ROUTE 28 CORRIDOR STUDY

FROM KITTANNING TO I-80

FINAL REPORT

November 2020

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Executive Summary

The Southwestern Pennsylvania Commission (SPC), in partnership with the Northwest Pennsylvania Commission; North Central Pennsylvania Regional Planning and Development Commission; Armstrong, Clarion and Jefferson Counties; and the Pennsylvania Department of Transportation, Engineering District 10-0 initiated a study of the Route 28 corridor to develop a plan for targeted transportation investments. The purpose of the study is to examine existing and future safety and mobility conditions and identify improvement projects that can be implemented to achieve the local and regional goals for the corridor. The study area encompasses approximately 40 miles of Route 28 through Armstrong, Clarion, and Jefferson Counties. The southern end of the study area begins at the US 422 interchange near Kittanning and extends to the I-80 interchange near Brookville (**EXHIBIT 2**).

A Study Steering Committee was formed consisting of local and regional planning officials who guided the development of the study. The Steering Committee included representation from the SPC, North Central Rural Planning Organization (RPO), Northwest RPO; Armstrong, Clarion, and Jefferson Counties; and the Pennsylvania Department of Transportation (PennDOT) Engineering District 10-0. This committee was integral in guiding the analysis, reviewing findings, and vetting conceptual improvements throughout the development of the study. One critical role of the Steering Committee was to develop corridor goals to guide improvements towards achieving the long-term vision of the Route 28 corridor.

Historically, the Route 28 corridor from Kittanning to I-80 has intermittently been studied to consider necessary safety and operational improvements, and its potential effect on the overall regional connection to the City of Pittsburgh. The most recent study was conducted in 1994 to analyze the widening of this northern portion of the Route 28 corridor to I-80 to a four-lane limited access facility. Much has changed nationally and regionally since the study was published, including the economy, transportation funding, and public opinion. More than 25 years later, the 1994 study was revisited as part of this corridor study. The original construction cost estimate of $550 million inflated to 2020 dollars yields an estimated $850 million. That value does not account for the community and environmental impacts associated with the construction of this type of facility, which would likely be high. This study did not find a case for full widening of the corridor to a four-lane roadway. The study instead focuses on identifying and addressing mobility concerns along the Route 28 study corridor by providing more practical improvements to support the region's current and future transportation use.

KEY STUDY FINDINGS

- The Route 28 corridor is expected to operate at acceptable Levels of Service (LOS) through the year 2045 in its current configuration.
- There is not a significant amount of pass through traffic currently using Route 28. Most trips are destined locally.
- Observed crashes primarily involve collisions with fixed objects at locations with steep grades and sharp curves. Safety was a concern voiced by the stakeholders and public.
- Based on existing and future traffic analysis, significant impacts, and public and stakeholder input, there is no need to widen Route 28 to four lanes in the study area. Additionally, widening would be cost prohibitive at today's costs.
- Truck percentages are approximately 15%, which is fairly high compared to the statewide average. Candidate truck climbing lanes were identified along the corridor. Further detailed analysis is needed to determine if they meet warrants and are feasible.
- Route 28 concern areas were identified through an analysis of existing studies, field observations, stakeholder and public input, geometric deficiencies, crash locations, PennDOT Safety Screening, and traffic operations.
- Corridor improvement concepts were developed at specific locations to address concern areas including:
  - Intersection realignments
  - Roadway reconstruction
  - Flattening of horizontal and vertical curves
  - Trail safety enhancements
  - Improved signing and delineation
  - Corridor wide systematic uniform improvements consisting of advanced curve and intersection treatments; high friction pavement surfaces; and lane departure warnings using center and edgeline rumble strips
- The Route 28 Corridor Study Mini-TIP summarizes specific and systematic improvements for use as a planning tool for RPO/MPO to assist with identifying future projects along the Route 28 corridor.

To identify transportation concerns within the Route 28 corridor, data was collected and analyzed through review of related planning studies, field observations, stakeholder meetings, public input, geometric analysis, and operational and safety analysis to identify common areas of concern throughout the corridor. A study concerns matrix was developed to document the data resource, interest group and/or study component that was referenced to summarize the common areas of concern. These common areas were mapped, and each location was given a unique identifier (ID), beginning at 1 at the southern limit of the study area and going to 38 at the northern limit of the study area. The number of common concerns were counted for each location to determine a level of priority. This process assumed the larger number of data groups that identified the same location, would be identified as a higher priority than a location mentioned by only a few groups. The priority locations became the basis for the development of the Conceptual Improvements. This information is summarized in the **Summarized Areas of Concerns Matrix** (**EXHIBIT 28**).

Forty improvement concepts were developed to address study concern areas**.** Eleven conceptual designs were developed to address 13 priority concern areas (5-9, 11, 14, 17, 25, 29, 33-35). **Systematic Improvement Concepts** were also identified to address common concerns and problem areas throughout the corridor. The primary concerns were related to safety, geometry that does not meet current standards, and driver recognition of intersection and access points along Route 28. These improvements would likely require limited or no right-of-way acquisition, limited utility involvement, and a small environmental footprint. **Other Improvement Concepts** consist of both localized and corridor-wide improvements at specific locations that may be less time consuming to implement than the priority improvement concepts identified and would not be categorized as systematic improvement. Each Improvement Concept's location, cost, description and the study goals each conceptual design addresses are summarized in **EXHIBIT 1**. The synthesis of this information is detailed within the **Route 28 Corridor Conceptual "Mini-TIP"** matrix. See page 79 and **EXHIBIT 46** for more details about the "Mini-TIP". Collectively and individually, these improvements will address the study's goals to improve safety, support regional economic development, facilitate regional connectivity, improve operations and minimize impacts.

The resulting Route 28 Corridor Conceptual Mini-TIP provides a tool that can help facilitate the transition from the conceptual planning stage to project programming. SPC, Northwest Commission, and North Central RPO/MPO, Armstrong, Clarion, and Jefferson Counites as well as PennDOT can utilize the Mini-TIP as a working document to consider future transportation improvements and programming opportunities to more strategically make upgrades to the Route 28 corridor for years to come. To be programmed on the MPO/RPO's actual TIP, the study concepts would likely need to be further detailed as part of Linking Planning and NEPA process.

Exhibit 1 - Improvement Concepts Summary

Concept Locations	Improvement Description	Study Goals Addressed				
		Improves Safety	Supports Regional Economic Development	Facilitates Regional Connectivity	Improves Operations	Minimizes Impacts
PRIORITY IMPROVEMENT CONCEPTS [1] - $140.4 MILLION						
Concepts 5-9: Route 28 from Sloan Hill Rd to SR 1018 near Hogback Hill/ Orchardville	Reconstructs vertical and horizontal curves to meet the Study Design Criteria and Typical Section.	x	x	x	x	
Concept 11: Route 28 & SR 1016 (Calhoun School Rd)	Provides greater distance between the transition of the Route 28 climbing lane and the northbound left turn taper, advanced lane control signing, street name signs, and "SLOW" pavement markings. Also, reconfigures the Route 28/SR 1016 intersection to be closer to a 90-degree intersection.	x		x	x	x
Concept 14: Route 28/SR 1004 (Madison Rd) & Kohlersburg Rd	Narrows the roadway to create a right turn south along Route 28 to provide a better-defined opening and reconfigures the stop condition for SR 1004. Signing upgrades would also be part of this improvement.	x			x	x
Concept 17: Route 28 at South Bethlehem (15mph curve)	Utilizes vehicle detection for system to alert motorists traveling too fast to negotiate the curve.	x			x	x
Concept 25: Route 28 at Redbank Valley Trail Crossing	Moves the trail crossing approximately 1100 feet to the south along Route 28 to occur along a tangent section of Route 28 at Middle Run Road.	x	x		x	x
Concept 29: Route 28 & SR 0536 (Mayport Rd)	Realigns Mayport Road to intersect with Route 28 closer to a 90-degree angle.	x		x	x	x
Concepts 33-35: Route 28 from Moore Rd to T-396	Reconstructs the horizontal curves with minor vertical grade adjustments to meet the Study Design Criteria and Typical Section.	x	x	x	x	
SYSTEMATIC IMPROVEMENT CONCEPTS [1] - $1.6 MILLION						
Entire Corridor	Intersection Safety Improvements, Curve Safety Treatments, High Friction Surface Treatments, Rumble Strips, Guiderail Replacement, Pavement Deterioration and Slope Erosion.	x		x	x	x

[1] Improvements include estimated Design and Construction costs. Estimated utility and right-of-way acquisition costs not included. Priority Improvements estimated costs include group Concepts 5-9 and 33-35. The individual Concepts 6, 8, 33, 35 estimated costs are included with these group concepts to develop the total estimate cost.

Concept Locations	Improvement Description	Study Goals Addressed				
		Improves Safety	Supports Regional Economic Development	Facilitates Regional Connectivity	Improves Operations	Minimizes Impacts
OTHER IMPROVEMENT CONCEPTS [1] - $4.0 MILLION						
Concepts 18-24: New Bethlehem	Includes upgrading or repairing existing sidewalks, adding new areas of dedicated sidewalks, considering consistent piano key crosswalks, and improving signing and pavement markings with enhanced signing to the Redbank Valley Trail.	x	x	x		x
Concept 20: Route 28 and Route 66 (Broad and Wood St)	Considers updating pavement markings to narrow through lanes to provide more room for turning trucks, using dashed tracking lines to connect turning movements, adding “piano key” crosswalks, and further evaluating any areas of conflict with trucks and pedestrians and the optimal location of the stop bars to maximize the turning radii.	x	x	x	x	x
Concept 24: Route 28 pedestrian crossing at Redbank Valley School	Installation of a Rectangular Rapid Flashing Beacons (RRFB) warning device installed at each side of the crosswalk.	x			x	x
Concept 25: Route 28 at Redbank Valley Trail Crossing	Short-term solution to add pole mounted pedestrian and bike flashing warning device.	x	x		x	x
Concept 28: Route 28 through Hawthorn Area	Adds advanced warning signs, wayfinding signs and improved roadway pavement markings.	x			x	x
Concept 30: Route 28 and Jefferson County Maintenance and School Bus Turnaround	Considers a proposed left turn lane with a minimum length into the turnaround in the northbound direction, post mounted delineators and special signing.	x		x	x	x
Concept 37: Route 28 and US-322 Intersection	Intersection improvement focusing on ensuring truck turning movements can be accommodated within the designated lanes and tracking radii.	x	x		x	
Concept 38: Route 28 and US 322	Modifies the intersection to better accommodate tracking of turning movements within the roadway template.	x		x	x	x

Study Background and Public Outreach

Study Area

Transportation and Land Use Context

The Route 28 Corridor Study focus area encompasses an approximately 40-mile section of Route 28 from the US 422 interchange near Kittanning, Pennsylvania northward to the Interstate 80 interchange near Brookville, Pennsylvania (**EXHIBIT 2**). The land use surrounding the corridor is primarily agricultural, low-density residential, and undeveloped forest. Communities developed along Route 28 in support of the industries of lumber, mining, farming, and manufacturing in the early 1800s and 1900s, including Kittanning, New Bethlehem, Hawthorn, Summerville, Brookville and villages such as Distant and Orchardville. Many of these industries continue to operate along the corridor, though at reduced capacity similar to the trends of the region and nation. Freight operators in the corridor typically deliver heating oil, timber, coal, aggregates, and mechanical equipment.

Example of freight operators traveling in the study area

Route 28 was designated from Pittsburgh to Kittanning in 1927. In the highway expansion era of the 1960s, the route was widened from Pittsburgh to Kittanning to a primarily four-lane divided expressway. However, the initial study of the area conducted by the Pennsylvania Department of Transportation (PennDOT) recommended extension of the four-lane, limited access facility from Aspinwall to I-80. A portion of this recommendation was built in the 1970s and 1980s terminating in Kittanning, PA. This study examined the feasibility of continuing the 4-lane template from Kittanning to I-80. A second study was completed in 1994 and estimated the cost to be over $550 million for construction of the facility.

End of the Route 28 four-lane expressway in Kittanning, Pennsylvania

The corridor today serves many purposes. It serves short trips for residents and local agriculture and business owners, and longer, critical regional trips for Pittsburgh-bound commuters and freight operators, such as the heavy Powdered Metal areas of north central PA. From New Bethlehem, the approximate midpoint of the corridor, it takes approximately one hour ten minutes to drive the 61 miles to Pittsburgh along Route 28. The northern portion of the Route 28 corridor also provides a critical temporary detour of I-80 traffic during fairly frequent traffic incidents on I-80. The surrounding land and environmental features draw outdoor enthusiasts to activities including biking, hunting, fishing, camping, and ATV riding. ATV organizations on the corridor frequently host "runs"[2], which draw thousands of ATVs to the valley and its trails. Redbank Creek offers trout fishing and kayaking activities. The creek runs roughly parallel to the corridor north of New Bethlehem, visibly close to the roadway in some areas where it winds through Summerville toward Brookville.

[2] ATV Runs are events organized either for fun or charity where riders are given a route and check-in points along the way where they can participate in activities or, in the case of a "poker run," obtain playing cards to try to have the best poker hand at the end of the run for prizes.

Businesses are frequently located directly adjacent to the corridor. Route 28 runs through the Central Business District of New Bethlehem and the campus of Redbank Valley High School. There is an at-grade trail crossing of the Redbank Valley Trail in New Bethlehem. The last train ran on the adjacent rail corridor in 2007, when it was railbanked and transformed into the Redbank Valley Trail, a 51-mile non-motorized trail that connects from Brookville westward to the Armstrong Trail. In 2014, the Redbank Valley Trail was awarded the 2014 Trail of the Year by the Pennsylvania Department of Conservation and Natural Resources (DCNR).

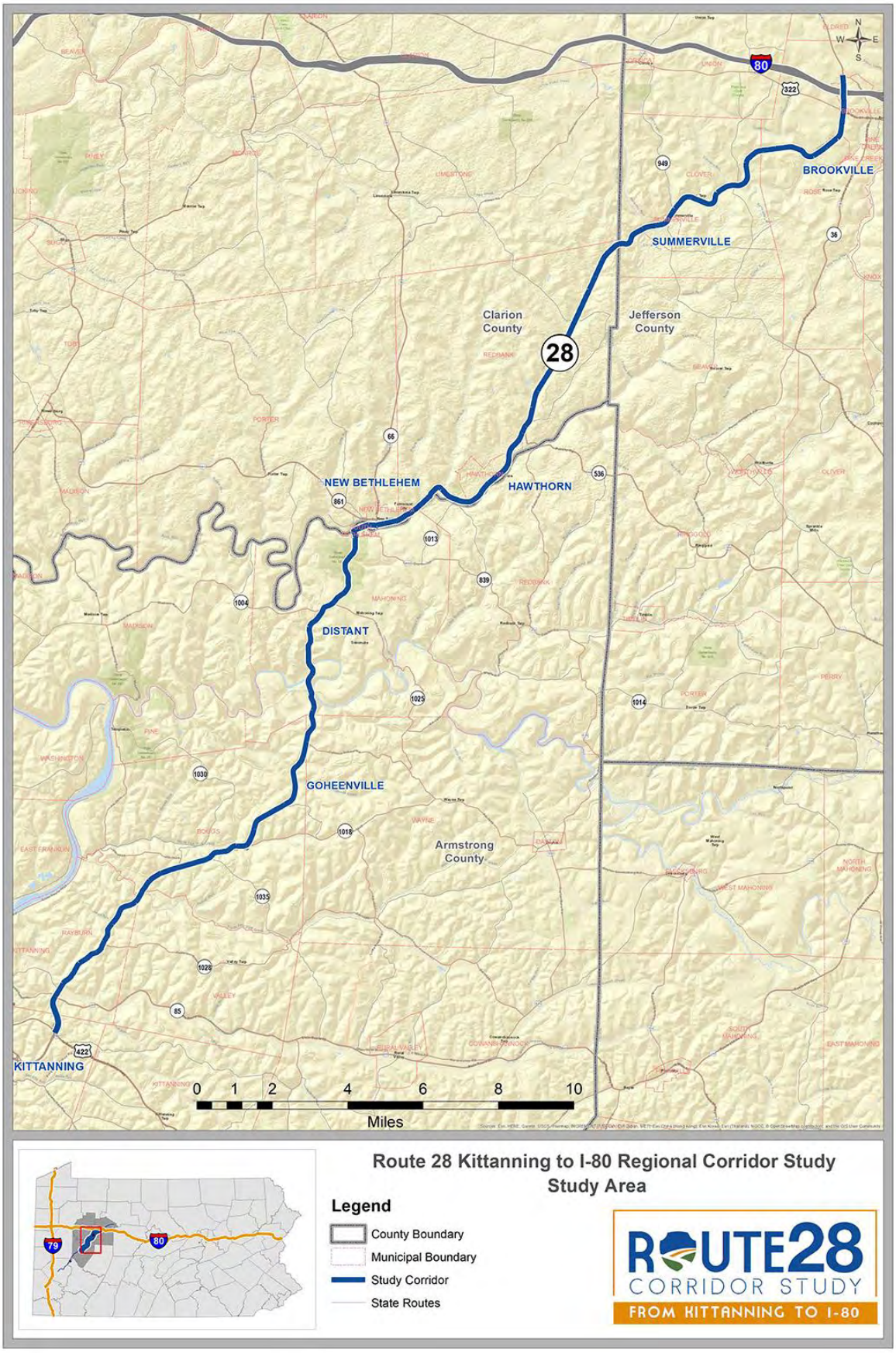
Example of businesses located along Route 28

Geography

Route 28 runs through unique geography that could roughly be broken down into three sections. The southern section from approximately Kittanning to New Bethlehem hosts mountainous terrain adjoining steep slopes with long grades exceeding 9% in some areas and winding turns. Truck climbing lanes and brake check areas are found throughout this portion of the corridor. In the middle section of the corridor from approximately New Bethlehem to Summerville, the mountains begin to break to flatter, rolling hills with passing zones and clearer lines of sight. The northern section of the corridor from Summerville to US 322 has rolling terrain, but winds horizontally around the mountain and generally follows the Redbank Creek. The segment from US 322 to I-80 is built-up with commercial businesses and densely spaced driveways, travel service amenities, signals, and four lanes of traffic with turning lanes.

Example of an existing truck brake check area on Route 28

Exhibit 2 - Study Area Map



Steering Committee

To ensure study input and outcomes were representative of the overall area, SPC established a Steering Committee to guide the Study Team. The Committee included representation from two additional planning organizations: North Central Rural Planning Organization (RPO) and the Northwest RPO; each of the three counties: Armstrong, Clarion and Jefferson; and the Pennsylvania Department of Transportation (PennDOT) Engineering District 10-0. The Steering Committee was engaged at key intervals throughout the study to review technical data and public feedback, establish study goals, identify improvement areas of focus, and consider improvement concepts. The following meetings were held. Due to the impact of the 2019 Novel Coronavirus (COVID-19), many of these meetings were conducted virtually, rather than in-person.

- **Meeting #1, December 5, 2019** (In-person)
  Meeting Focus and Input: Study Area, Public Involvement Approach, Data Collection, Potential Focus Areas, and Schedule
- **Meeting #2, January 24, 2020** (Virtual)
  Meeting Focus and Input: Study Goals, Website & Wiki Map Survey Review, Stakeholder Outreach, and Study Updates
- **Meeting #3, April 28, 2020** (Virtual)
  Meeting Focus and Input: Existing Conditions Findings, Concern Areas, and Next Steps
- **Meeting #4, June 10, 2020** (Virtual)
  Meeting Focus and Input: Future Conditions Analysis, Potential Improvement Concepts, and Study Report Outline

Detailed meeting summaries documenting each of the above meetings are available for review in **Appendix A**.

STEERING COMMITTEE MEMBERS

SPC

North Central RPO

Northwest RPO

Armstrong County

Clarion County

Jefferson County

PennDOT District 10-0

Study Goals

The study goals were developed in close coordination with the Steering Committee. These goals identify key measures that resulting improvements should support in order to best represent the area's existing and future interests and concerns. As such, these goals will be used to determine the effectiveness of each of the conceptual improvements.

Improve Safety - improve safety for all modes of transportation

- o Improve Security – improve security by maintaining critical assets such as bridges and reducing emergency response times

Support Regional Economic Development – promote the corridor as a regional trade route between I-80 and Pittsburgh, in addition to attracting new businesses

- o Promote Tourism – promote tourism to historic locations, trails, and outdoors activities

Facilitate Regional Connectivity – facilitate connections to regional routes

- o Accommodate Multimodal Use – improve existing and plan for new multimodal connections to non-motorized facilities
- o Accommodate Freight Movement – facilitate access for freight and trucks

Improve Operations – improve operations and reduce congestion

- Improve Resiliency/Reliability – provide reliable travel times
- Focus on Asset Preservation – maintain a good state of repair of assets such as bridges, guiderails, signs, drainage, slopes, lighting, pavement structure, signals, and variable message signs

Minimize Environmental Impacts – minimize impacts to the environment and community

- Improve Quality of Life – improve quality of life by providing access to a safer and more efficient transportation system and public resources
- Gain Community Buy-in/Satisfaction – promote projects that have broad community support, meet the study's goals, and minimize impacts to the traveling public during construction

Public Outreach

Public and stakeholder outreach played an important role in the Study Team's data collection efforts. Through the use of an online mapping survey and a series of stakeholder meetings, the team was able to develop a better understanding of the local perspective and identify the needs and opportunities along the Route 28 corridor. Below is a brief summary associated with these efforts. Additionally, the Study Team utilized a project website (www.Route28CorridorStudy.com) to share information throughout the study and post the draft study report for public and stakeholder comment. Comments received can be referenced in **Appendix B** – Public Comment.

Online mapping survey results summary.

Online Mapping Survey

The Study Team utilized a crowd sourcing tool called Wiki-Maps to conduct an online mapping survey. The survey was available at https://wikimapping.com/Route-28-Corridor-Study-Kittanning-to-I-80.html from Friday, February 7 through Friday, March 6, 2020. The Steering Committee member organizations promoted the survey through a press release, emails, and social media. Direct links to the mapping survey were also available on the study website.

