on the west side of MD 500. North of Chillum Rd., pedestrians were traveling between the bus stop on the west side of MD 500 and south of Chillum Rd and retail just south of Chillum Rd. From 2004 to 2006, there was one reported midblock pedestrian crash between Jamestown Rd. and Chillum Rd. During these same years there was two reported pedestrian crashes between Chillum Rd. and Brookeston St.

View of MD 500 between Chillum Rd. and Brookeston St. shows a pedestrian crossing midblock where there is no crossing. The RSA team observed numerous pedestrian crossings at this section of roadway.

- *The perceived safety of crossings at MD 500 and Chillum Rd.:* The RSA team observed several conditions that may affect pedestrians' perceptions of the safety of crossings at this intersection, which may contribute to the reported crash involving two pedestrians between 2004 and 2006. Intersection characteristics that may contribute to this perception include the following:
  - *Traffic queuing:* Traffic queues were observed blocking crosswalks. For example, during the PM peak, traffic in the southbound direction was observed to completely block the crosswalk on the south side of the intersection.
  - *High-speed turning traffic:* Right turns channelized islands are designed so that drivers focus their attention to the left to look for gaps in traffic. This causes the driver will be looking away from pedestrians when they are trying to cross an intersection from the right of the driver. Furthermore, curb radii are large enabling vehicles to make fairly right turns.

Project Schedule

Task	Activity	Weeks from RSA
1	Identify RSA Team	Complete
2	Data Collection and Analysis	Complete
3	Conduct Kickoff Meeting	Complete
4	Conduct Field Reviews	Complete
5	Identify Issues and Develop Countermeasures	1 week
6	Prepare Study Option Alternatives	3 weeks
7	Conduct Cost-Benefit Analysis	4 weeks
8	Project Coordination and Meeting	6 weeks
9	Prepare Draft Report	8 weeks
10	Finalize Report	16 weeks

Old Dover Road and Tebbetts Road

Purpose and Need

- Crash history
- Crash severity

Existing Conditions

- Intersection
  - 4-legged
  - Two-way stop-controlled
  - Flashing red/yellow beacons
  - Slight skew
  - Residential

Existing Conditions

- Old Dover Road
  - 2-lane road
  - 35 MPH (Posted)
  - No turn lanes
  - Flashing yellow signal

Existing Conditions

- Tebbetts Road
  - 2-lane road
  - 30 MPH (Posted)
  - No turn lanes
  - Stop-controlled
  - Flashing red signal

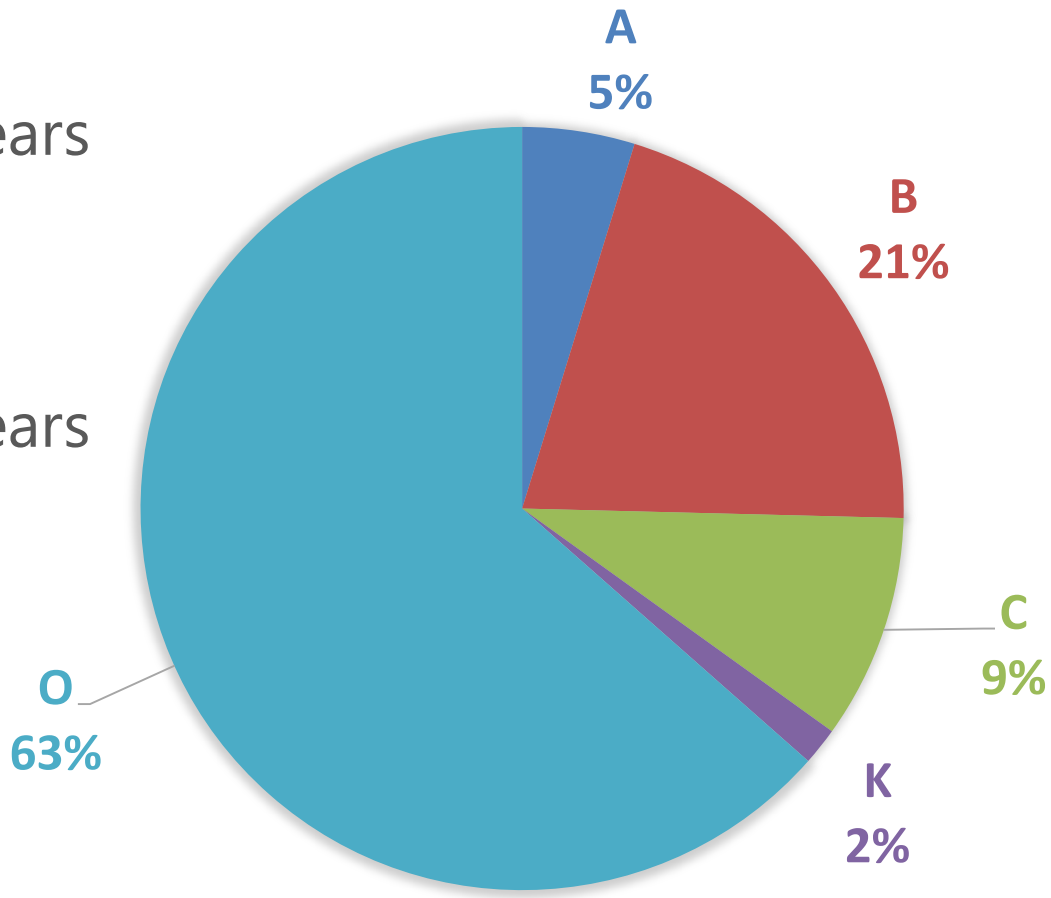
Traffic Volumes

- Old Dover Road= 5,215 veh/day
- Tebbetts Road = 4,301 veh/day
- Periods of Interest/Concern
  - Commuter Peaks:
    - 7:00AM – 9:00AM
    - 4:00PM – 6:00PM