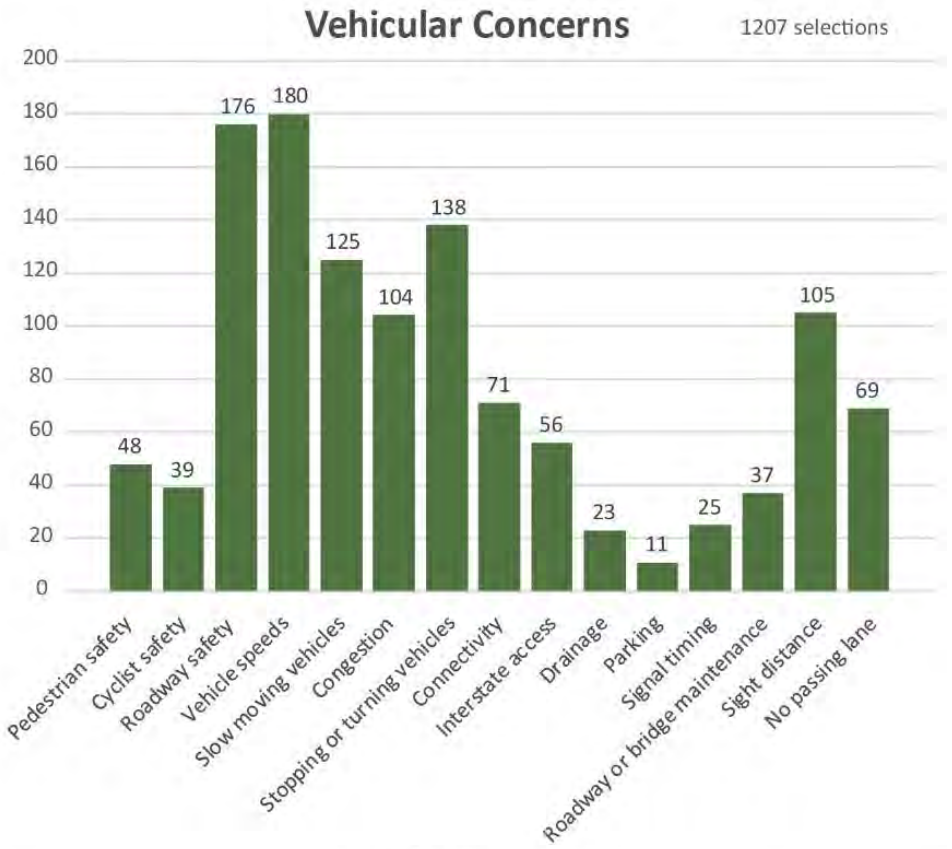
The interactive map allowed users to place points on a map of the corridor to identify areas of concern or opportunities for improvement related to vehicular, freight, bicycle, and pedestrian traffic. Each mode included targeted survey questions to collect specific details about the concern or opportunity. A copy of all survey questions is included in **Appendix C.**

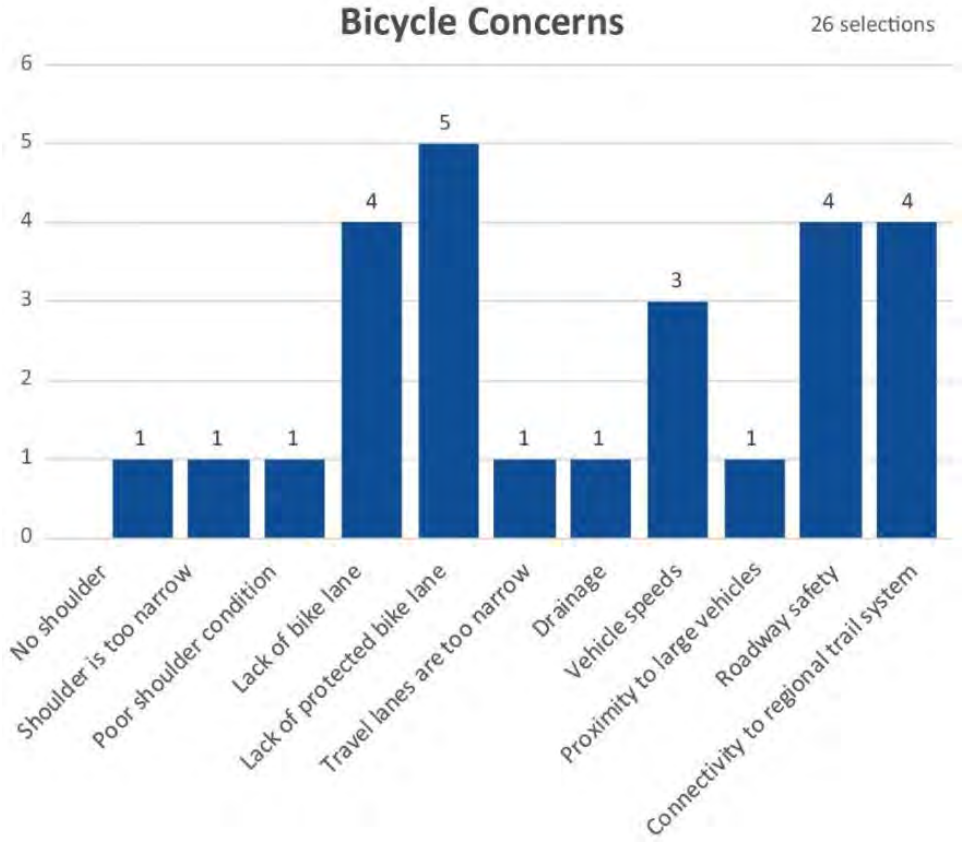
During the course of the survey period, 305 total map points were placed by 151 unique users. A majority (269) of points were related to vehicular traffic. Nineteen were related to freight; ten related to pedestrians; and seven related to bicycles. There were 730 logins to the WikiMap site that include visitors who entered the site multiple times and those who entered the site but did not complete the survey.

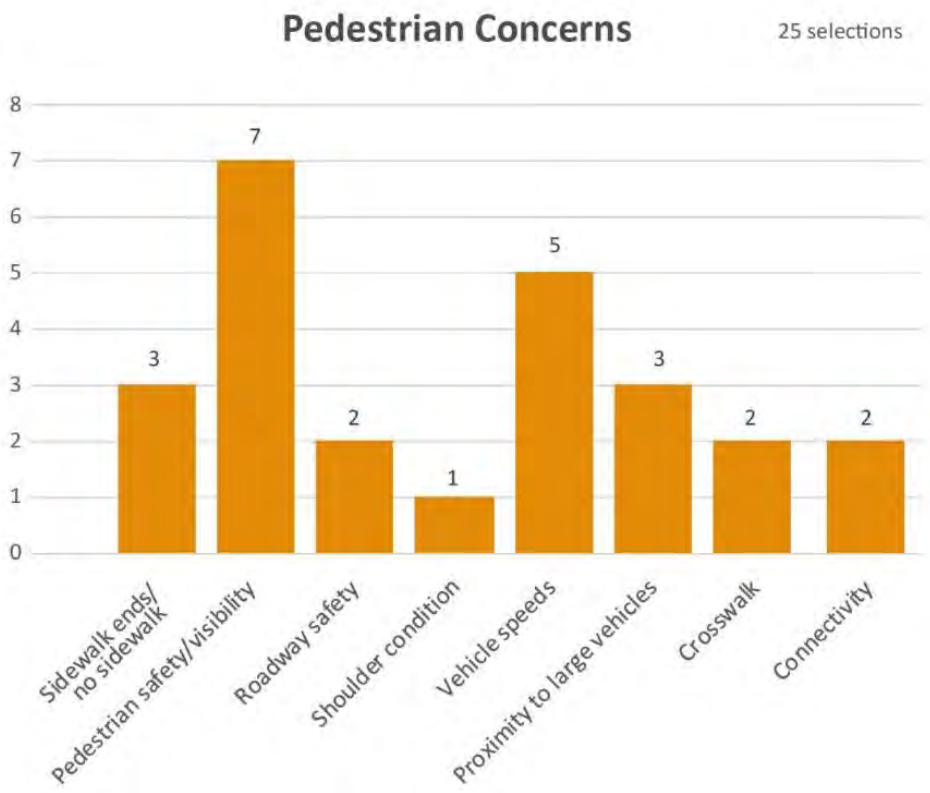
Areas of concern were summarized into 31 unique locations and mapped in **Appendix D.** The survey points revealed common areas of concern, some of which were corridor-wide.

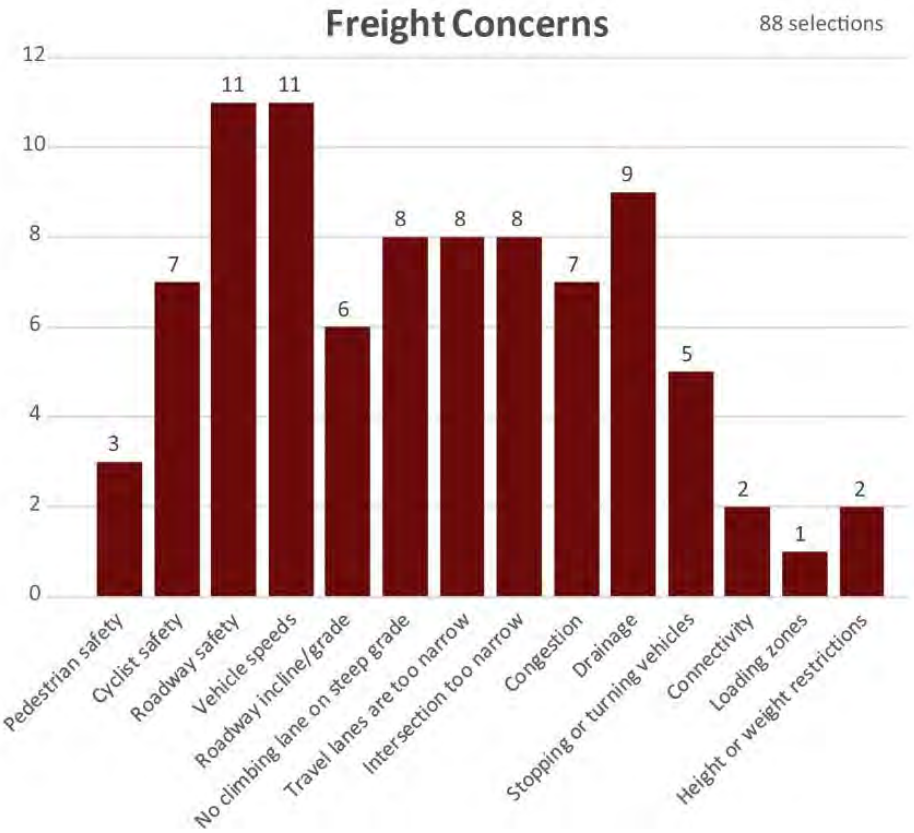
The survey included questions relative to different travel modes. **EXHIBIT 3** displays the frequency of concerns for each mode. While each mode varied slightly in the options, the most common concerns were roadway safety, vehicle speeds, slow moving vehicles, intersection sight distance, and visibility of pedestrians and bicycles on the roadway.

Exhibit 3 - Public Concern Frequency






Pedestrian Concerns
25 selections
8
7
6
5
4
3
2
1
0
3
7
2
1
5
3
2
2
Sidewalk ends/ no sidewalk
Pedestrian safety/visibility
Roadway safety
Shoulder condition
Vehicle speeds
Proximity to large vehicles
Crosswalk
Connectivity


Freight Concerns
88 selections
12
10
8
6
4
2
0
3
7
11
11
6
8
8
8
7
9
5
2
1
2
Pedestrian safety
Cyclist safety
Roadway safety
Vehicle speeds
Roadway incline/grade
No climbing lane on steep grade
Travel lanes are too narrow
Intersection too narrow
Congestion
Drainage
Stopping or turning vehicles
Connectivity
Loading zones
Height or weight restrictions

Stakeholder Outreach

The Study Team and Steering Committee identified potential stakeholders representing both rural and urban areas. Stakeholders included emergency services, school transportation officials, municipal representatives, frequent roadway or trail users, and more.

In late February 2020, stakeholders were invited to attend one of three meetings. Meetings were held in Brookville, New Bethlehem, and Kittanning to get a broad geographic spread of comments, and for ease of stakeholder attendance. The attendee list and meeting minutes can be found in **Appendix E**. Areas of concern identified through the stakeholder interviews were summarized into 24 unique locations and mapped – see **EXHIBIT 4**.

The concerns highlighted by the stakeholder interviews and the public survey comments aligned with the goals set out by the Study Team and Steering Committee early in the study process. Concerns and comments focused on the safety of the corridor, citing intersections with poor sight distance and speed differentials; the importance of ensuring connectivity of the corridor with other destinations and regions; and the improvement of operations by reducing congestion, especially when the corridor is used as a detour route. Public input was also vital to give local perspective and insight into corridor use related to special events, which the Study Team could not gather in other ways.

STAKEHOLDER INVOLVEMENT:

Armstrong County

Armstrong County Chamber of Commerce

Barber Trucking

Boggs Township

Bradigan's Inc.

Clarion County

Hawthorn Borough

Jefferson County

Jefferson County 911

Kittanning Township Volunteer Fire Department

Mahoning Township

Miller Fabrication

New Bethlehem Borough

PennDOT – Clarion County

Pennsylvania State Police – Kittanning

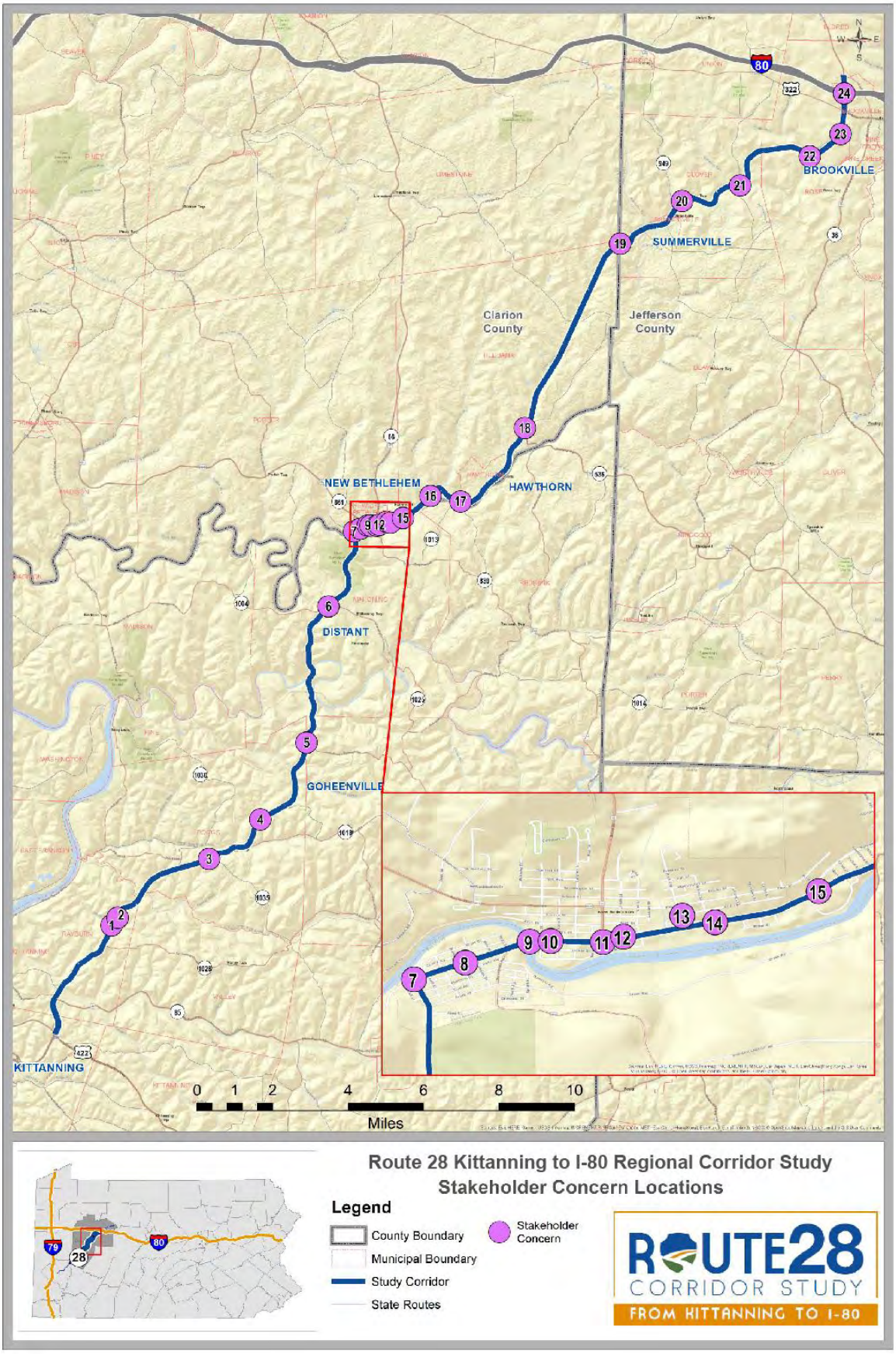
Pine Township Fire Department

Redbank Valley Trails Association

Redbank Valley School District

Both the stakeholders and general public identified specific concern locations that often overlapped with each other and with locations identified by other study analysis. The concerns and comments from the stakeholders and the general public were compiled with data and analysis of different aspects of the corridor and contributed to the identification of study concern areas.

Exhibit 4 - Stakeholder Concern Map



Corridor Conditions Analysis

Data Collection

Field Observations

Field observations were conducted on January 13, 2020 to gather photographs, observations, and key measurements of current corridor conditions. Refer to **Appendix F** - Existing Conditions Memorandum for detailed notes and images. The examined areas were identified by the Steering Committee or through research prior to field work. The types of data gathered by the observations included vehicular observations, pedestrian and trail observations, roadway geometry, guiderail erosion, sight distance, speeds, and freight patterns. Locations of observations included:

- Downtown New Bethlehem
- South New Bethlehem
- Distant
- Hawthorn
- Redbank Valley Trail
- Intersections of Route 28 with the following roads
    - Sloan Hill Road
    - SR 1035 (Oscar Road)
    - SR 1004 (Kohlersburg/Madison Road)
    - SR 1025 (Putneyville Road)
    - SR 0536 (Mayport Road)
    - South Main Street
    - SR 1028 (Anderson Creek Road)
    - Poverty Hill Road
    - Toadtown Road/Anderson Road/Creek Street
- Corridor-wide observations
    - Freight
    - Speeds
    - Guiderail erosion
    - Signs and pavement retroreflectivity

In general, many of the locations have apparent limited sight distance due to the horizontal and vertical curvature of the roadway. Note that comparisons for sight distance, geometric features, etc. are to current standards, which were not in effect and may not have been applicable to the roadway as originally designed. There are also locations of tight geometry that are difficult for large vehicles to navigate with evidence of overtracking and sign hits throughout the corridor. Several locations of missing or deteriorating guiderail were noted. Rumble strips have been installed in some locations, but not consistently throughout the corridor. Speed differentials were noticeable based on drive-throughs of the corridor, with a spectrum ranging from 10-15 mph below the speed limit to 10 mph over the 55 mph posted speed limit, and aggressive passing behavior in areas without passing zones.

Signal at Route 28 and Wood Street

Trail crossing in New Bethlehem

Guiderail erosion repair on Route 28

Counted Intersections

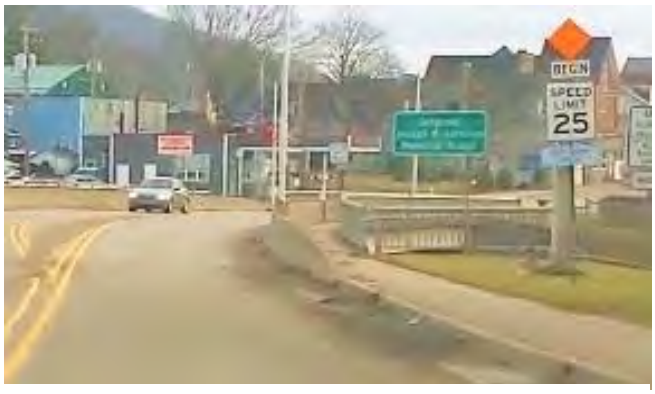
Turning movement counts were collected at 16 intersections along the corridor previously identified by the Steering Committee as higher volume or potentially congested intersections (**EXHIBIT 5**). Passenger cars and heavy vehicles were counted on Tuesday, November 19, 2019, an average weekday while school was in session. Count data for the AM and PM peak hours can be found in **Appendix F,** the Existing Conditions Memo.

Exhibit 5 - Counted Intersections

ID	Intersection Name
1	Route 28 & SR 85
2	Route 28 & SR 1004 (Madison Road) & Kohlersburg
3	Route 28 & Kohlersburg Road
4	Route 28 & SR 1025 (Putneyville Road)
5	Route 28 (Broad Street) & SR 66 (Wood Street)
7	Route 28 & Center Street/Walker Flat Road
8	Route 28 & SR 536 (Mayport Road)
9	Route 28 & Carrier Street
10	Route 28 & South Main Street
11	Route 28 & SR 0322
12	SR 36 & I-80 EB Ramps
13	SR 36 & I-80 WB Ramps
14	Route 28 & Waterford Pike
15	Route 28 & I-80 EB Ramps
16	Route 28 & I-80 WB Ramps

Speed and Travel Times

Speed and travel time are concerns for residents and businesses that use the Route 28 corridor. Observations on the corridor show that getting stuck behind a slow-moving vehicle in an area with no climbing lanes or passing zones creates driver frustration, leading to aggressive driving behavior such as speeding and improper passing. Historical average speed data provided by SPC through the data service INRIX shows a wide range of preferred speeds for travelers on the corridor, as well as the speed differentials between passenger cars and large commercial vehicles.



25mph speed limit in New Bethlehem

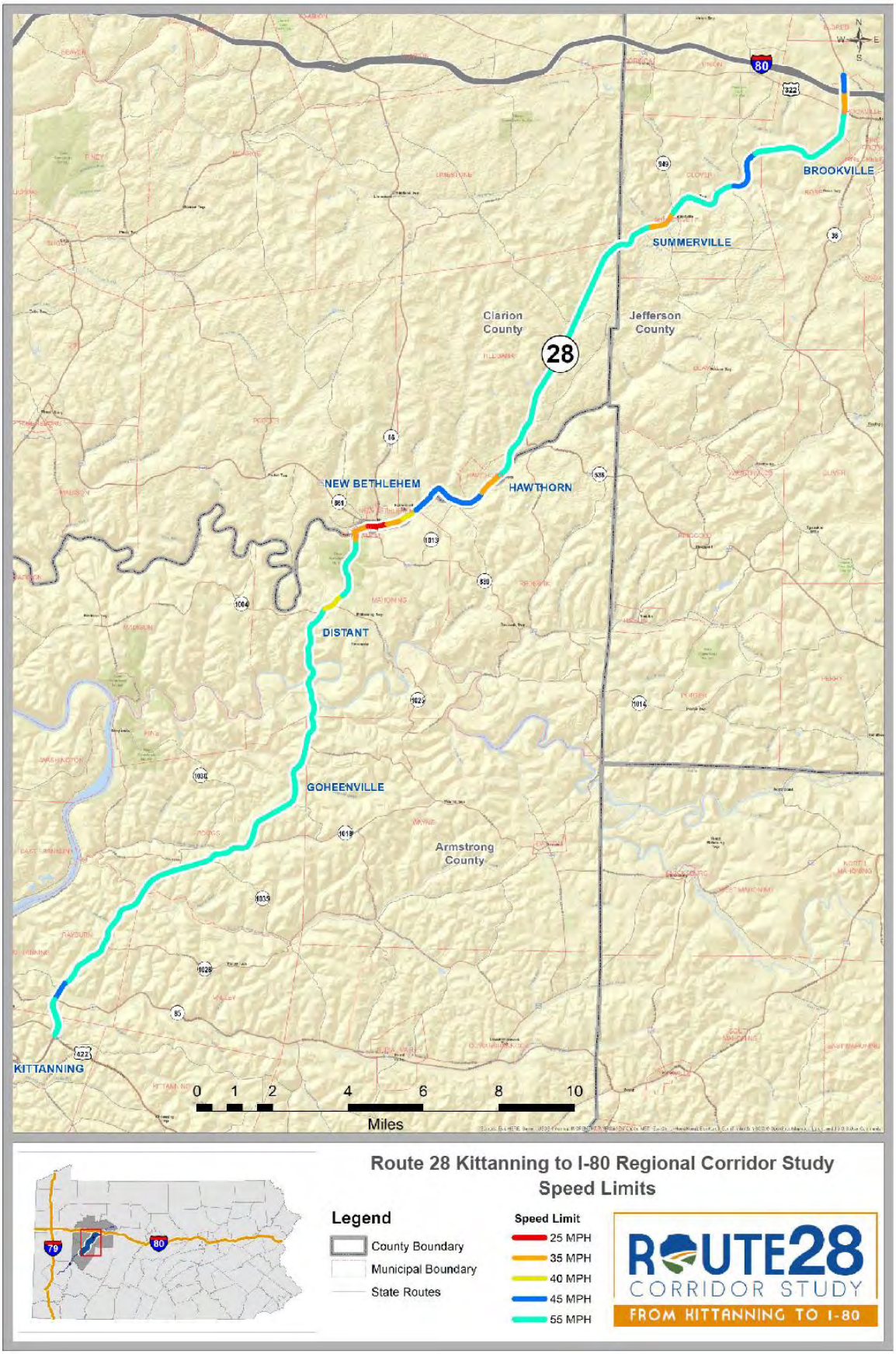
Speed limits fluctuate throughout the corridor from 25 mph in built-up areas like New Bethlehem, to 35 mph leaving the borough, 40 mph, and 45 mph around curves and 55 mph in most sections between communities. The speed limit fluctuates frequently between Distant, New Bethlehem, and Hawthorn with little change in the roadway template to provide visual cues to drivers to slow down. It was noted during stakeholder interviews that speed limits may not be consistently posted for the

same segment of roadway in opposing directions, particularly in the shopping plaza area between downtown New Bethlehem and the high school. Current posted speed limits are shown in **EXHIBIT 6**.

Speeding is a noted concern by the public. In areas like New Bethlehem, maximum average hourly speeds range from 35 to 40 mph in the posted 25 mph zone. Most segments in the corridor have maximum observed speeds trending above 55 mph, including areas with significant grades and curvature. On average, the maximum average hourly speeds for cars on the corridor is 57 mph. The maximum average hourly speed for trucks on the corridor is 51 mph. This 6 mph speed differential is observed in areas where there are significant grades. The longest segment of speed differential between cars and trucks is from approximately Goheenville to Distant (5 to 10 mph difference) over the area known locally as Hogback Hill. Field observations and GIS data noted areas of significant grade change in this area. Another segment with a high speed differential between cars and trucks is coming into South Bethlehem around the 15 mph curve through New Bethlehem (10 to 15 mph difference).

55 mph speed limit majority of the corridor

Exhibit 6 - Posted Speed Limits



Grades

Roadway grades were mapped for the corridor to better understand areas where cars and trucks are subject to different acceleration and braking requirements. Grades were mapped using elevations captured at 1,000-foot intervals. In the northbound direction, the uphill grades (> 5%) are shown in red, and downhill grades (< 5%) are shown in blue. Anything from flat to a 5% grade was shown as “rolling” or “flat”. This correlates with PennDOT’s Design Manual 2 maximum vertical grade criteria of 5% based upon functional classification of the Route 28 study corridor. This vertical grade is shown to provide an understanding of locations where existing grades may be affecting traffic operations. Some segments on the corridor reach 9% grades for miles. There is a truck pull-off location in the northbound direction before a steep downhill grade. There are no runaway truck ramps present on the corridor.

Steep grade warning 9% grade over 2 miles

The grade data was mapped and compared to the locations of existing truck climbing lanes in order to understand where truck climbing lanes might be warranted (**EXHIBIT 7**). General purpose passing zones on relatively flat surfaces are also included on this map to give an idea of how frequently there are opportunities to overtake vehicles. The areas where there are significant grades and no climbing or passing lane in the vicinity may be identified as bottlenecks.

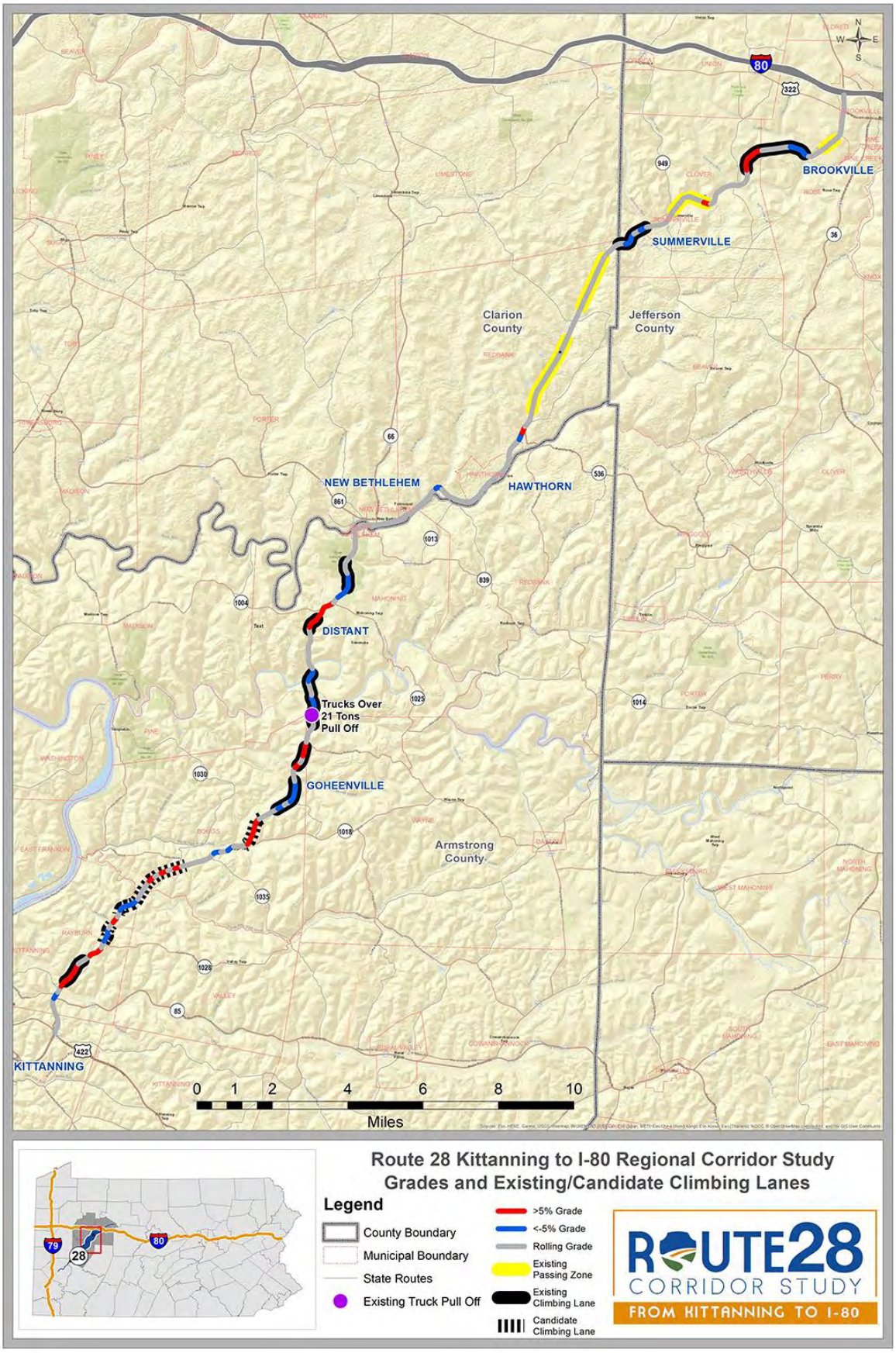
Truck pull-off before downhill grade

Candidate areas for truck climbing lanes were identified. As part of this corridor study, stakeholders and the public shared the desire for more climbing lanes to pass slow-moving vehicles. Field observations further identified areas as potential candidates for climbing lanes. An area with a number of candidate climbing lane areas is on the southern end of the corridor between Goheenville and Kittanning. Two candidates were identified in the northbound direction and two in the southbound direction, around the area locally known as Hayes Dip and north of SR 1018. The operational Level of Service for climbing lanes takes into account Average Travel Speed and Percent Time Spent Following. Candidate locations were analyzed with Highway Capacity Software. Some experience poor operations in the current year and others degrade under future year 2045 traffic.


Following heavy vehicles

Further detailed traffic studies should be performed to determine the feasibility of a truck climbing lane at these or other locations per AASHTO guidelines. The warrants should be documented and a feasibility analysis conducted, including a summary of impacts on intersection tie-ins, sight distance, safety, right-of-way, utilities, and environmental features. Further data needs would include spot-specific video or pneumatic 24-hour traffic counts that pick up vehicle classification and speed distributions in the vicinity, travel time runs through the areas to improve upon the INRIX data, and detailed log of grades in the field to improve upon the planning-level grade analysis. Further analysis should also consider potential candidate locations for runaway truck ramps on long downhill grades.

Exhibit 7 - Grades and Climbing Lanes



Detour Conditions

Posted detour routes on Route 28 can be seen in **EXHIBIT 8**. Detour traffic from I-80 was a concern noted by nearly all stakeholders, as portions of the Route 28 corridor are marked for the Orange, Blue, and Green detours for I-80 that converge at US 322 as shown in **EXHIBIT 9**. Detour traffic from travelers following their personal navigation devices and getting back on the interstate only to be detoured again was identified as an issue by the Steering Committee and stakeholders.

The New Bethlehem bridge was identified by stakeholders as an infrastructure security concern as there is no redundancy in the roadway system. The Black Detour route is posted for the New Bethlehem bridge closures. The typically 17-mile stretch of Route 28 is detoured westward at a length of more than 43 miles through many villages and communities that are not easily navigable by trucks to reach New Bethlehem or Kittanning.

More information and analysis on detour conditions can be found in the **Appendix F** - Existing Conditions Memo.

Blue, green, orange detours at intersection of Route 28 and US 322

Exhibit 8 - Posted Detour Routes

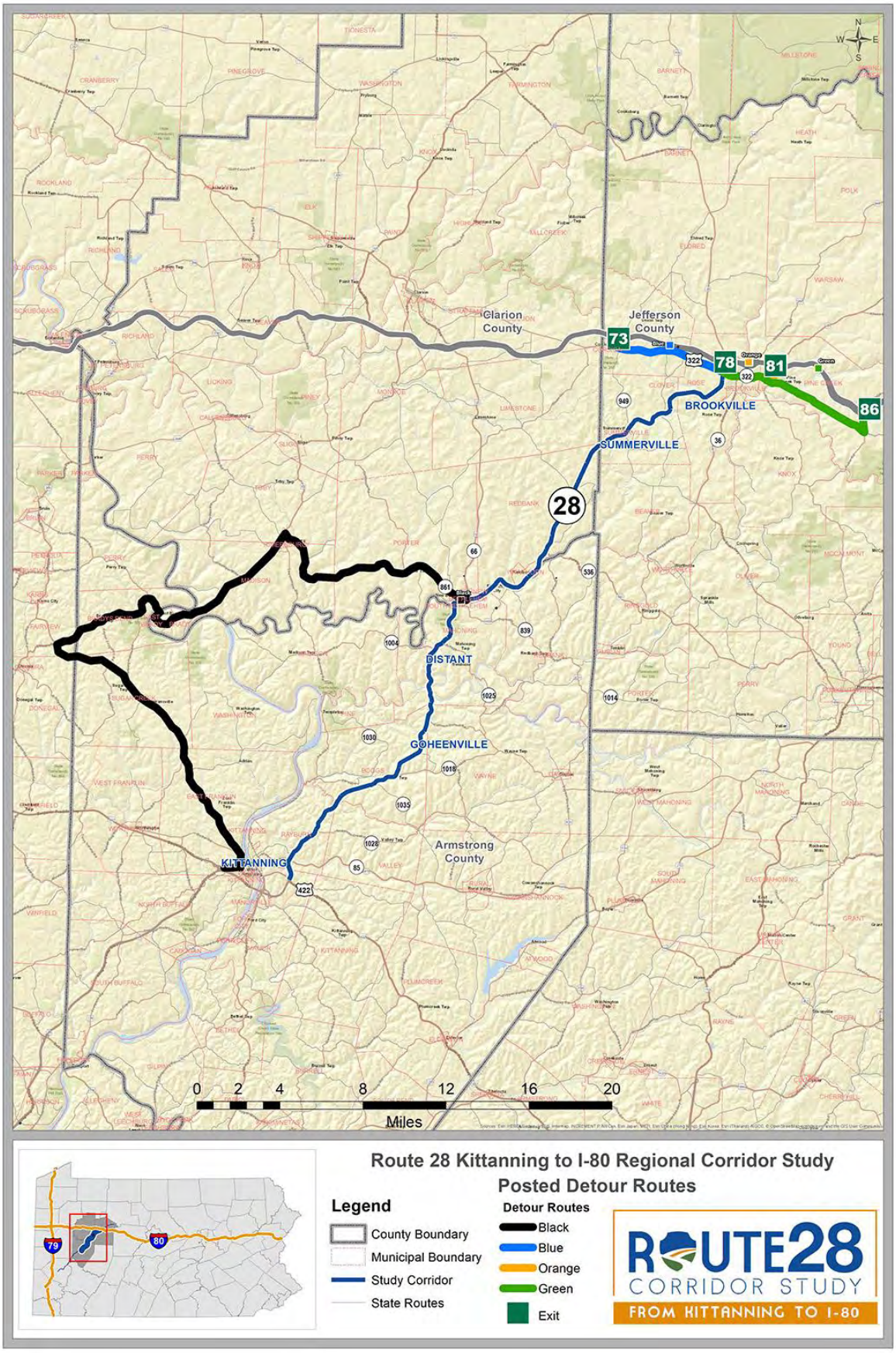
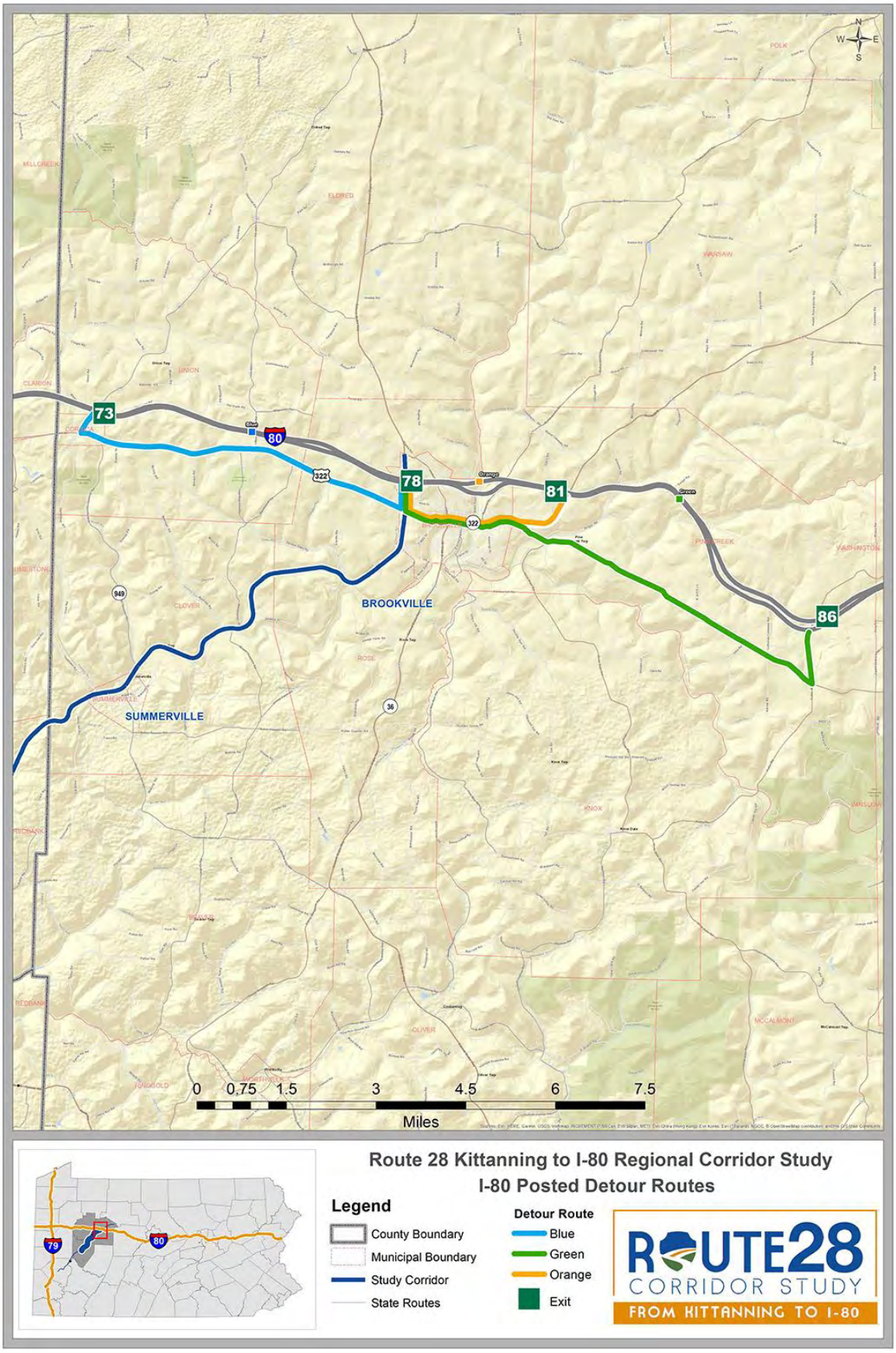


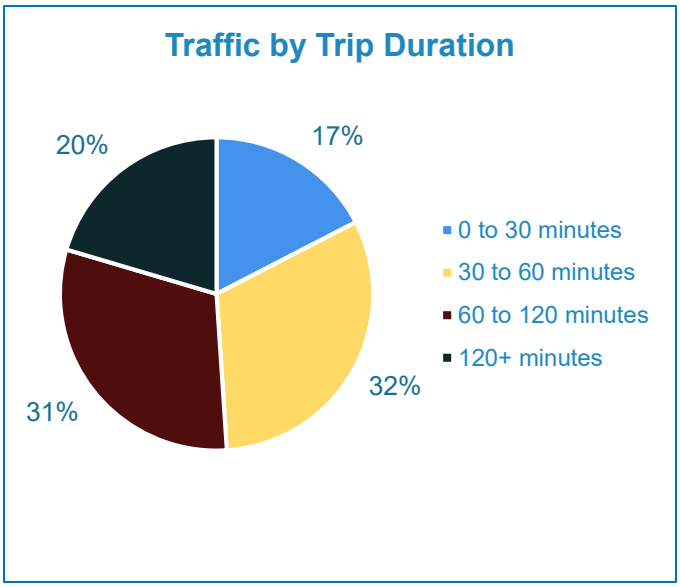
Exhibit 9 - I-80 Posted Detour Routes

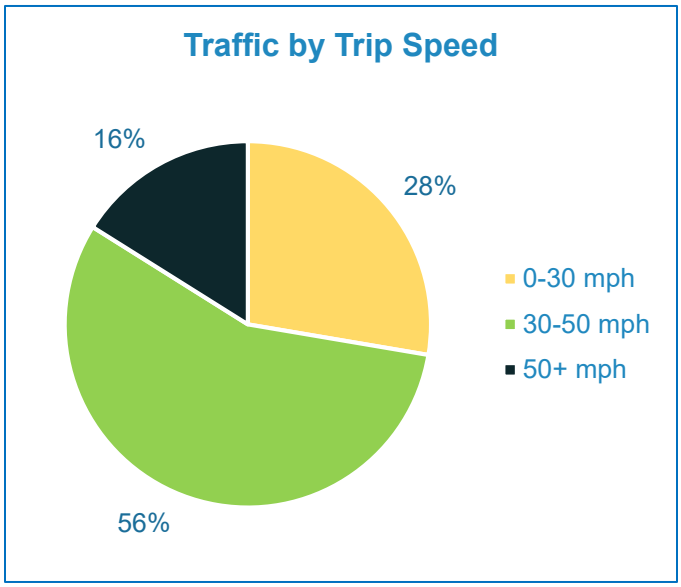


Streetlight Data for Corridor

Streetlight data is a big data company that provides travel insights based on cellular and GPS data. Access to the Streetlight data service was provided by the SPC's subscription in support of the Route 28 Corridor Study. The data was analyzed to understand existing travel conditions on the Route 28 corridor. **EXHIBIT 10** shows general characteristics of all trips over the 40-mile length of the study corridor. More than half of the trips on the corridor are over 60 minutes in duration, with a large number of trips over 120 minutes. This trip duration includes commercial vehicle traffic, which may have hauling routes along the corridor or destined northward to Forest, Elk or Venango Counties. Trip lengths correspond with the trip duration, with a majority of trips longer than 30 miles. More than half of the travel speeds are between 30 mph and 50 mph, with approximately 16% traveling 50 mph to 70 mph. Of those, 4% were over 60 mph.