*Annual Average Daily Traffic (AADT) from Strafford Regional Planning Commission, 2019

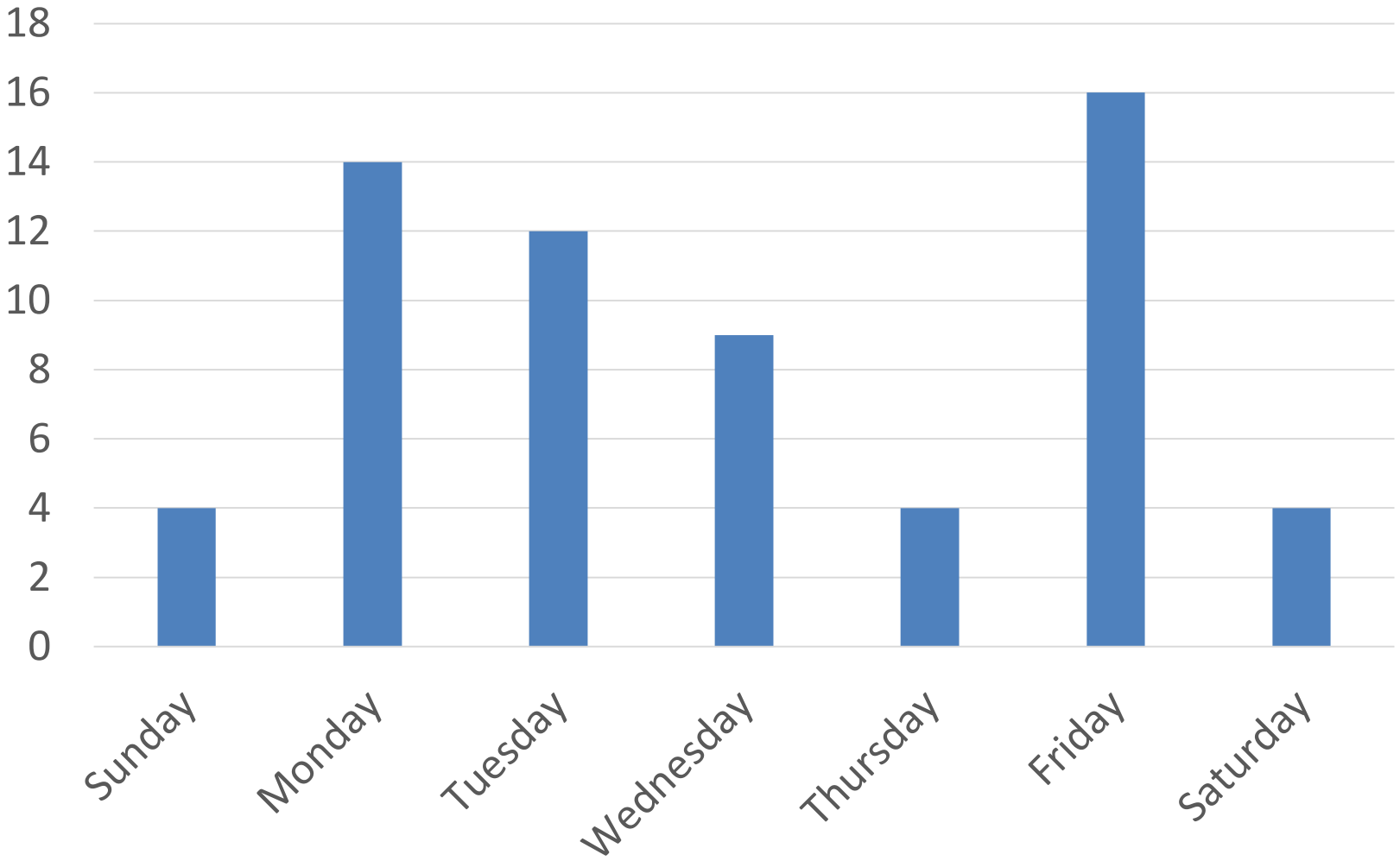
Crash History (Jan. 2007 – Dec. 2018)

- Total crashes
  - 63 crashes in 12 years
  - 5.3 crashes/year
- Injury crashes
  - 23 crashes in 12 years
  - 32% of crashes
- 3 A-injury crash
- 1 fatal crash