Exhibit 10 - Trip Characteristics





Who does the Route 28 corridor serve? **EXHIBIT 11** shows the geographic spread of the home locations of travelers. The cluster shows that travelers on this 40-mile section of the Route 28 corridor primarily live and work in areas adjacent to the corridor to the east and west. There are fewer home locations for Route 28 travelers north of I-80. The cluster of home locations stretches as far southwest as Pittsburgh, with a few isolated clusters focused primarily in places that are accessible via Route 28, I-80, I-79, US 422, and US 322 such as Youngstown, Ohio and in Pennsylvania: Erie, Altoona, DuBois and State College. The public survey conducted for this study was targeted to the zip codes surrounding the corridor and advertised via press release and posted on participating Steering Committee member organization social media pages.

Where are people going on the Route 28 corridor, and at what levels of frequency? **EXHIBIT 12** designates a point in the middle of the corridor that identified personal trips pass through on a weekday, and their origins and destinations. This map highlights a distinct diagonal pattern of trips that follows the trajectory of the corridor. There is a large geographic catchment area in the northeast counties (Forest, Elk, Warren, McKean, Clearfield, Cameron) for Route 28 traffic destined to Kittanning and Pittsburgh.

Exhibit 11 - Home Grids for Route 28 Corridor Travelers

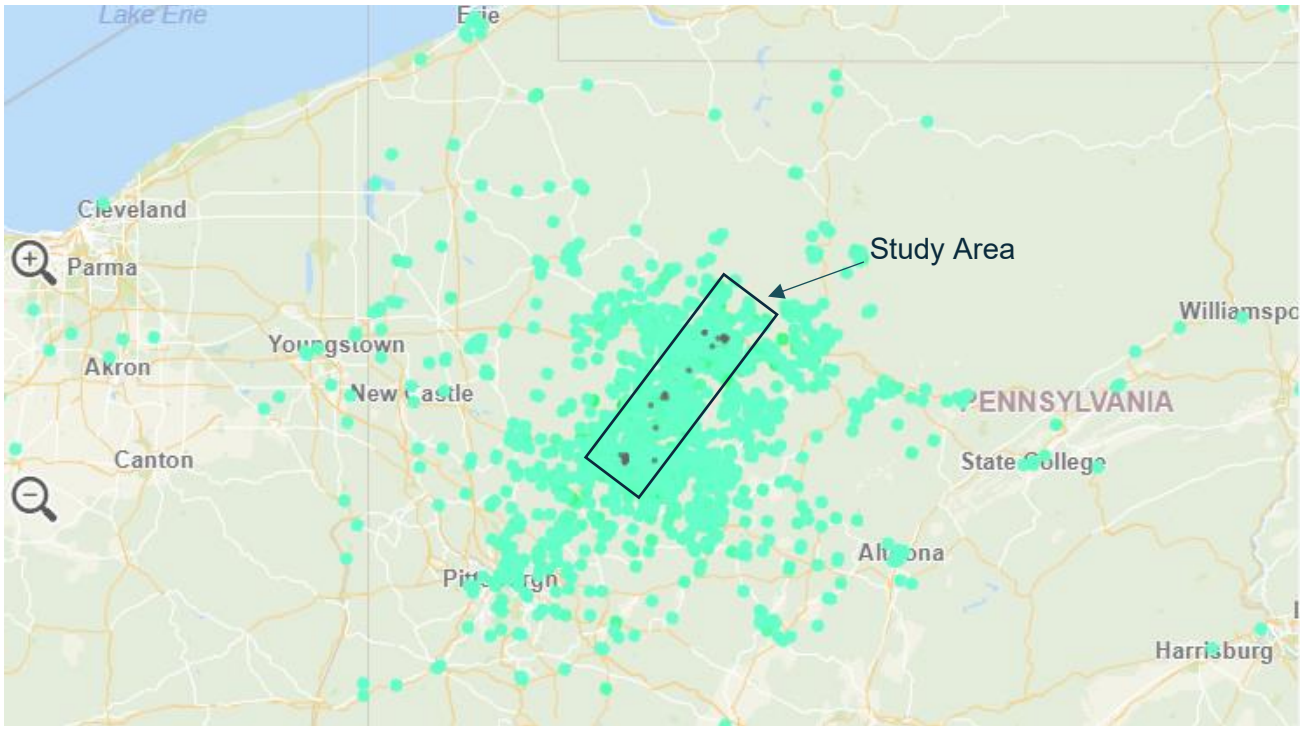


Exhibit 12 - Origin-Destination Heat Map (Weekdays)

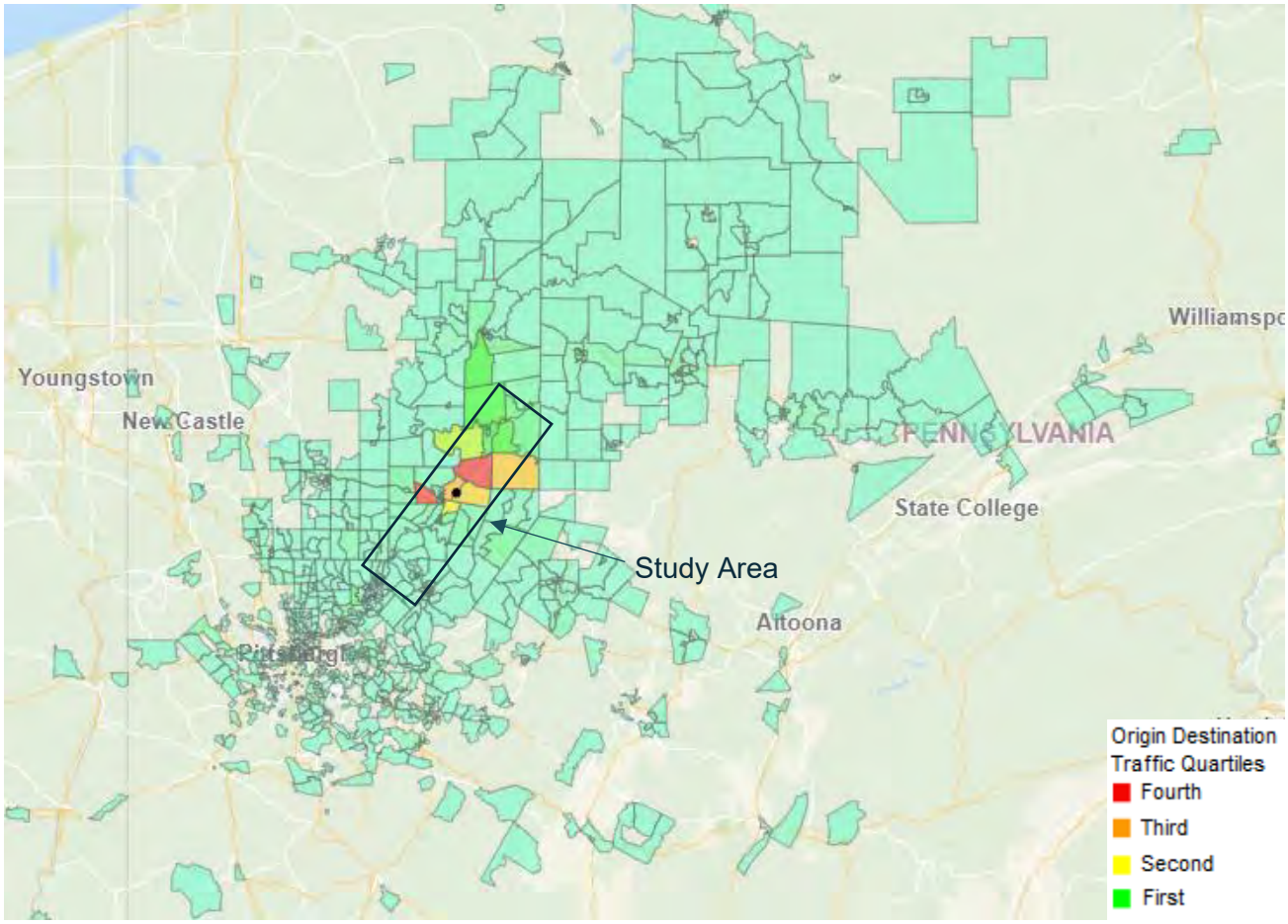
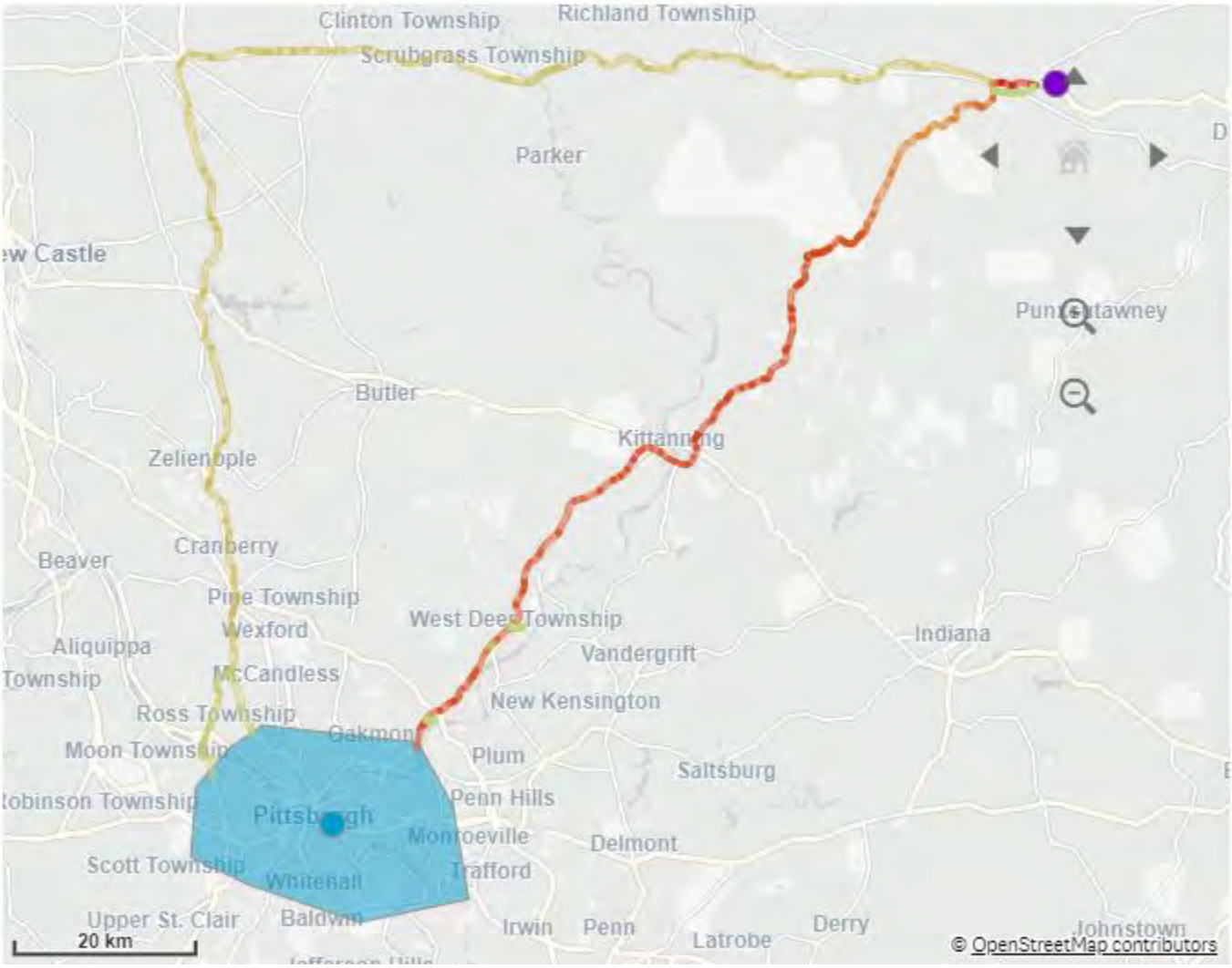


EXHIBIT 13 shows primary travel routes from Pittsburgh to a point east of Brookville. It highlights two main routes: the Route 28 corridor, and the I-79 to I-80 corridor. The data analysis shows that Route 28 is more popular than I-79 to I-80 for this origin-destination zone pair based on a trip index variable calculated by the Streetlight software. However, we do not currently observe a significant amount of through traffic on this route because there is not significant demand between these two points. For example, about 4% of traffic passing South Main Street near Brookville is destined to/from Pittsburgh. Most trips were destined adjacent to the Route 28 corridor or Kittanning.

Exhibit 13 - Top Routes from Pittsburgh to Brookville



Multimodal Facilities

While the Route 28 corridor today primarily serves passenger cars and commercial freight traffic, the corridor also serves pockets of multimodal activity surrounding communities and areas like Distant, South Bethlehem, New Bethlehem, Redbank Valley High School, the Redbank Valley Trail, and Hawthorn. This section describes the land use context and multimodal facilities in each of these areas.

Distant

Distant is a primarily residential community with homes with close setbacks and driveways directly accessing Route 28. There are also agricultural uses nearby including Bostonia Farms. The speed limit in Distant is reduced from 55 mph coming up Hogback Hill to 40 mph through town. Distant is home to pedestrian-generating stores such as Sweet Delights ice cream and a Dollar General that was built in recent years. There is approximately 1,000 feet of sidewalk on the north side of Route 28 from the SR 1004 intersection to a residential endpoint approximately 200 feet west of Sweet Delights on the opposite side of the roadway. The Dollar General is approximately 1,000 feet further east. There are no marked crosswalks or ADA-compliant curb ramps in this area. The sidewalk is narrow but in overall good condition since there is no evidence of significant heaving, cracking, or overgrowth. A general inventory of Distant's multimodal facilities and pedestrian generators can be found in the Existing Conditions Memo.

Typical roadway in Distant (looking southbound)

South Bethlehem

Rounding the 15 mph advisory curve going northbound on Route 28 entering South Bethlehem, sidewalks begin and are located on both sides of the roadway through a traditional residential street grid. Many of the sidewalks and curb ramps are narrow, heaved due to tree roots, overgrown with grass, cracked, and have no curb ramps. In one instance, there is a step at the ramp. There are no marked crosswalks or pedestrian crossing signs in this area. West of the curve, there is a pedestrian bridge over the Redbank Creek that provides an access point to the Redbank Valley Trail. This access is not signed from the roadway or connected to the community by sidewalk. At the intersection with SR 839 / Putneyville Road, there are three curb ramps with detectable warning surfaces. A general inventory of South Bethlehem's multimodal facilities and pedestrian generators can be found in the Existing Conditions Memo.

Further coordination would be needed with Distant and South Bethlehem municipalities and the county to further assess the need for sidewalk maintenance and/or improvements. Additional planning for future sidewalk improvements, reconstruction, and future maintenance will need to be more closely evaluated with respect to local pedestrian needs and available funding. Potential funding opportunities may exist, in whole or in part, through PennDOT's Transportation Alternatives Set-Aside (TASA), Multimodal Funding, and potential local grant opportunities such as Community Development Block Grants (CDBG), where applicable.


A wide sidewalk outside of a New Bethlehem business

New Bethlehem

The bridge over Redbank Creek crossing into New Bethlehem from South Bethlehem has sidewalks and curb ramps on both sides. In downtown New Bethlehem, there is a walkable street grid with sidewalks on both sides of the street, recently updated curb ramps with detectable warning surfaces, mid-block pedestrian crossings, and parking on both sides of the street. The speed limit in this segment is reduced to 25 mph. Sidewalk on the north side of the roadway ends around Keck Avenue near the Smucker's facility, but continues on the south side of the corridor toward the Library and a mini-mall. A general inventory of New Bethlehem's multimodal facilities and pedestrian generators can be found in the Existing Conditions Memo.

Library and Redbank Valley High School

Heading north on Route 28, the speed limit is 35 mph towards the shopping plaza, which has a Riverside grocery store, Burger King, restaurants, and the New Bethlehem Public Library. The sidewalk continues to the Redbank Valley High School football field and main building. Across the street from the high school's main entrance is a cluster of small businesses including a chiropractor and a Subway restaurant. There is one marked pedestrian crossing of Route 28 near the main entrance and signs for "no parking". Parking in the business lots around dismissal time is a problem for businesses as spaces are taken up by non-customers. Student dismissal was a concern for stakeholders, as large numbers of students cross Route 28 to be picked up along the southbound lane and walkers cross the street to use the rail trail that leads back to their homes in the heart of downtown New Bethlehem. The sidewalk ends at the edge of the Redbank Valley High School property approximately 900 feet east of the high school crosswalk. A general inventory of this area's multimodal facilities and pedestrian generators can be found in the Existing Conditions Memo.

Redbank Valley High School crossing

Sign on the Redbank Valley Trail

Redbank Valley Trail Crossing

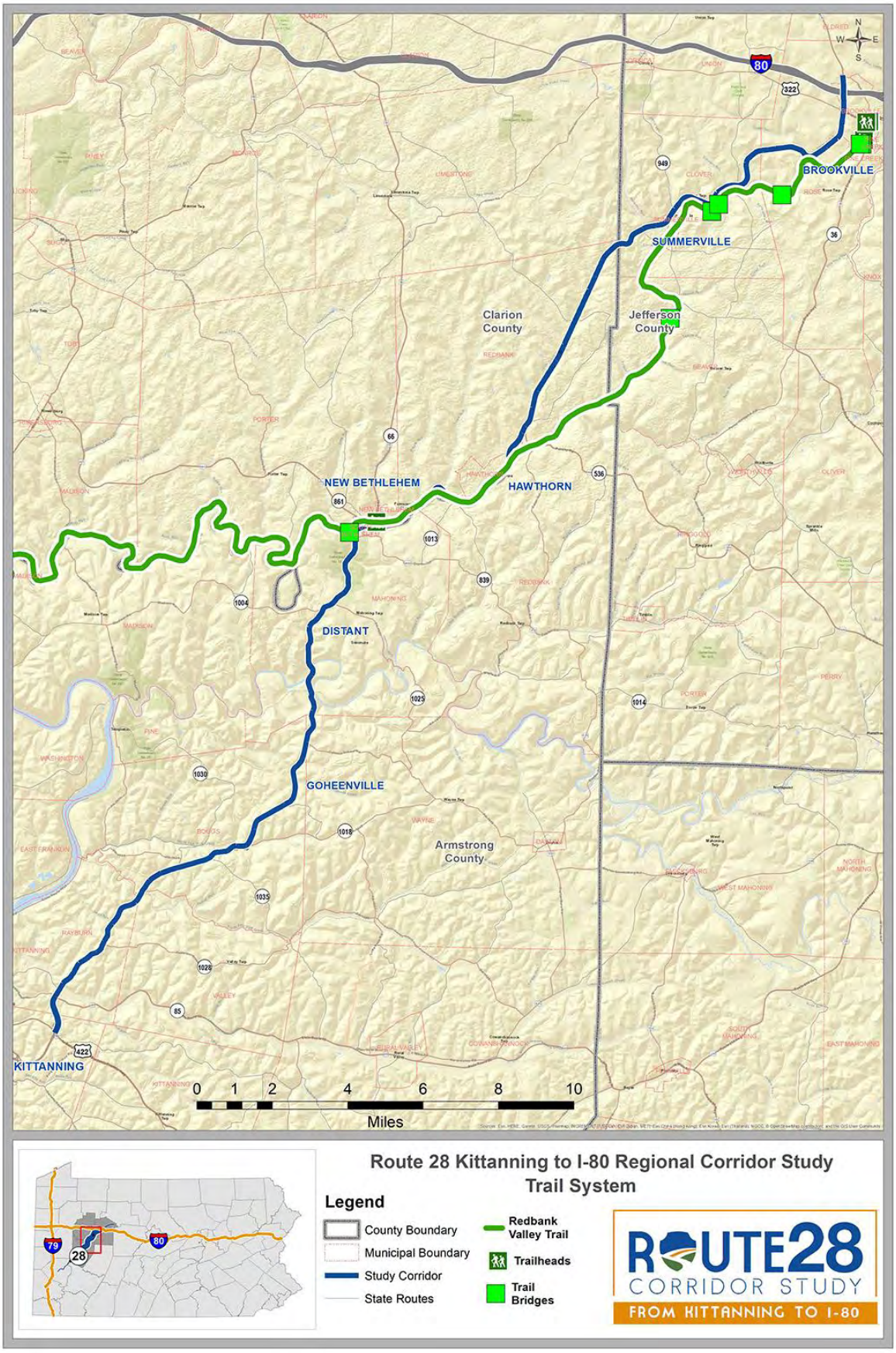
Heading north away from the High School, the speed limit is 45 mph near M&S Meats. The building density in this area decreases and the roadway curvature resumes. Approximately 0.75 miles east of the last sidewalk, the Redbank Valley Trail crosses the Route 28 corridor at an angle between two horizontal curves. There is signage for the trail ahead and what remains of a marked crossing. Stakeholder interviews indicated that the authority responsible for the trail recently responded to complaints about the location of the crossing by removing the crosswalk striping from the roadway. The overall location map of the regional trail is shown in **EXHIBIT 14**. This shows that the trail serves not just residents of New Bethlehem, but of many communities and is a regionally important multimodal connection. An aerial view of the trail crossing location at Route 28 can be found in the Existing Conditions Memo.

Hawthorn

In Hawthorn, approximately 0.5 mile of sidewalk network is present on the northern side of Route 28 from Yost Street to E. 1st Street. The Redbank Valley Trail is visible from Route 28 and runs parallel to the roadway in this area at approximately 15 to 50 feet away, but there are no marked crossings across Route 28. This area was reported as a hot spot for canoe and kayak activity in summer months due to the accessibility of the Redbank Creek in the area. Hawthorn is also home to Redbank Valley Municipal Park, where the Clarion County Fair is held each year, and also has campsites, shelters, and RV hookups. North of this area, Route 28 and the Redbank Valley Trail diverge as the trail follows the river. Fishbasket Indian Town historical marker in this area depicts where Native Americans settled on the river. A general inventory of Hawthorn's multimodal facilities and pedestrian generators can be found in the Existing Conditions Memo.

Example of a sidewalk in Hawthorn

Exhibit 14 - Redbank Valley Regional Trail System



Existing and Future Conditions

Traffic Analysis

Traffic Analysis Methodology

Capacity and level of service (LOS) analyses were completed to evaluate the operational performance of vehicular traffic within the study area. LOS grades operations on a letter grade scale from A to F, where A represents the most free flowing conditions and F represents the most congested conditions. These analyses were completed for Base Year 2019 (Existing) and Future Year 2045. The traffic analysis software used to analyze the operations at intersections was TrafficWare Synchro 10.3, Build 28, Revision 0. For two-lane highway, the software McTrans Highway Capacity Software 7 (HCS) was used. HCS7 uses the *Highway Capacity Manual, 6th Edition* methodology to develop LOS measures.

Existing Conditions

Traffic conditions vary along the approximately 40-mile length of the Route 28 study corridor. The Average Daily Traffic (ADT) is a measure of the vehicle volume passing over a segment of roadway in a 24-hour period. Average Daily Truck Traffic (ADTT) measures truck traffic in that same 24-hour period. The most recent ADT data was collected at six locations along the corridor between 2017 and 2019 (**EXHIBIT 15**). The data shows ADTs ranging from 5,600 to 7,300 vehicles per day south of New Bethlehem to 4,100 to 4,600 vehicles per day north of New Bethlehem (**EXHIBIT 15**). Truck percentages are consistently around 15%, which is fairly high compared to the statewide average.

Exhibit 15 - Average Daily Traffic

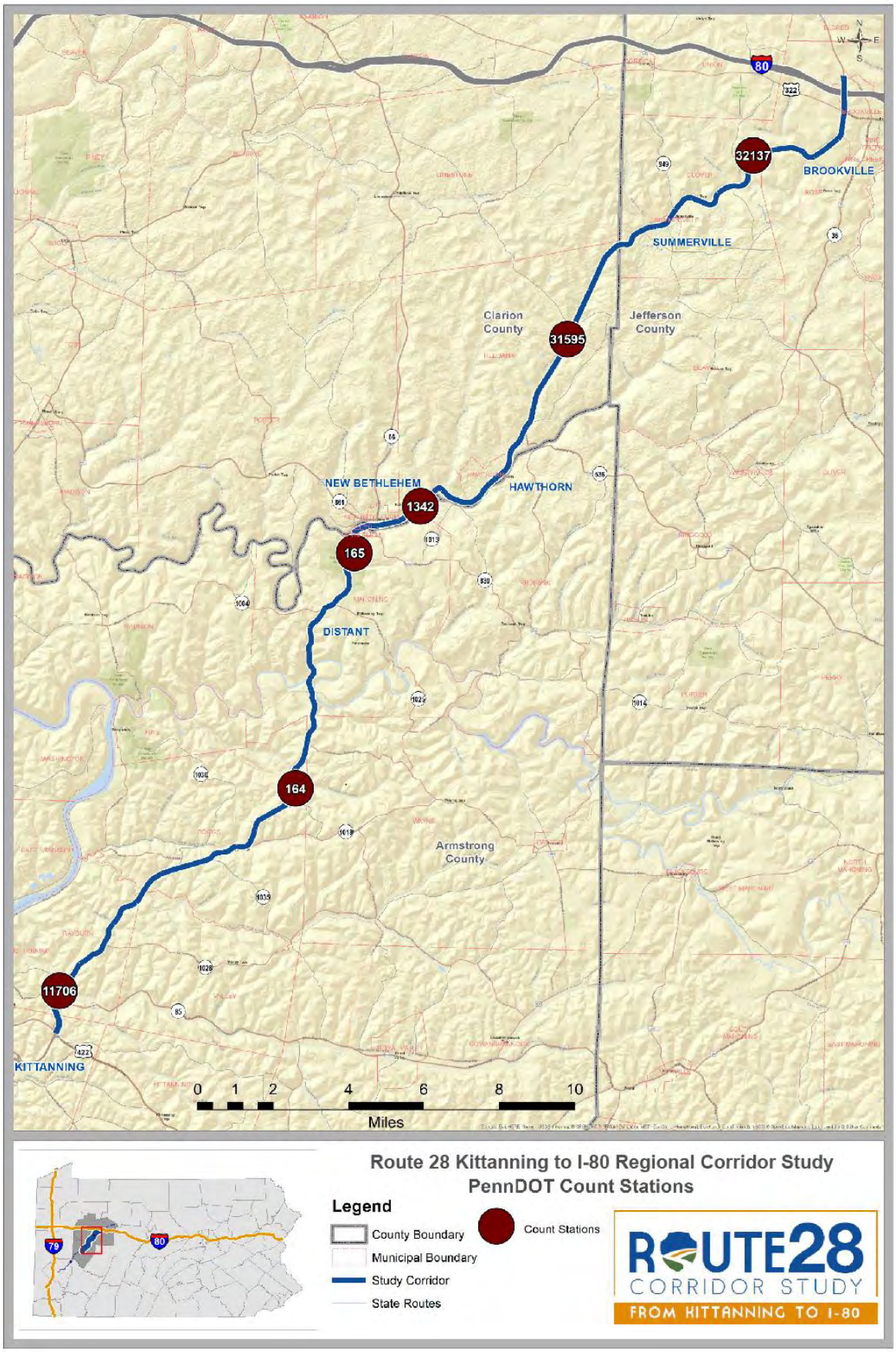
Location	Year	ADT	ADTT	Truck %
Route 28 north of SR 85	2019	7,298	1,140	15.6
Route 28 south of Calhoun School Rd	2019	5,601	881	15.7
Route 28 south of South Bethlehem	2019	7,320	1,031	14.1
Route 28 north of New Bethlehem	2017	7,025	821	11.7
Route 28 near Shannondale Rd	2018	4,147	624	15.0
Route 28 north of Summerville	2018	4,635	731	15.8

Future Conditions

The study year for traffic forecasts for the Route 28 Corridor Study is 2045. Multiple sources of historical traffic count data were considered to determine a reasonable future growth rate for the corridor, including PennDOT Statewide Count Maps, PennDOT Growth Rates by Traffic Pattern Group, and PennDOT Traffic Information Repository (TIRe) data from portable count stations at specific locations along the corridor.

The historical traffic data on the corridor indicates that growth has been slow or negative in some locations over the past 20 years. Using a negative rate would not provide a reasonable and conservative analysis for the future conditions. Assuming too large of a positive growth rate could result in over-estimating the future needs for the facility. Given the data and consideration of Steering Committee input, we used a growth rate for the entire corridor of 0.5% annually to forecast traffic to the future year of 2045. This growth rate is consistent with modeling projections done by SPC for the municipalities of the corridor. This growth rate provides a conservative and reasonable rate for planning purposes.

Exhibit 16 - PennDOT Count Stations



Intersection Capacity Analysis Results

EXHIBIT 18 shows the delay thresholds for signalized and unsignalized intersections and **EXHIBIT 19** shows the letter grade associated with each intersection in the AM and PM peak hours for 2019 and 2045. Some left turns have high delay due to their protected phasing but in general, capacity at intersections is not a major concern. Further detailed tables can be found in **Appendix G.**

Highway Capacity Analysis

Highway Capacity Software 7 (HCS7) was used to analyze the operations of two-lane highways. LOS thresholds for two-lane highways from *Highway Capacity Manual, 6th Edition* can be found in **EXHIBIT 18**. LOS thresholds for Class I two-lane highways is based on the segment average travel speed (ATS) in miles per hour and percent time spent following (PTSF). Since the corridor is over 40 miles long and has varying lane and shoulder widths, the capacity analysis focused on five representative typical sections along the corridor, as well as nine locations of existing climbing lanes, and four areas with significant grades for potential climbing lanes.

EXHIBIT 20 shows the results from the Highway Capacity Analysis for the peak hours for 2019 and 2045 conditions. In general, the analysis shows acceptable LOS through on the typical sections. Potential candidate locations for truck climbing lanes were analyzed where the uphill grade is significant over a long length, such as the currently one-lane segments at ID #91 and ID #92. These operate at a LOS E due to a high Percent Time Spent Following or low Average Travel Speeds. These candidate locations should undergo additional warrant and feasibility analysis.

Based on capacity analyses, there appears to be no need for future widening of Route 28 to four lanes throughout the study area. There is a perception of poor operations on the corridor due to following slow-moving vehicles and variations in speed limits, but roadway capacity is not the issue. Field observations and input from locals have shown that more frequent opportunities for passing are desired. The traffic analysis does not substantiate this perceived poor operation and in general the corridor operates with levels of service of C or better. A key takeaway from this study is further exploration of additional climbing lanes in the candidate areas in the southern end of the corridor to provide more passing opportunities.

Exhibit 17 - Level of Service Thresholds for Signalized and Unsignalized Intersections

Level of Service	Intersection Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	0 - 10	0 - 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Exhibit 18 - Level of Service Thresholds for Two-lane Highways

Level of Service	Class I Highway	
	Average Travel Speed (mph)	PTSF%
A	> 55	< = 35
B	> 50 - 55	> 35 - 50
C	> 45 - 50	> 50 - 65
D	>40 - 45	> 65 - 80
E	< = 40	> 80

Exhibit 19 - Level of Service Results for Intersections

ID	Intersection	LOS 2019 AM	LOS 2045 AM	LOS 2019 PM	LOS 2045 PM
1	RT 28 at SR 85 (Signalized)	D	D	C	D
2	RT 28 at SR 1004	A	A	A	A
21	Kohlersburg Rd at SR 1004 Madison Rd	A	A	A	A
3	RT 28 at Kohlersburg Rd	A	A	A	A
4	RT 28 at SR 839	A	A	A	A
5	RT 28 at SR 66 (Signalized)	B	B	B	B
7	RT 28 at Center St	A	A	A	A
8	RT 28 at Mayport Rd SR 536	A	A	A	A
9	RT 28 at Carrier St	A	A	A	A
10	RT 28 at S Main St	A	A	A	A
11	SR 28 at SR 322 (Signalized)	B	B	B	B
12	SR 36 at I-80 EB Ramps (Signalized)	B	B	B	B
13	SR 36 at I-80 WB Ramps (Signalized)	B	B	C	D
14	RT 28 at Waterford Pike	A	A	A	A
15	RT 28 at I-80 EB Ramps	A	A	A	A
16	RT 28 at I-80 WB Ramps	A	A	A	A
81	RT 28 at Dairy Rd	A	A	A	A

Exhibit 20 - Highway Capacity Analysis Segments

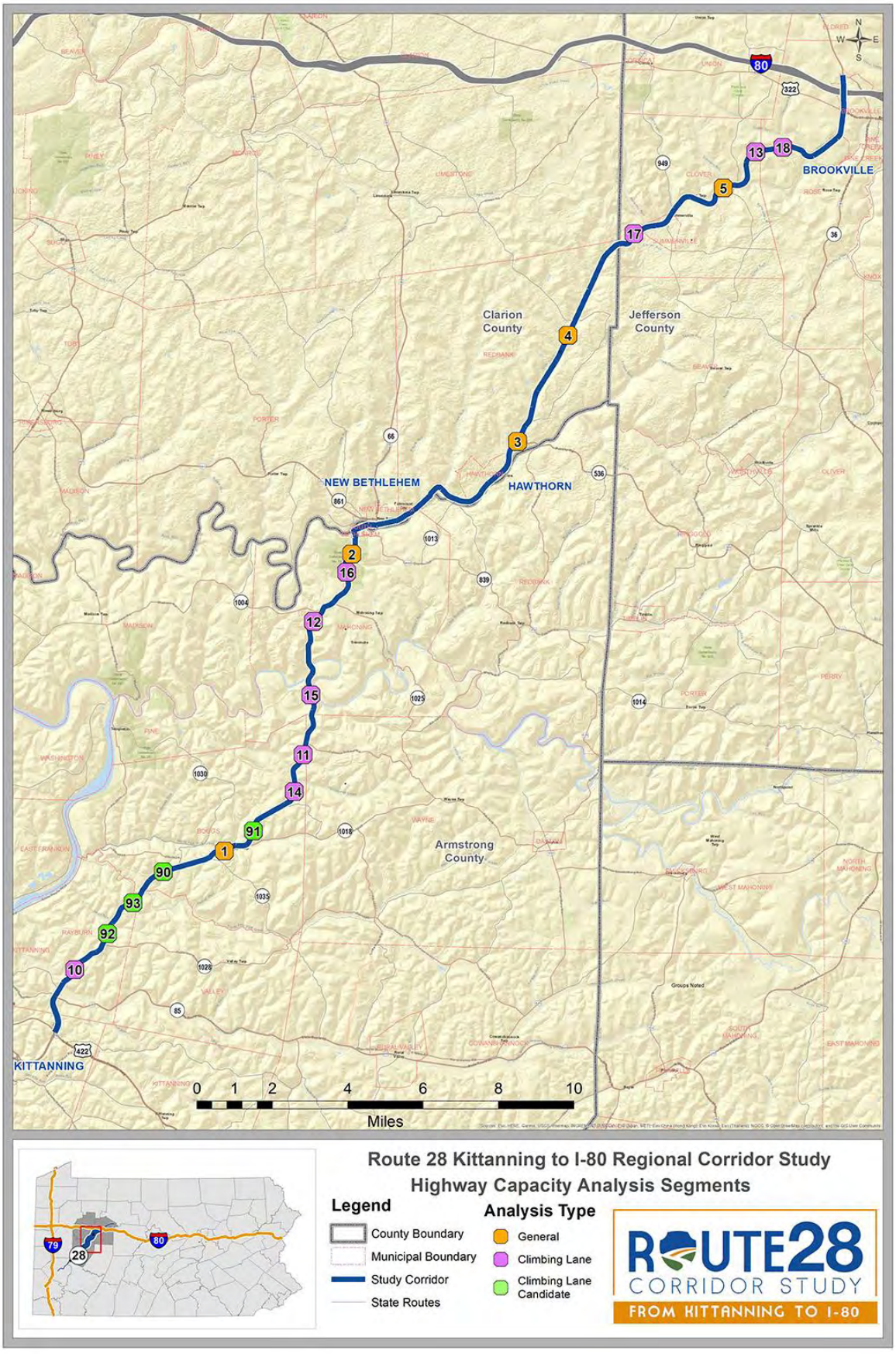


Exhibit 21 - Highway Capacity Analysis Results for General Segments

ID	Direction	Southern Terminus	Northern Terminus	2019						2045					
				AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
				Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service
1	Northbound	Oscar Rd	Baum Pump Station	46.8	56	C	45.3	76.9	D	46.4	57.6	C	44.7	79.4	D
	Southbound			46.2	72.2	D	45.6	62.5	C	45.8	73.6	D	44.8	64.7	D
2	Northbound	SB Truck Climbing Lane	0.3 miles south of King St	47.5	68	D	47.1	68.5	D	47.1	68.6	D	46.7	70.3	D
	Southbound			47.9	58.6	C	47.4	66.2	D	47.7	60.7	C	47.1	68.6	D
3	Northbound	Longview Rd	Yearney Lane	47.5	66.3	D	48.1	60.7	C	47.2	69.4	D	47.8	62	C
	Southbound			47.8	61.8	C	48.1	66.5	D	47.6	63.7	C	47.7	67.2	D
4	Northbound	Dewey Rd	SR 2001	45.5	58.1	C	45.4	52.9	C	45.3	60.6	C	45.2	55.8	C
	Southbound			45.7	50.7	C	44.9	64.6	D	45.5	54.1	C	44.6	66.7	D
5	Northbound	Moore Rd	Mendenhall Rd	46.5	63.1	C	46.3	49.9	C	46.2	67.1	D	46	52.6	C
	Southbound			47.2	43.7	C	45.3	71.1	D	47	46.9	C	44.9	72.1	D

Exhibit 22 - Highway Capacity Analysis Results for Climbing Lanes

ID	Direction	Configuration	2019						2045					
			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
			Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service	Average Travel Speed (mph)	Percent Time Spent Following	Level of Service
10	Northbound	2 Lanes	53.9	7.6	B	54.3	12.7	B	52.7	8.9	B	53.1	15	B
11	Northbound	2 Lanes	53	6	B	56.4	8.6	A	49.8	6.7	C	53.5	9.5	B
12	Northbound	2 Lanes	53.5	6	B	56.8	8.6	A	50.4	6.7	B	56.1	9.4	A
13	Northbound	2 Lanes	52.4	6.6	B	50.3	6.1	B	54.9	7.2	B	47.1	6.8	C
90	Northbound Candidate	1 Lane*	42	48.5	D	41.4	77	D	41.2	51.6	D	40.6	80.4	E
91	Northbound Candidate	1 Lane*	44	47	D	43.8	65.7	D	43.3	49.3	D	43.3	69.2	D
14	Southbound	2 Lanes	52.7	6.9	B	53.7	5.8	B	51.3	7.5	B	52.8	6.3	B
15	Southbound	2 Lanes	53.4	7.2	B	54.7	6	B	52	7.7	B	53.7	6.6	B
16	Southbound	2 Lanes	57.1	7	A	53.7	9.7	B	56.3	7.8	A	56.3	10.5	A
17	Southbound	2 Lanes	54.4	2.7	B	56.6	6.9	A	53.9	3	B	50.9	7.5	B
18	Southbound	2 Lanes	53	4	B	53.6	10.1	B	52.4	4.7	B	53.2	11.1	B
92	Southbound Candidate	1 Lane*	39.1	59.2	E	40.5	44.2	D	38.1	61.4	E	40	46.5	E
93	Southbound Candidate	1 Lane*	43.2	59.2	D	44.4	44.2	D	42	61.7	D	43.7	46.5	D

Safety Analysis

Methodology

The most recent five years of available crash data were compiled from the Pennsylvania Crash Information Tool (PCIT). Information relating to vehicle crash type, injury severity, weather conditions, time of day, seasonality, illumination, and roadway condition were analyzed to identify crash patterns and locations where the overall crash and fatality rates are higher than the statewide average.

The Department of Transportation defines a "reportable crash" as those that involve a fatality, injury, or require towing of one or more vehicles. Therefore, the crash system includes data from those "reportable" incidents only. The segments encompass approximately 40 miles of roadway network along Route 28 from Kittanning to I-80.

Guiderail damage on Route 28

A general safety analysis of the entire corridor existing conditions was prepared to examine crash contributing factors and details such as location, type, severity, time of day, weather, seasonality, and illumination type. The crash location information from 2013-2017 shows that of the 291 reported crashes, 232 (80%) occurred at a mid-segment location, 56 (19%) occurred at an intersection, and remaining three crashes are identified as other types (1%). The primary crash type observed involved vehicles hitting fixed objects (40%), angle crashes (20%) and rear-end crashes (14%).

Approximately 5% of the crashes involved serious to fatal injuries. Overnight and mid-day were the highest time periods for crashes, with 70% of the daily crashes combined. Seventy-four percent of crashes occurred during no adverse weather conditions. Winter and fall were the highest seasons for crashes at around 63% percent combined. Sixty-one percent of crashes occurred in the daylight. More detailed crash information can be found in the Existing Conditions Memo.

Crash Rate Comparison

An annualized crash rate for each segment was calculated for the five-year period for comparison to the Pennsylvania statewide average crash rate. The crash data was converted to an annual crashes per 100 million vehicle miles traveled by segment for comparison to the most recent available crash information from PennDOT, *2017 Pennsylvania Crash Facts and Statistics*. The crash rate was calculated by dividing the annual crash frequency by the current average annual daily traffic and segment distance found in PennDOT's Roadway Inventory Management System (RIMS) data. For comparison, Pennsylvania's 2017 overall statewide crash rate was 126.8 crashes per hundred million vehicle miles of travel; the 2017 statewide fatality rate was 1.12 fatalities per 100 million vehicle miles of travel.