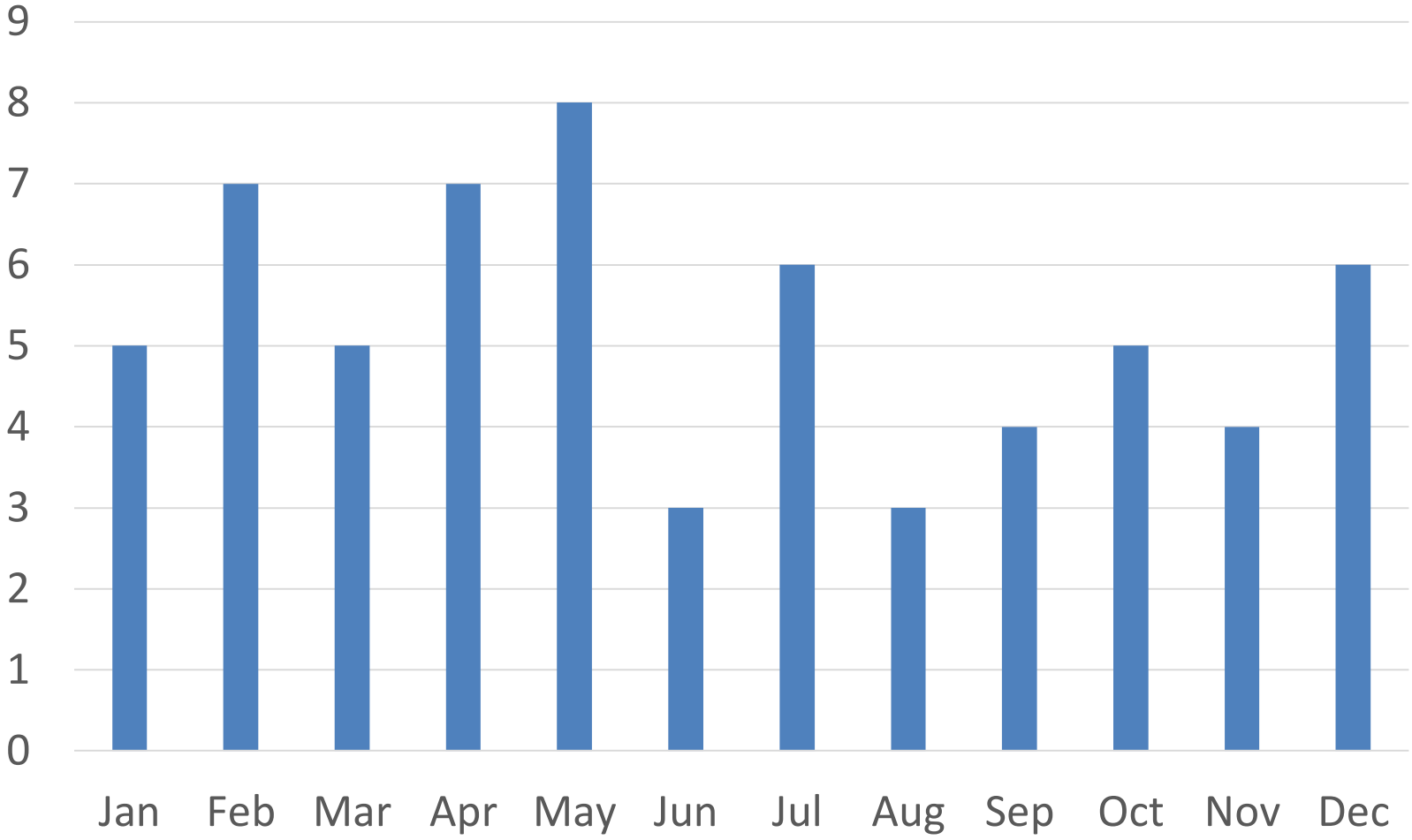


*Crash Data from Strafford Regional Planning Committee.

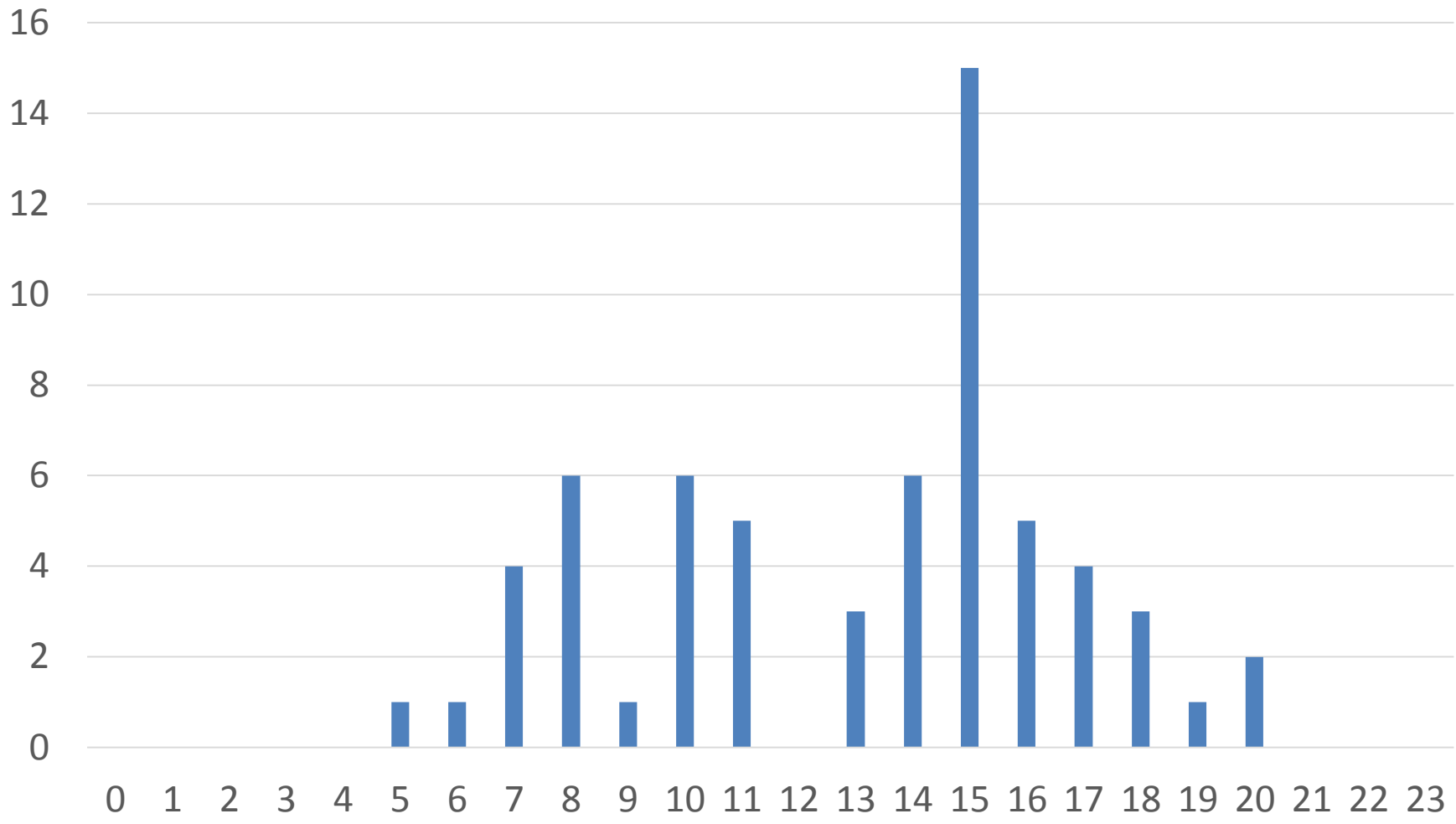
Crash History by Day



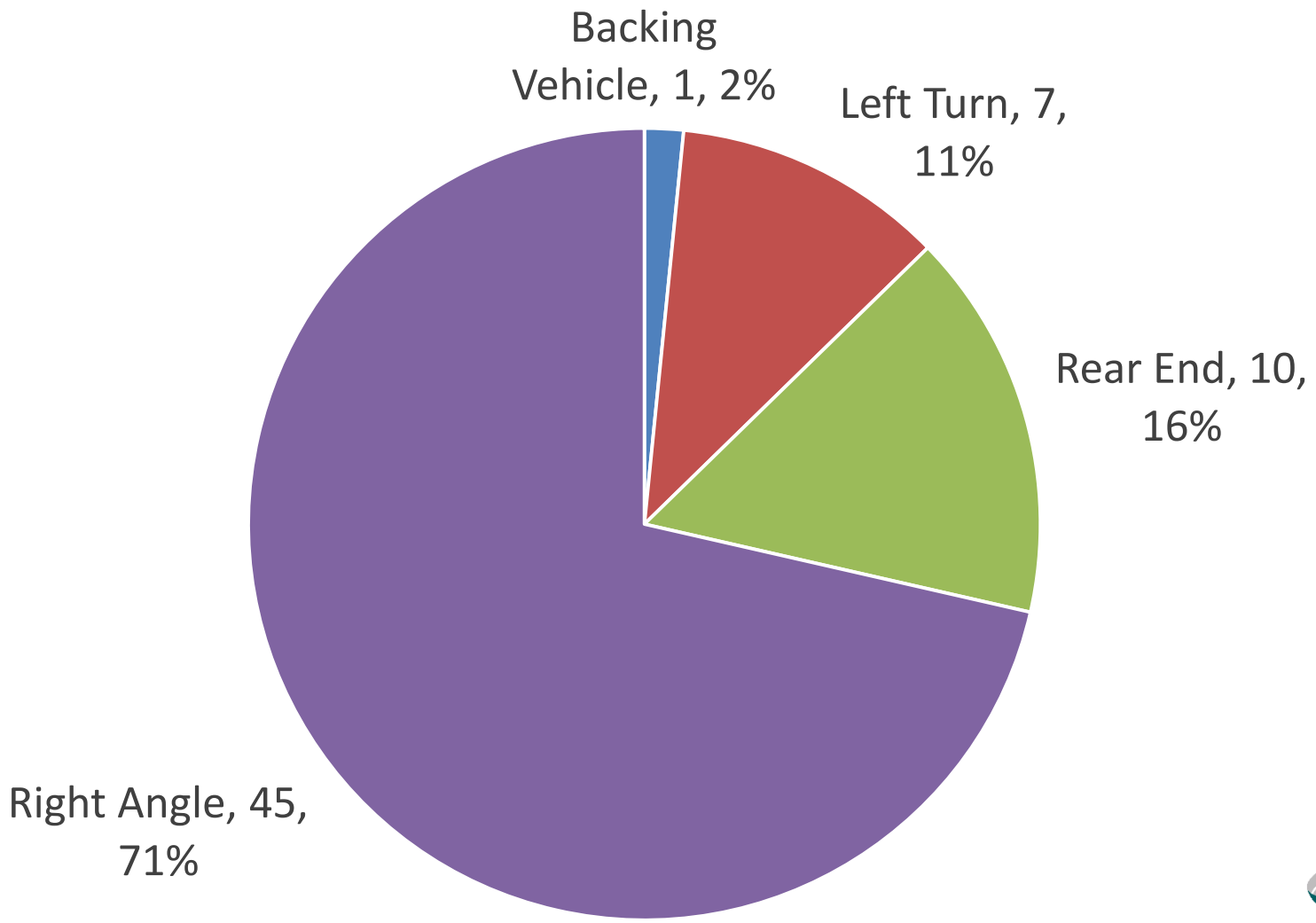
Crash History by Month