The corridor had higher than statewide average rates of fatalities on three segments – in the vicinity between Kittanning and Goheenville and near Hawthorn (**EXHIBIT 23**). There were four fatal crashes reported in the period from 2013-2017. Of those, three were head-on collisions, and one was a hit fixed object type of collision. All occurred during dry roadway conditions, three were in daylight, one included a heavy vehicle. Three of the crashes were in 2015, and one was in 2013. There was no pattern in the time of day or location. The other higher-than-statewide-average crash frequency on the corridor is hit fixed object collisions. There are two major segments for high hit fixed object type crashes, between Goheenville and Distant, and between Summerville and Brookville (**EXHIBIT 24**). Driving too fast for conditions and geometric constraints may factor into these types of collisions.

PennDOT Safety Screening

PennDOT conducts a statewide inventory of observed crashes versus predicted crashes based on roadway geometry and the Highway Safety Manual. Through this process, PennDOT identifies roadway segments with observed crashes greater than the predicted amount of crashes. These are identified as areas with excess crashes. **EXHIBIT 25** shows segments along the Route 28 corridor that have been identified as areas of potential excess crashes. This identification may provide insight on locations where crashes are occurring more frequently than predicted, thus enabling engineers to identify any correctable design features.

Safety Summary

The project-specific crash history analysis comparison against the statewide average rate coupled with PennDOT's predictive safety screening processes help the Study Team to identify some areas with correctable safety features. The statistical patterns generally support concern areas that were identified by the steering committee, public, and stakeholders. The safety screening information is accounted for in the evaluation matrix and purpose and need for certain projects.

Exhibit 23 – Crash History Comparison (Fatalities)

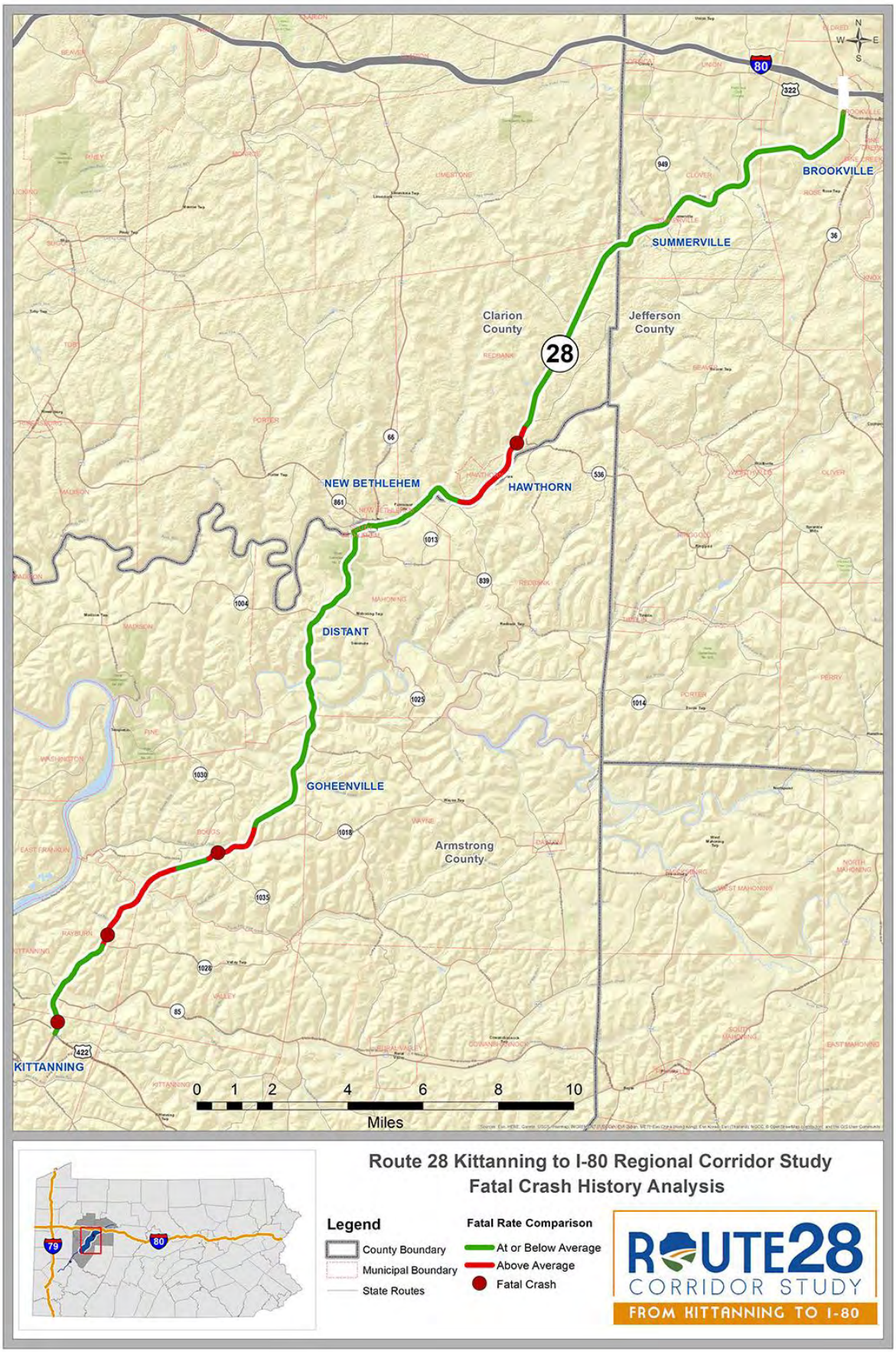


Exhibit 24 – Crash History Comparison (Hit Fixed Object)

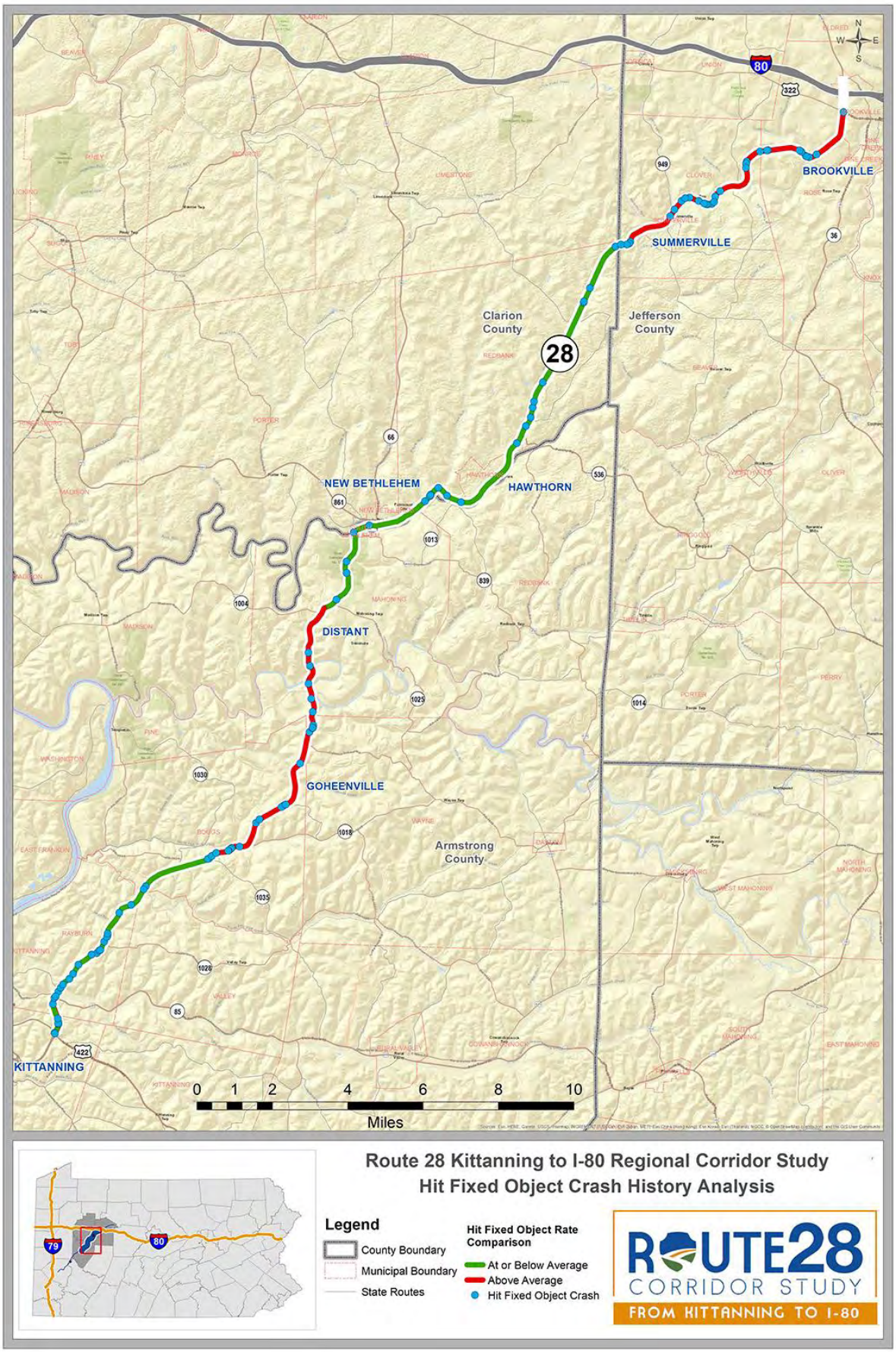
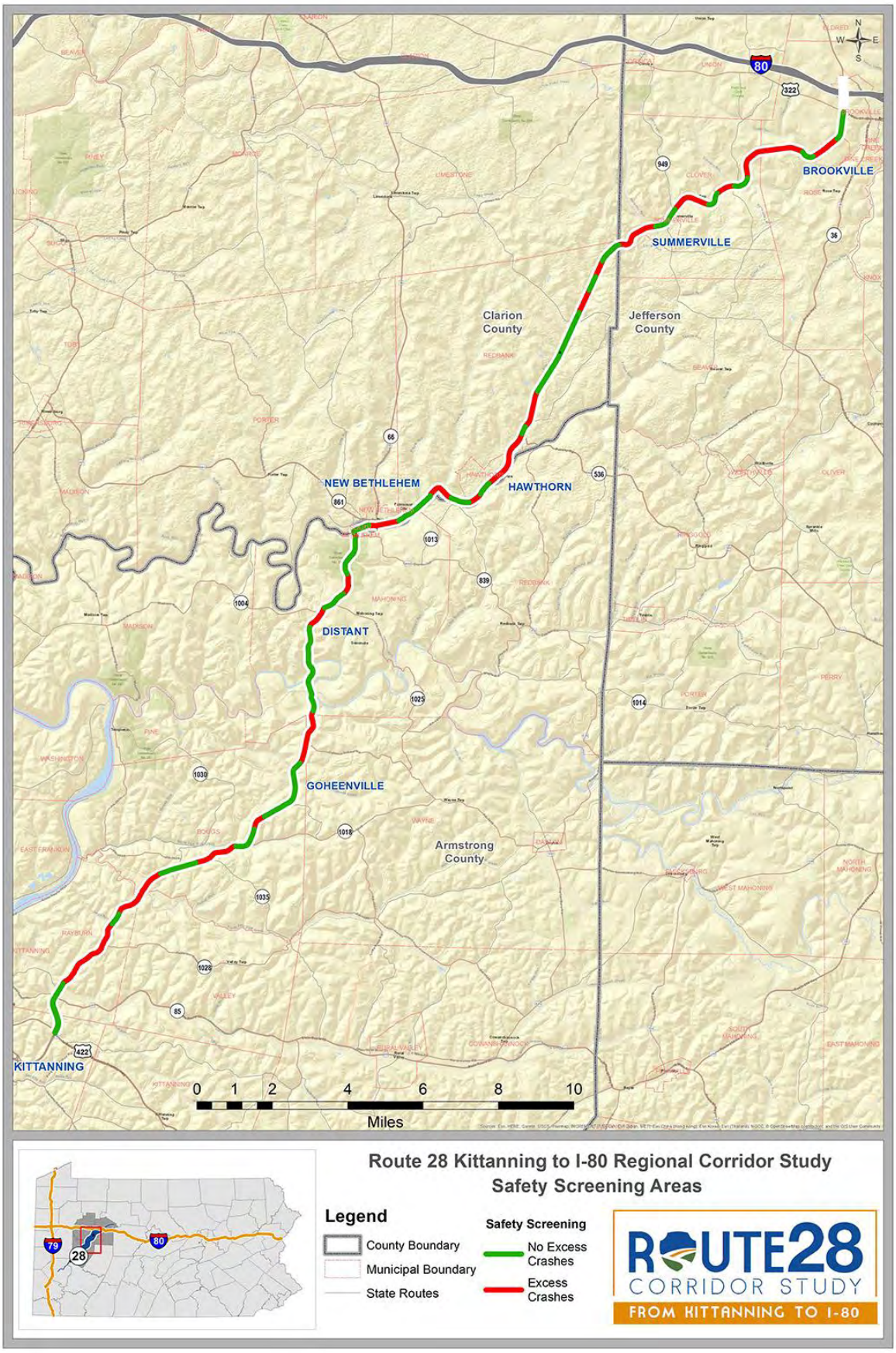


Exhibit 25 – PennDOT Safety Screening Segments



Four-lane Concept Revisited

The section of the Route 28 corridor from Kittanning to Brookville, mile marker 40 to mile marker 80, of the 98 mile corridor, has been the subject or mentioned in a number of studies over the past 30 years. The most recent study from 1994 evaluated the construction of a 4-lane limited access type of facility from Kittanning to I-80. Analysis of the existing and future traffic conditions indicate there is not a need to increase capacity in this area to maintain an acceptable level of service through the corridor. There would likely be significant impacts to protected environmental resources, farms and private properties along the corridor, and the study found a lack of public interest in pursuing a four-lane widening of Route 28. Additionally, safety and operational concerns can be addressed with other improvement concepts identified within this study area.

The 1994 study included a conceptual cost estimate. **EXHIBIT 26** includes the 1994 estimate and compares it with a 2020 cost estimate that demonstrates how costs have escalated from 1994 to 2020. As noted, the 2020 cost estimate totals over $850 million. While this estimate accounts for the construction cost, it does not take into account more stringent modern environmental regulations. In particular, regulations related to stormwater management, volume and rate management, water quality treatment and the mitigation of protected environmental features such as streams and wetlands located throughout the corridor. The additional design, permitting, environmental and community impacts, and construction, would increase the cost estimate further and would require additional future PennDOT maintenance costs associated with the permitted stormwater and mitigation features.

Additionally, the capacity and level of service (LOS) analyses outlined on pages 32-38 demonstrates that existing conditions will remain within acceptable levels in the AM and PM peak hour through the year 2045. The majority of intersections show service levels of C or greater with two locations decreasing to level D in the year 2045. Additional locations may be considered to determine if truck climbing lanes may be needed to allow for passing in some areas. Overall, the travel demand, significant impacts, and lack of public support does not substantiate a need for a four-lane highway in the next 25 years.

Due to these findings the four-lane concept was not carried forward as part of this study.

Exhibit 26 - Cost Estimate

Item	Michael Baker's 1994 Study		McCormick Taylor's 2020 Study Update	
	Cost/Mile (1994)	35 Miles (1994)	Cost/Mile (2020)	35 Miles (2020)
Clearing and Grubbing	$150,000	$5,250,000	$150,000	$5,250,000
Roadway Excavation	$3,000,000	$105,000,000	$3,567,000	$124,845,000
Pavement, Shoulders, Curbs	$3,200,000	$112,000,000	$4,460,000	$156,100,000
Drainage	$900,000	$31,500,000	$1,200,000	$42,000,000
Guiderail and Barrier	$70,000	$2,450,000	$132,000	$4,620,000
Right-of-Way Fence	$110,000	$3,850,000	$158,400	$5,544,000
Landscaping	$130,000	$4,550,000	$217,545	$7,614,075
Temporary Traffic Control	$210,000	$7,350,000	$351,418	$12,299,630
Utility Relocations	$200,000	$7,000,000	$334,684	$11,713,940
Bridges, Box and Arch Culverts	$3,900,000	$136,500,000	$6,526,331	$228,421,585
Signalization and Signing	$30,000	$1,050,000	$50,203	$1,757,105
Pavement Markings and Delineators	$20,000	$700,000	$33,469	$1,171,415
Erosion and Sedimentation Control	$250,000	$8,750,000	$418,355	$14,642,425
Miscellaneous	$400,000	$14,000,000	$669,368	$23,427,880
Mobilization/Field Office	$450,000	$15,750,000	$753,039	$26,356,365
Stormwater Management	-	-	$418,355	$14,642,425
Subtotal		$455,700,000		$680,405,845
Design Engineering (10%)		$45,570,000		$68,040,585
Construction Engineering (5%)		$22,785,000	(10%)	$68,040,585
Subtotal		$524,055,000		$816,487,014
Right-of-Way		$26,202,750		$40,824,351
TOTAL		$550,257,750		$857,311,365

Summarized Areas of Concern Matrix and Map

At the conclusion of the information gathering and analysis stage of the study, patterns emerged around specific intersections or roadway segments. We named these “areas of concern” and summarized them in a table and showed which analysis or study identified it. In order to give each area of concern a priority, we counted how many of the groups identified the specific area. It is assumed that the more groups that identified an area, the higher the initial priority to develop a conceptual alternative for it.

The following **EXHIBIT 27** shows the locations of the 38 specific areas of concern and **EXHIBIT 28** shows which analyses identified them as an area of concern. There are systematic improvements that apply to the entire corridor beyond those 38 specific areas of concern. Each column in **EXHIBIT 28** describes a component of the prioritization rating:

- **Previous studies** were collected and examined for relevance to the Route 28 corridor study area and proposed project goals.
- **Stakeholder interviews** were conducted at three locations along the corridor to get a broad geographic perspective: Brookville, New Bethlehem, and Kittanning.
- **A Wikimap survey** was created and published for public input. Clusters of comments were noted at various points along the corridor.
- **A field inventory** was completed through a site visit to the corridor. Field measurements, sketches, and photos were obtained.
- **Horizontal Curvature** deficiency areas were developed through PASDA mapping and Bentley Microstation Inroads based on the speed limit for each segment to determine if the curve radii were greater than the AASHTO Green Book 2012 minimum horizontal radii standards for each speed range.
- **Vertical Grades** for the corridor were developed utilizing PASDA LIDAR and GIS. Based on the AASHTO Green Book 2012, if the grades were greater than 6% for speed limits of <=45MPH or greater than 5% for speed limits = 55MPH the vertical grade was added to the deficient vertical grades list.
- **A crash history analysis** was prepared based on the latest 5-year crash information. Crash rates greater than the statewide average are flagged and mapped.
- **PennDOT’s safety screening** flagged areas that were in excess of predicted crashes for similar segments based on traffic volume and roadway features.
- **An operational analysis** was performed in Synchro and HCS to understand locations of capacity issues during the AM and PM peak hours.

Exhibit 27 - Summarized Areas of Concern

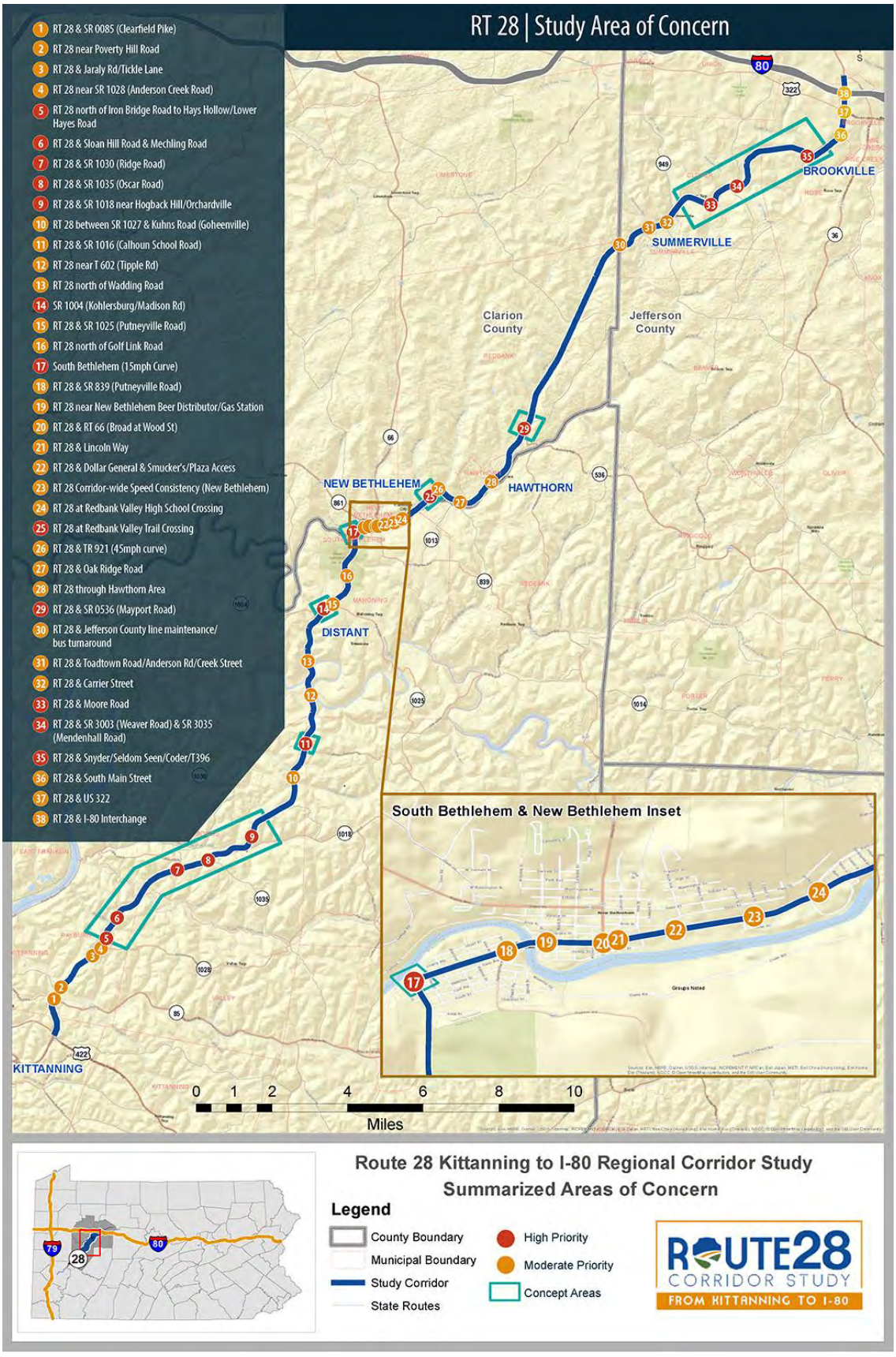


Exhibit 28 - Summarized Areas of Concern Matrix

Concerns by Group												
ID	Area of Concern	# Groups Noted	Draft Priority	Previous Studies	Stakeholder Interviews	Public Survey	Field Inventory	Horizontal Curvature	Vertical Grade	Crash History	PennDOT Safety Screening	Existing Operations
1	RT 28 & SR 0085 (Clearfield Pike)	4	Moderate	X		x			x			x
2	RT 28 near Poverty Hill Road	3	Moderate			x	x		x			
3	RT 28 & Jaraly Rd/Tickle Lane	4	Moderate				x	x	x		x	
4	RT 28 near SR 1028 (Anderson Creek Road)	5	Moderate			x	x		x	x	x	
5	RT 28 north of Iron Bridge Road to Hays Hollow/Lower Hayes Road	6	High		x		x	x	x	x	x	
6	RT 28 & Sloan Hill Road & Mechling Road	7	High		x	x	x	x	x	x	x	
7	RT 28 & SR 1030 (Ridge Road)	2	Moderate			x			x			
8	RT 28 & SR 1035 (Oscar Road)	7	High		x	x	x	x	x	x	x	
9	RT 28 & SR 1018 near Hogback Hill/Orchardville	6	High	X	x	x	x		x	x		
10	RT 28 between SR 1027 & Kuhns Road (Goheenville)	4	Moderate			x		x	x	x		
11	RT 28 & SR 1016 (Calhoun School Road)	6	High		x	x		x	x	x	x	
12	RT 28 near T 602 (Tipple Rd)	4	Moderate			x		x	x	x		
13	RT 28 north of Wadding Road	4	Moderate			x		x	x	x		
14	SR 1004 (Kohlersburg/Madison Rd)	6	High		x		x	x	x	x	x	
15	RT 28 & SR 1025 (Putneyville Road)	3	Moderate			x	x		x			
16	RT 28 north of Golf Link Road	3	Moderate					x	x		x	
17	South Bethlehem (15mph Curve)	6	High	X	x	x	x	x			x	
18	RT 28 & SR 839 (Putneyville Road)	1	Moderate				x					
19	RT 28 near New Bethlehem Beer Distributor/Gas Station	2	Moderate		x						x	
20	RT 28 & RT 66 (Broad at Wood St)	4	Moderate		x		x	x			x	
21	RT 28 & Lincoln Way	2	Moderate		x						x	