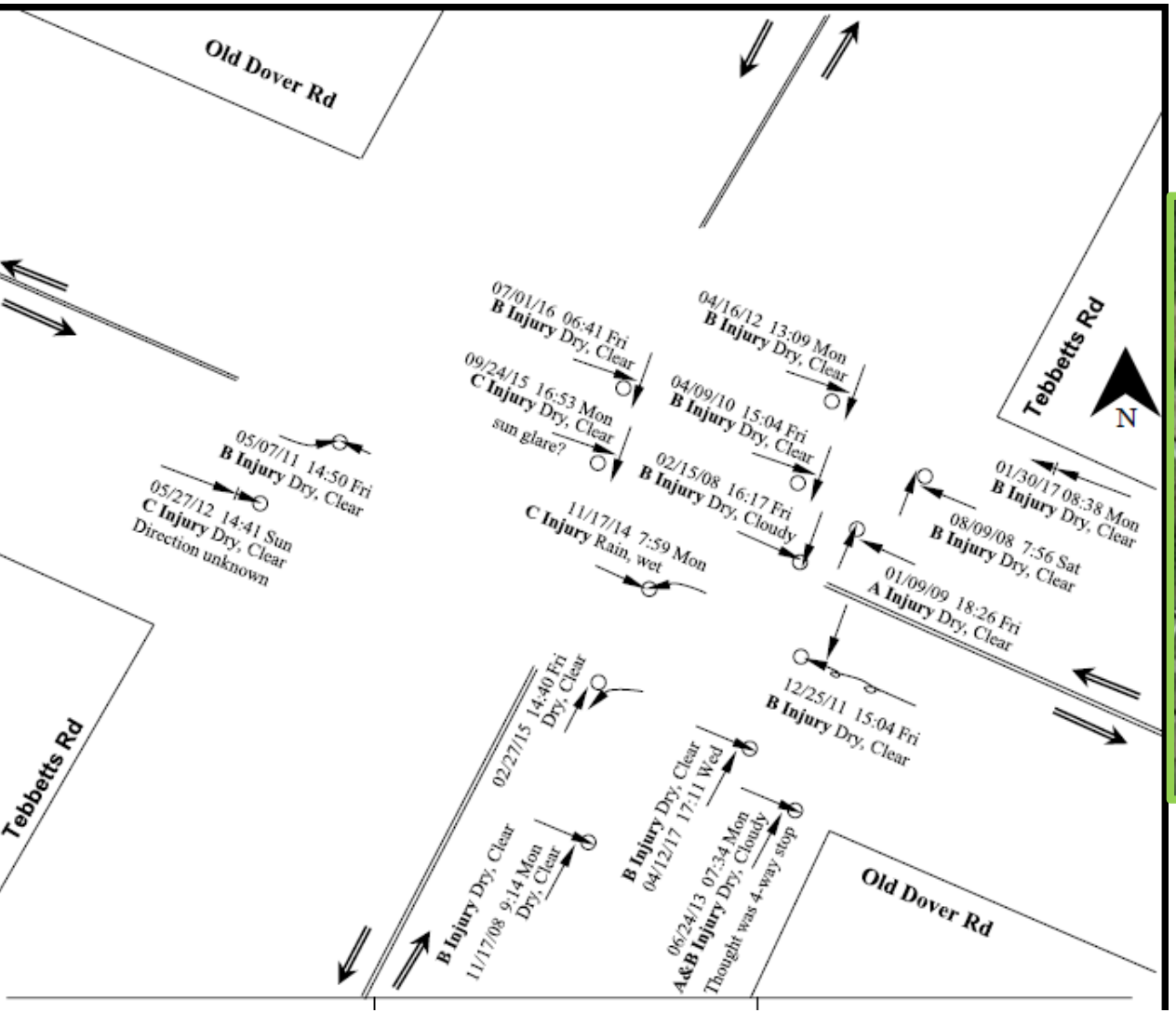
Crash History by Time of Day



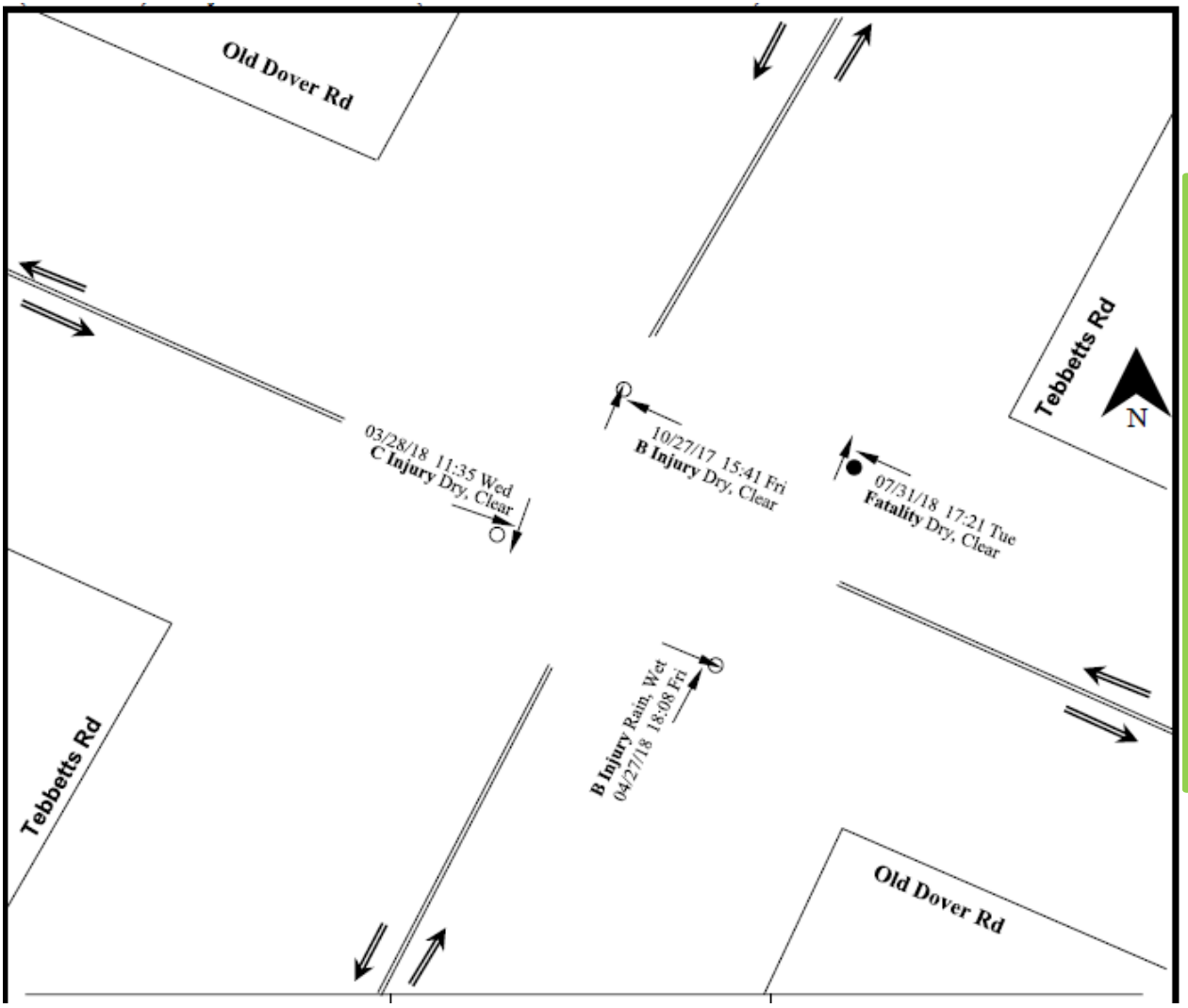