Concerns by Group												
ID	Area of Concern	# Groups Noted	Draft Priority	Previous Studies	Stakeholder Interviews	Public Survey	Field Inventory	Horizontal Curvature	Vertical Grade	Crash History	PennDOT Safety Screening	Existing Operations
22	RT 28 & Dollar General & Smucker's/Plaza Access	3	Moderate		x	x					x	
23	RT 28 Corridor-wide Speed Consistency (New Bethlehem)	3	Moderate		x		x				x	
24	RT 28 at Redbank Valley High School Crossing	3	Moderate		x	x	x					
25	RT 28 at Redbank Valley Trail Crossing	6	High		x	x	x	x		x	x	
26	RT 28 & TR 921 (45mph curve)	3	Moderate			x		x			x	
27	RT 28 & Oak Ridge Road	2	Moderate		x		x					
28	RT 28 through Hawthorn Area	3	Moderate				x			x	x	
29	RT 28 & SR 0536 (Mayport Road)	6	High	X	x	x	x		x		x	
30	RT 28 & Jefferson County line maintenance/bus turnaround	4	Moderate		x			x	x		x	
31	RT 28 & Toadtown Road/Anderson Rd/Creek Street	5	Moderate			x	x		x	x	x	
32	RT 28 & Carrier Street	2	Moderate				x			x		
33	RT 28 & Moore Road	6	High		x	x		x	x	x	x	
34	RT 28 & SR 3003 (Weaver Road) & SR 3035 (Mendenhall Road)	5	Moderate	X	x	x				x	x	
35	RT 28 & Snyder/Seldom Seen/Coder/T396	6	High		x	x		x	x	x	x	
36	RT 28 & South Main Street	3	Moderate		x		x			x		
37	RT 28 & US 322	4	Moderate	X		x	x	x				
38	RT 28 & I-80 Interchange	2	Moderate		x	x						

Conceptual Improvements

Conceptual Improvement concepts were considered and developed to address the concern areas throughout the corridor and were identified as either a Priority Improvement, Systematic Improvement or Other Improvement Considerations. The concern areas found to have the most safety, design, operations, and public interest were categorized by the Study Team and the Steering Committee as **Priority Improvement Concepts.** These concepts included localized improvements that typically require a larger capital investment for design, construction, right-of-way and utility costs. **Systematic Improvement Concepts** include low-cost improvements targeting common safety and operational concerns observed throughout the corridor. **Other Improvement Concepts** are standalone concepts not requiring the level of capital investment or the number of impacts as the priority concepts. Each of the concepts were developed to provide corridor uniformity and to increase user expectations and awareness of the roadway conditions.

The improvement concepts and associated locations, costs and potential funding are detailed on the **Route 28 Corridor Conceptual Mini-TIP** (See **EXHIBIT 46**). The Mini-TIP is a corridor planning level tool consisting of proposed improvement concepts, concept priority within the context of the data collected within this study, estimated implementation timeframe, estimated total project costs, and potential funding sources. The Mini-TIP provides a breakdown of this detailed information that was developed throughout the study within a concise single page matrix for ease of use. The concepts provided on the Mini-TIP are further categorized by MPO/ RPO to be able to assist with the programming of short- and long-term transportation improvement projects.

Conceptual construction costs estimates provided in the Mini-TIP applied current PennDOT construction items, associated unit costs, and linear foot estimates from similar projects to develop conceptual construction costs. An estimated 20% of the construction cost was used to approximate the preliminary and final design engineering costs associated with each improvement concept. Due to the variable nature of right-fo-way acquisition and utility relocation costs, a relative range of impact was assigned based upon the concept type and likely anticipated impacts. The concepts provided on the Mini-TIP have been further defined as priority, systematic, and other improvement concept as further detailed below.

Priority Improvement Concepts

The Priority Improvement Concepts are engineered conceptual improvements developed based upon the data collection, stakeholder and public input, and direction provided by the project Steering Committee. Available data from third party mapping and imagery from the Pennsylvania Spatial Data Access (PASDA) was used to develop the conceptual engineering concepts. Additionally, proposed PennDOT Design Manual 2 new construction criteria was applied to develop the roadway template using 12-feet travel lanes and six-feet shoulder. See **Appendix H** – Route 28 Study Design Criteria. Planning level engineering of horizontal and vertical grades using the study design criteria was developed using PASDA data to determine planning level impacts, display, and costs. Further development of these planning concepts will need to be refined at the project level using more precise surveys and mapping, and refining the design criteria to be specific to the proposed improvement. The concepts developed in this section provide a good planning level estimation of the feasibility and costs for construction.

Background research, survey data, and corridor analyses were included in the Summarized Areas of Concern Matrix (**EXHIBIT 28**) and Concepts Map (**EXHIBIT 27**). Using the results of the Concerns Matrix, it was possible to prioritize a list of concern areas and related improvement concepts within the study area. Improvement concepts were reprioritized from moderate to high in order to better differentiate concepts based upon how many groups identified a location as a concern. All categories were weighted equally within the matrix. Areas that received up to six or greater references were categorized as a high priority area. Areas receiving less than five references were categorized as a moderate priority area. Of the 38 areas identified within the Summarized Areas of Concern Matrix, a combination of 13 high and moderate priority areas were further evaluated for potential future Conceptual Improvement Projects. Additionally, improvements were combined to address concerns related to larger adjacent sections of roadway. These improvements would address several roadway geometric deficiencies that overlap with areas where crashes have been observed. These combined concepts group Concepts 5 to 9 and Concepts 33 to 35, which would require a higher level of capital investment. The Priority Concepts are further detailed below.

Concept 5: Route 28 north of Iron Bridge Road to Hays Hollow/Lower Hayes Road

***Associated Concern Groups**: Stakeholder Interviews, Field Inventory, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

This area was studied for horizontal and vertical geometric improvements. A series of "S" curves that do not meet current criteria for the existing facility type/use occur over steep crest curves varying from 7.7% to 9%. The speed limit in this area is 55 mph. An improvement concept was developed to address the horizontal geometry. The current minimum horizontal radius of 960 feet was applied to this concept to meet a design speed of 55 mph. Additionally, proposed PennDOT Design Manual 2 new construction criteria was applied to develop the roadway template using 12-foot travel lanes and 6-foot shoulders. This study improvement concept reconstructs the vertical and horizontal curves to meet the Study Design Criteria and Typical Section, thus improving safety. (See **EXHIBIT 31**)

Concept 6: Route 28 & Sloan Hill Road & Mechling Road

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

This area is a series of intersections with Route 28 following an 8.9% vertical curve. The vertical curve combined with the 55 mph speed limit hinders the sight distance at the two sides streets for Sloan Hill Road and Mechling Road. The intersection of Sloan Hill Road as it meets Route 28 is also a sharp skew. This study improvement concept reconstructs the vertical and horizontal curves to meet the Study Design Criteria and Typical Section, thus improving safety and operations. (See **EXHIBIT 29**)

Concept 7: Route 28 & SR 1030 (Ridge Road)

***Associated Concern Groups**: Public Survey, Vertical Grade*

This area has a close to tangent roadway with vertical grades of 5.3% that are only slightly above the recommended design criteria 5.0% max. This improvement concept was developed to adjust the Route 28 vertical grade and horizontal "S" curves closer to SR 1030 (Ridge Road) to improve the geometrics of the roadway on Route 28 and improve sight distance on Ridge Road, which will improve safety and operations of the roadway. (See **EXHIBIT 31**)

Concept 8: Route 28 & SR 1035 (Oscar Road)

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

This area has a series of horizontal "S" curves compounded with a steep vertical grade of 8.9% following the intersection. The vertical grade's close proximity to the intersection impedes the sight distance for users entering from Oscar Road. The evaluated improvement concept reconstructs the vertical and horizontal curves to meet the Study Design Criteria and Typical Section. (See **EXHIBIT 30**)

Concept 9: Route 28 & SR 1018 near Hogback Hill/Orchardville

***Associated Concern Groups**: Previous Studies, Stakeholder Interviews, Public Survey, Field Inventory, Vertical Grade, Crash History*

This area has a set of steep vertical grades of 8.9% combined with a series of "S" bends. There are also numerous side streets all meeting Route 28 at different skews and points along this section of roadway. Both vertical and horizontal improvements can be made to this section of roadway along. Another option that could further improve this area would be to consider access management and connections with Gas Well Road, Hoover Road, and East Caldwell Road. An evaluation could be completed as to whether any of these intersections could be eliminated, combined, or realigned with Route 28. Concepts 5 through 9 could be combined into one project if funding for a larger combined roadway improvement project was available. This study improvement concept reconstructs the vertical and horizontal curves to meet the Study Design Criteria and Typical Section. (See **EXHIBIT 31**)

Exhibit 29 - Concept 6: RT 28 & Sloan Hill Road & Mechling Road

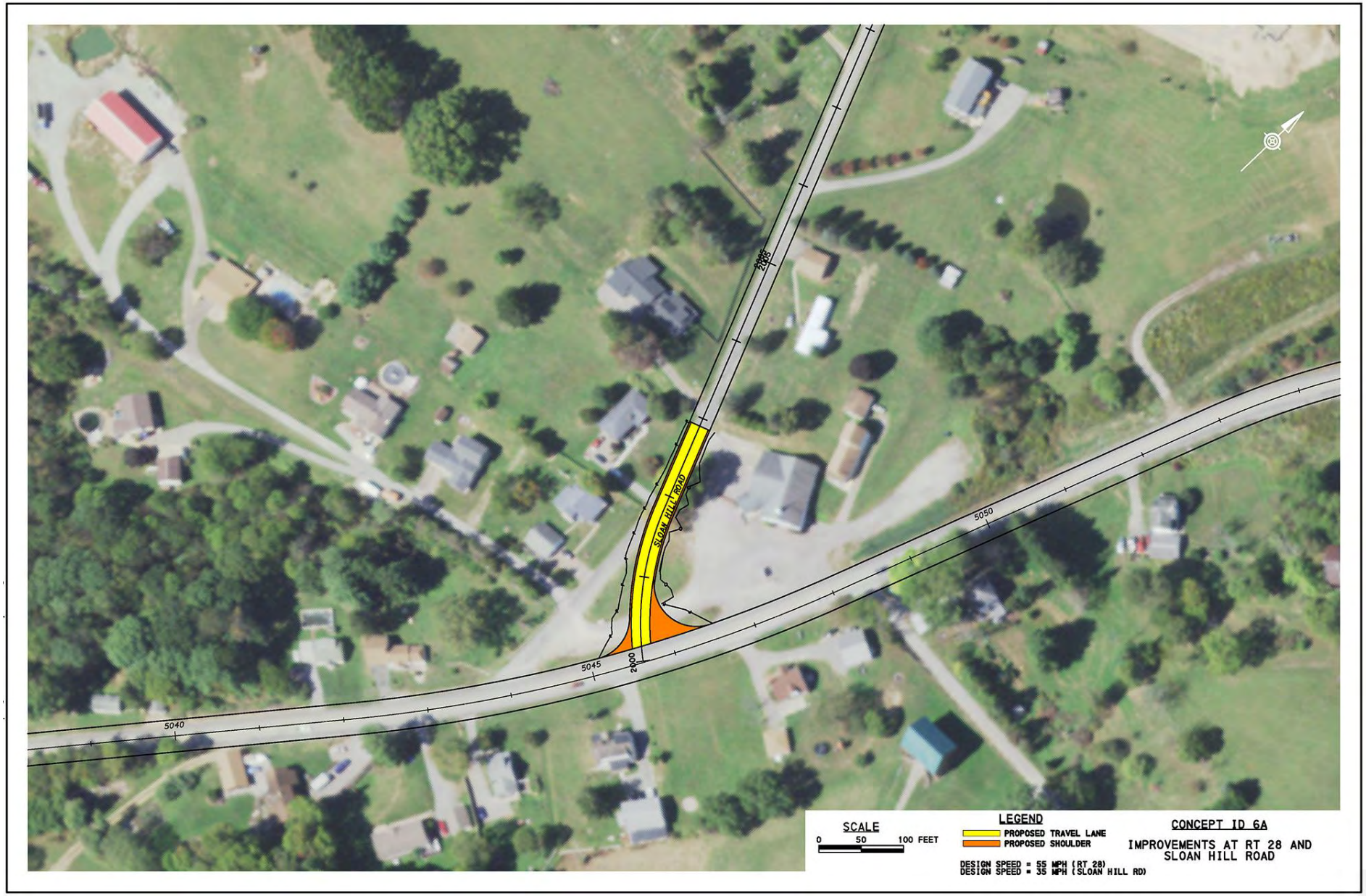


Exhibit 30 - Concept 8: RT 28 & SR 1035 (Oscar Road)

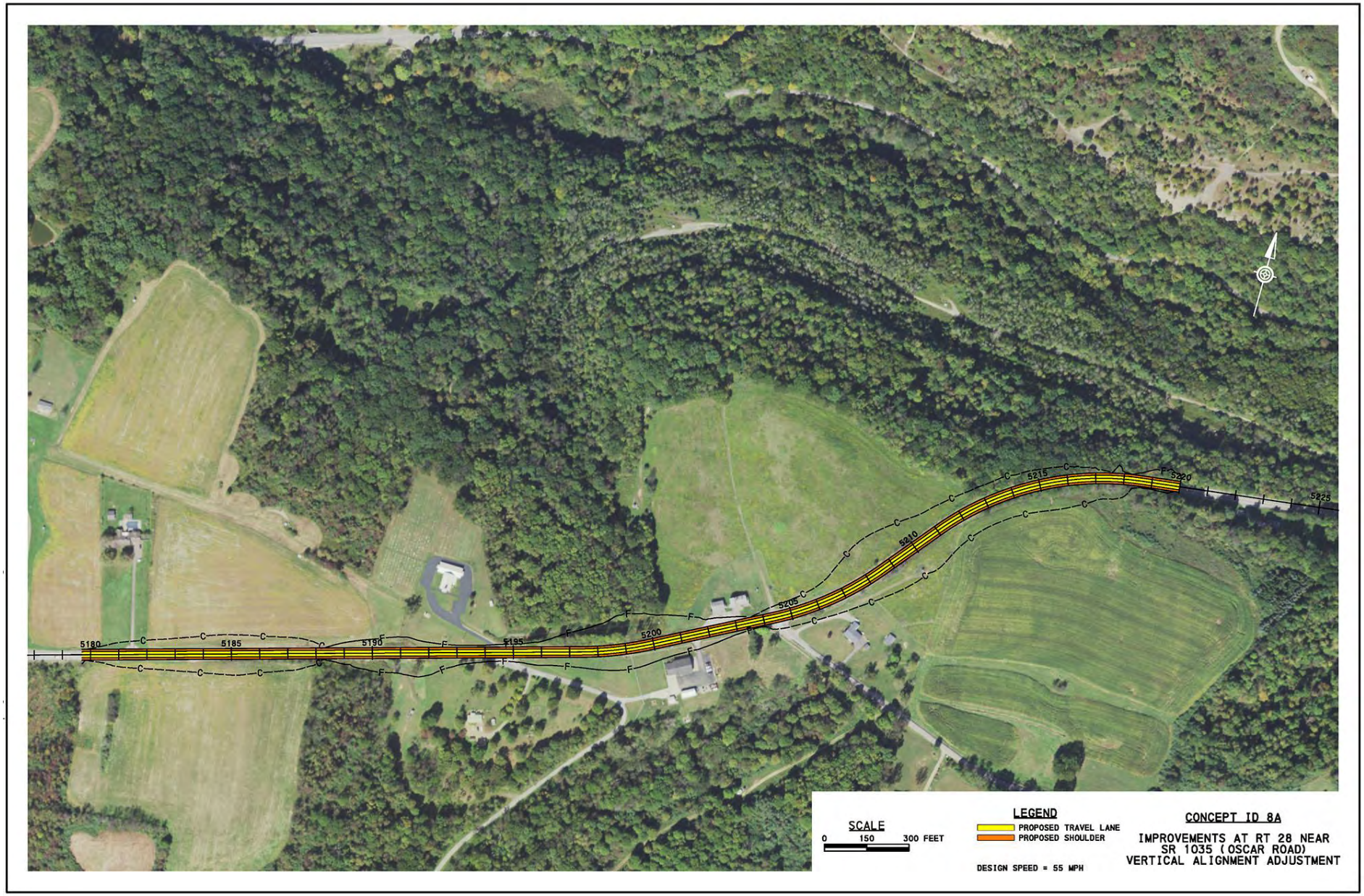


Exhibit 31 - Concept 5-9 (1 of 5): RT 28 from Sloan Hill Road to SR 1018 near Hogback Hill/Orchardville

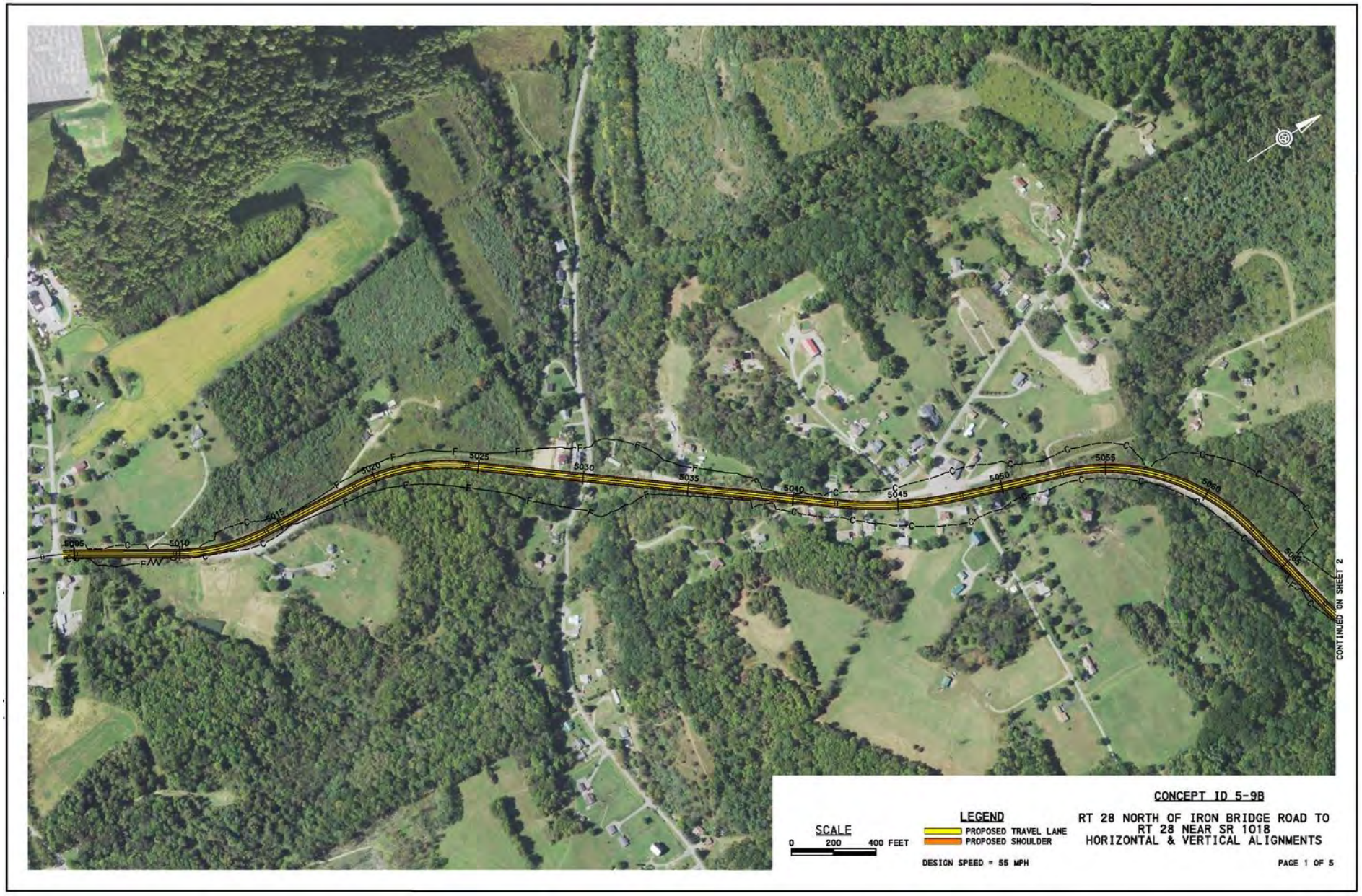


Exhibit 32 - Concept 5-9 (2 of 5): RT 28 from Sloan Hill Road to SR 1018 near Hogback