Crash History by Crash Type



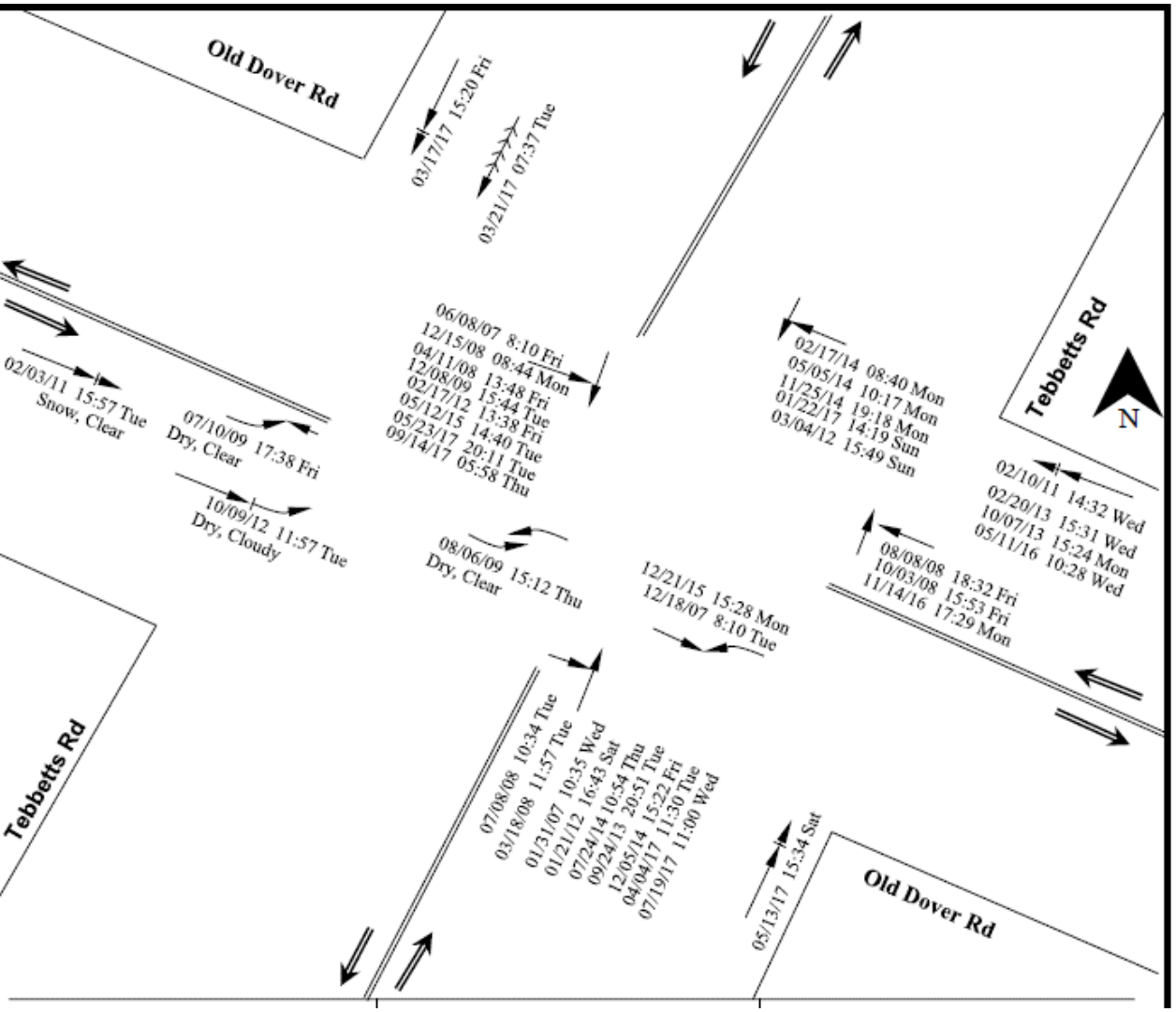
Intersection Collision Diagram 1



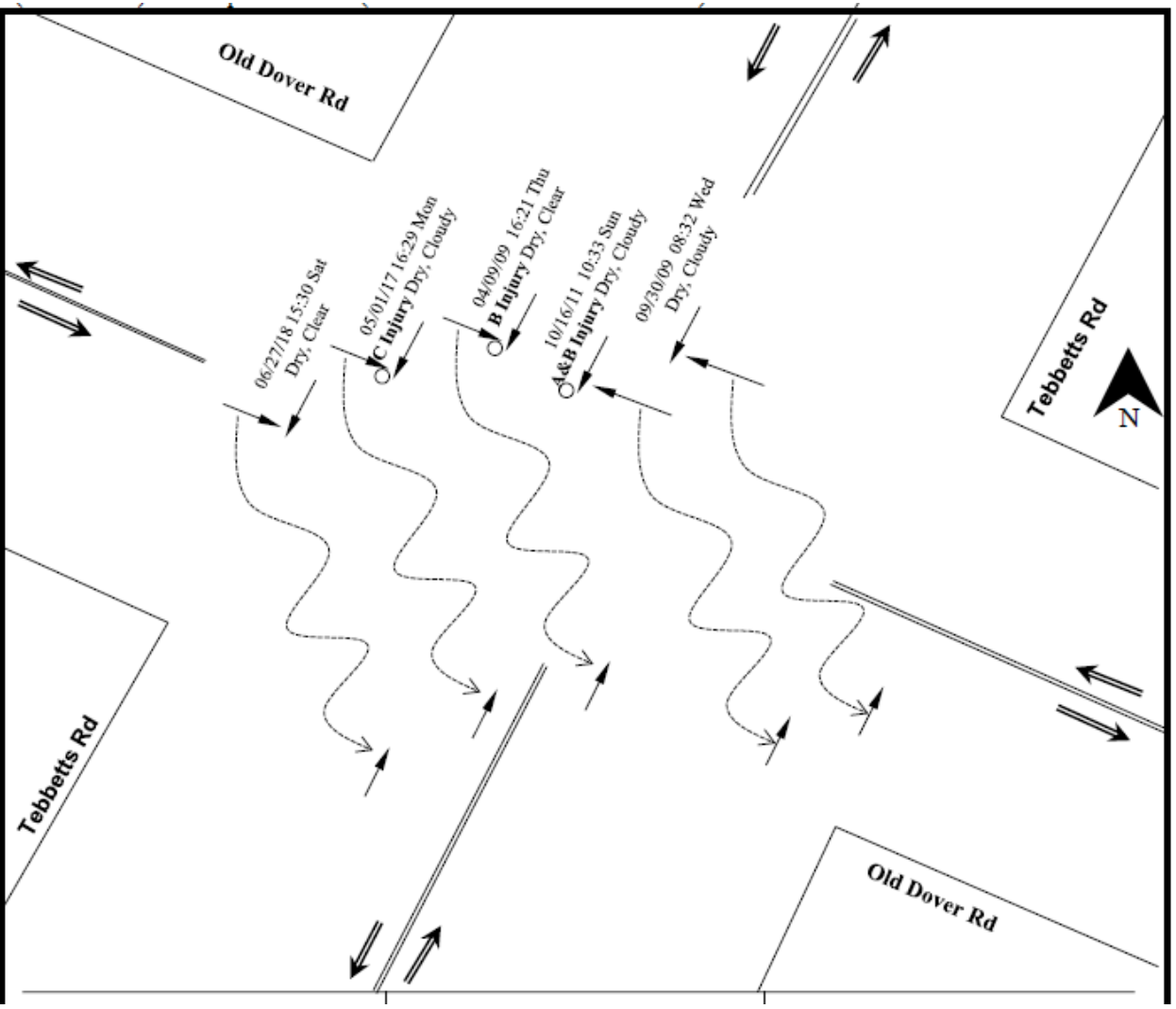
Intersection Collision Diagram 2



Intersection Collision Diagram 3



Intersection Collision Diagram 4



Positive Features:

- Overhead and sign-mounted flashing beacons improve conspicuity of the intersection
- Pavement, signs, and markings are in good condition (with exception of stop bar on EB approach)
- Narrow pavement width helps to manage speeds and limit passing on the shoulder (when vehicles are waiting in the through lane to turn left)
- Travel speeds appear reasonable compared to posted speed limit
- Overhead lighting (part of corridor lighting on Old Dover Rd)
- Advance STOP AHEAD warning signs on Tebbetts Rd
- Intersection is apparent from NB approach of Old Dover Rd (good line of sight and intersection sight distance)
- Good drainage (one puddle in NE corner)

Potential Issues:

- Sight obstructions in the NW and NE corners
  - Trees, utility poles (redundant), brush, landscaping
  - Trees create shadowing effect as well (could lead to issues with eyes adjusting coming out of the dark and into the light)
- Difficult to see minor roads from SB Old Dover Rd
  - Overhead beacon is only indication of the location
  - Tree canopy contributes and sight obstructions in NW and NE corners
  - No advance warning on SB approach

Potential Issues:

- Fixed objects on all 4 corners near roadway
  - Ditch on SE corner and dip in the pavement
- Minor issues on Tebbetts Rd
  - Faded stop bar on EB approach
  - Alignment of flashing beacon on STOP sign on EB approach
  - Flashing pattern may be a concern (rapid flash)
  - 'Cross traffic does not stop' signs are white (yellow would be more appropriate and may help with conspicuity)

Potential Issues:

- Large trucks
  - Trucks using this route as cut-through to NH 108 and NH 125
  - Contributing to rutting along the edge of pavement
  - Wide turns create off-tracking into opposing lanes and using the shoulder of the road

Potential Issues:

- Drivers on Old Dover and Tebbetts may perceive as 4-way stop
  - Some drivers on Tebbetts go when they should stop
  - Some drivers on Old Dover stop when they should go
- Drivers on Tebbetts may be misjudging gaps
- Queuing on Tebbetts could lead to driver impatience or aggressive maneuvers
  - Consider shiftwork from Safran (does this correlate with 3pm crash pattern?)

Potential Issues:

- Sun glare is an issue at certain times of the year
- Pedestrians and joggers using the shoulder of the road, which is relatively narrow
- Bicyclists are present as well

Potential Strategies to Mitigate Sight Obstructions

- Trim trees and vegetation in northeast and northwest corners to raise the tree canopy within the right-of-way
  - Same outside the right-of-way…work with property owners
  - History of cooperation from property owners
- Install advance intersection warning sign on southbound approach
  - Consider relocating northbound advance intersection warning sign
  - Add street name plaques to both northbound and southbound advance intersection warning signs
- Locate street name signs at the intersection where they are more visible from southbound Old Dover Rd

Potential Strategies to Mitigate Right-Angle Crashes

- Consider compact roundabout
  - Refer to State of Washington for results
  - Snow removal is necessary to maintain visibility of the center island (since it is not a traditional raised island)
  - Make sure visibility is good from southbound approach since the island will not be formal raised island
  - Consider that this may be an MS4 area – if you change (maybe even reduce) the impervious surface of road, then the project would be required to mitigate all runoff

Potential Strategies to Mitigate Right-Angle Crashes

- Consider converting to 4-way stop-controlled
  - Could create issues for large trucks turning around stopped vehicles
  - Consider interim supplemental signs/warnings (maybe message boards) to alert drivers to change in traffic control; potential for flashing LED border (temporary)
  - Potential to add STOP AHEAD pavement markings and temporary transverse rumble strips
  - Request turning movement counts and run simulation to check change in delay on Old Dover Rd and Tebbetts Rd
- Intersection Conflict Warning System (ICWS) was discussed but probably not a prime candidate for this location given the opportunity for physical (geometric) and operational changes to the intersection

Potential Strategies to Mitigate Minor Issues on Tebbetts Rd

- Good placement of stop bars but refresh eastbound stop bar
- Realign flashing beacon on STOP sign on eastbound approach
  - Look into flashing pattern and change as needed
- Replace 'Cross traffic does not stop' signs with yellow signs to help with conspicuity of the intersection
  - Look into research for placement of supplemental plaque under STOP sign (abutting or space in between)

Potential Strategies to Mitigate Large Trucks

1. Discussion of large trucks
    1. May not be contributing to historical crashes
    2. What does prohibition do to other routes (shift issue)
    3. Would require enforcement which would detract from other priorities
    4. Wide turns create off-tracking into opposing lanes and using the shoulder of the road
    5. Would a roundabout or 4-way STOP deter or discourage trucks from using the route (or would the roundabout provide a better turning opportunity)

Potential Strategies to Mitigate Fixed Objects

- Remove redundant utility poles as possible
- Pole for flashing beacon is redundant in southwest corner
  - Is it possible to tie to the utility pole (or not based on utility policy)
- Delineate utility poles with object markers

Questions?

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