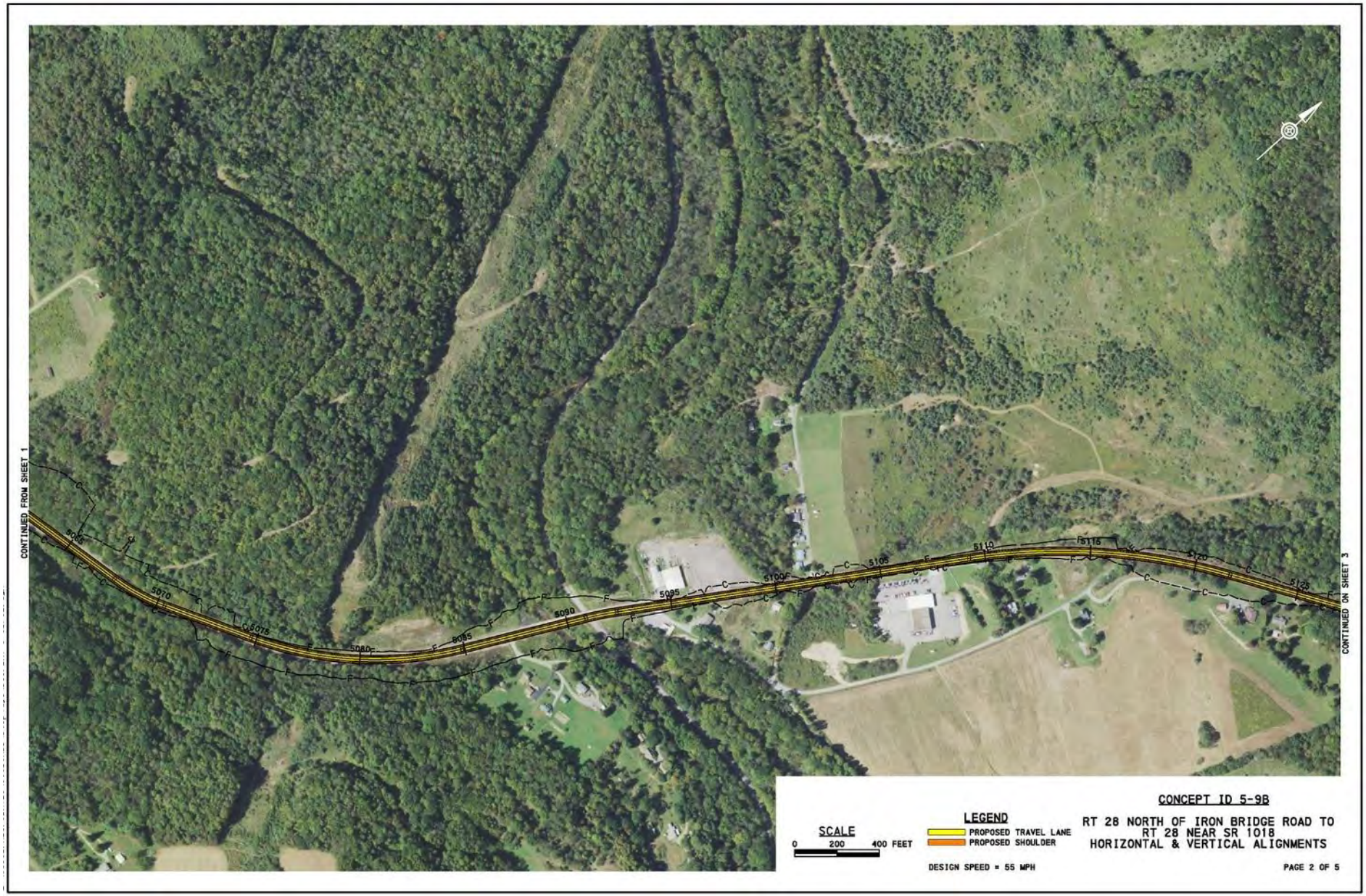


Exhibit 33 - Concept 5-9 (3 of 5): RT 28 from Sloan Hill Road to SR 1018 near Hogback

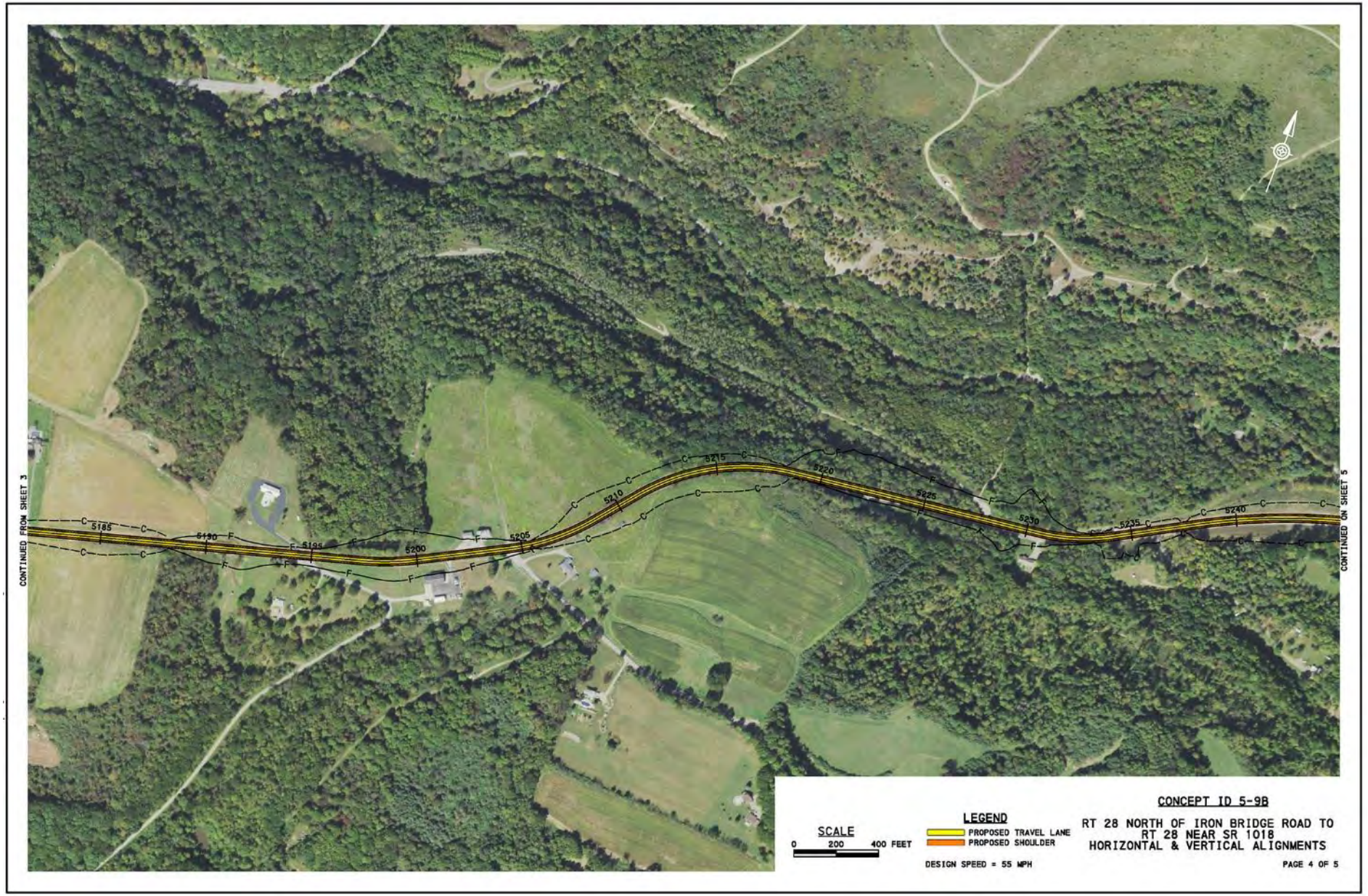


Exhibit 34 - Concept 5-9 (4 of 5): RT 28 from Sloan Hill Road to SR 1018 near Hogback

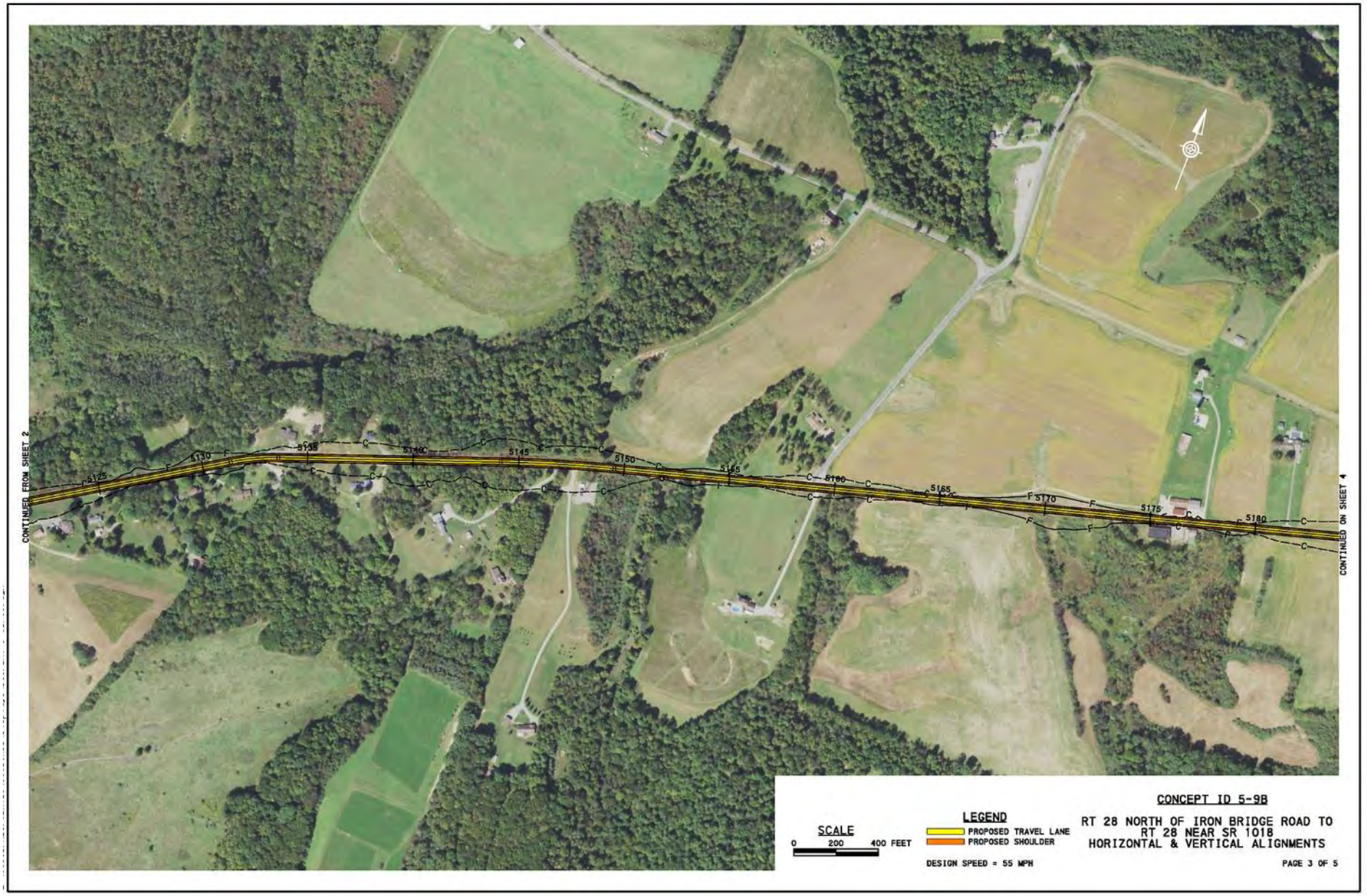


Exhibit 35 - Concept 5-9 (5 of 5): RT 28 from Sloan Hill Road to SR 1018 near Hogback

Concept 14: SR 1004 (Madison Road) & Kohlersburg Road

***Associated Concern Groups**: Stakeholder Interviews, Field Inventory, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

The intersection of SR 1004 Madison Road, Kohlersburg Road, and Route 28 is currently configured as a three-way intersection with extra wide shoulders. The extra wide intersection causes some confusion operationally at Kohlersburg Road/Madison Road, as it is not clear which of the two roads has right-of-way to proceed with traffic. Two improvement options were considered in this area including a roundabout intersection design. However, due to the anticipated environmental and property impacts and Steering Committee input, the roundabout was not further considered. Rather, the improvement concept for this area would be to narrow the roadway making a right turn south along Route 28 to provide a better-defined opening and reconfigure the stop condition for SR 1004. Signing upgrades would be part of this improvement. These improvements will address concerns identified as part of the safety analysis and stakeholder interviews. (See **EXHIBIT 36**)

Concept 25: Route 28 at Redbank Valley Trail Crossing

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, Crash History, PennDOT Safety Screening*

The crossing for the Redbank Valley Trail across Route 28 is currently at a location near an “S” bend with limited sight distance for drivers traveling Route 28. North of the trail crossing, Route 28 has a slight vertical crest curve that further impedes driver’s sight distance heading southbound; limiting ability to see trail users crossing Route 28. The trail crossing is skewed across Route 28, which increases the distance trail users must cross and the time users are in the roadway. Presently the trail crossing paint markings are very worn to the point of barely being visible to drivers. The speed limit in this area is 40 mph. The proposed improvement for this area would be to move the trail crossing approximately 1,100 feet to the south along Route 28 to occur along a tangent section of Route 28 at Middle Run Road. This will allow greater sight distance and a more perpendicular and shorter crossing with less exposure to traffic along Route 28. Route 28 would be reconfigured from this point up to the horizontal curve ”S” bend to construct the new trail parallel along the right side of Route 28 using the existing pavement located between Route 28 and the Redbank Valley Creek. The crossing would include improved signage. A shorter-term improvement option has been identified for this crossing under the Other Improvement Concepts - Pedestrian/Trail User Safety Enhancements section of this study. (See **EXHIBIT 37**)

Concept 29: Route 28 & SR 0536 (Mayport Road)

***Associated Concern Groups**: Previous Studies, Stakeholder Interviews, Public Survey, Field Inventory, Vertical Grade, PennDOT Safety Screening*

This section of Route 28 forms an X crossing with SR 0536 (Mayport Road). The extreme skew of the roadway paired with the vertical grade of 5.6% in this area limits the sight distance. The speed limit in this section of roadway is 55 mph. The proposed improvement in this area would be to realign Mayport road to intersect with Route 28 closer to a 90-degree angle. The intersection would be relocated approximately 350 feet south of the current configuration. The realignment of Mayport Road will improve the sight distance, thus making it safer for vehicular movements. The remainder of SR 0536 Mayport Road would be configured into a cul-de-sac to maintain access for current residents. (See **EXHIBIT 38**)

Concept 33: Route 28 & Moore Road

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

This concept looks at Route 28 in the vicinity of Moore Road. There is currently a sharp horizontal curve in the area that is substandard for the 55 mph speed limit. The proposed improvement would increase the horizontal radius to meet the 960 feet minimum and slightly adjust the vertical grades in this area to meet the 5% maximum. This study improvement concept reconstructs the vertical and horizontal curves to meet the Study Design Criteria and Typical Section. (See **EXHIBIT 39**)

Concept 34: Route 28 & SR 3003 (Weaver Road) & SR 3035 (Mendenhall Road)
***Associated Concern Groups**: Previous Studies, Stakeholder Interviews, Public Survey, Crash History, PennDOT Safety Screening*
This "S" bend occurs at the intersection of Route 28 and Mendenhall Road. This horizontal curve does not meet current design criteria with a radius of less than 960 feet. The improvement would look only at the horizontal geometry improvements as the vertical grades are within standards for this area and match the existing roadway template. (See **EXHIBIT 41**)

Concept 35: Route 28 & Snyder, Seldom Seen, Coder, T-396
***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*
This section of Route 28 occurs near the intersection of Seldom Seen Road, Seneca Trail, and Snyder Road. The horizontal radius in this area is less than the minimum 960 feet for the 55 mph design criteria. The proposed improvement would focus on realigning the horizontal alignment of this area and minor vertical grade adjustments to stay under the 5% maximum vertical grade. (See **EXHIBIT 40**) Concepts 33 through 35 could be combined into one project if a larger combined roadway improvement project can be accommodated. (See **EXHIBIT 41**)

Exhibit 36 - Concept 14A: SR 1004 (Madison Road) & Kohlersburg Road

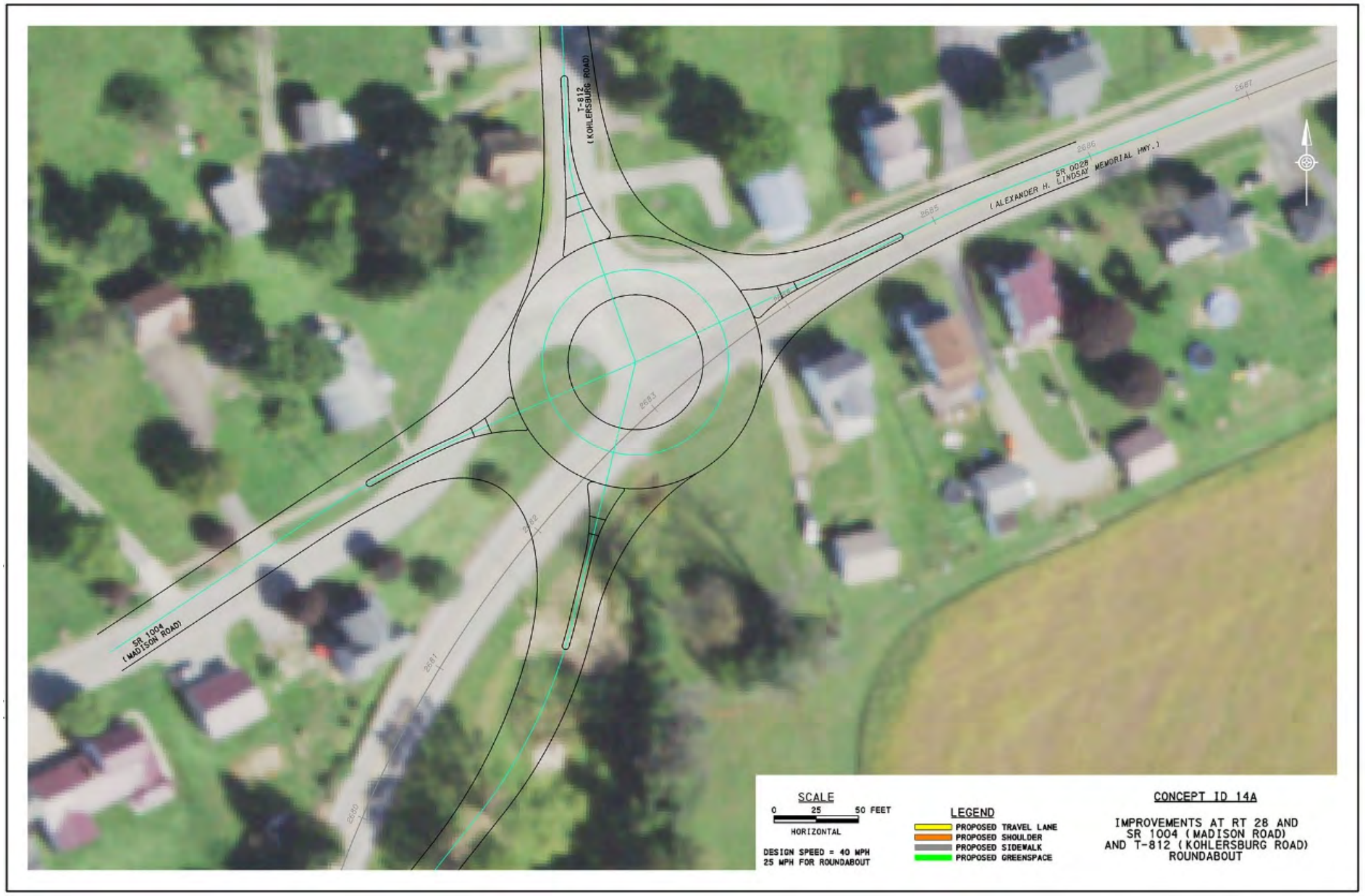


Exhibit 36 - Concept 14: SR 1004 (Madison Road) & Kohlersburg Road

Exhibit 37 - Concept 25: Route 28 at Redbank Valley Trail Crossing

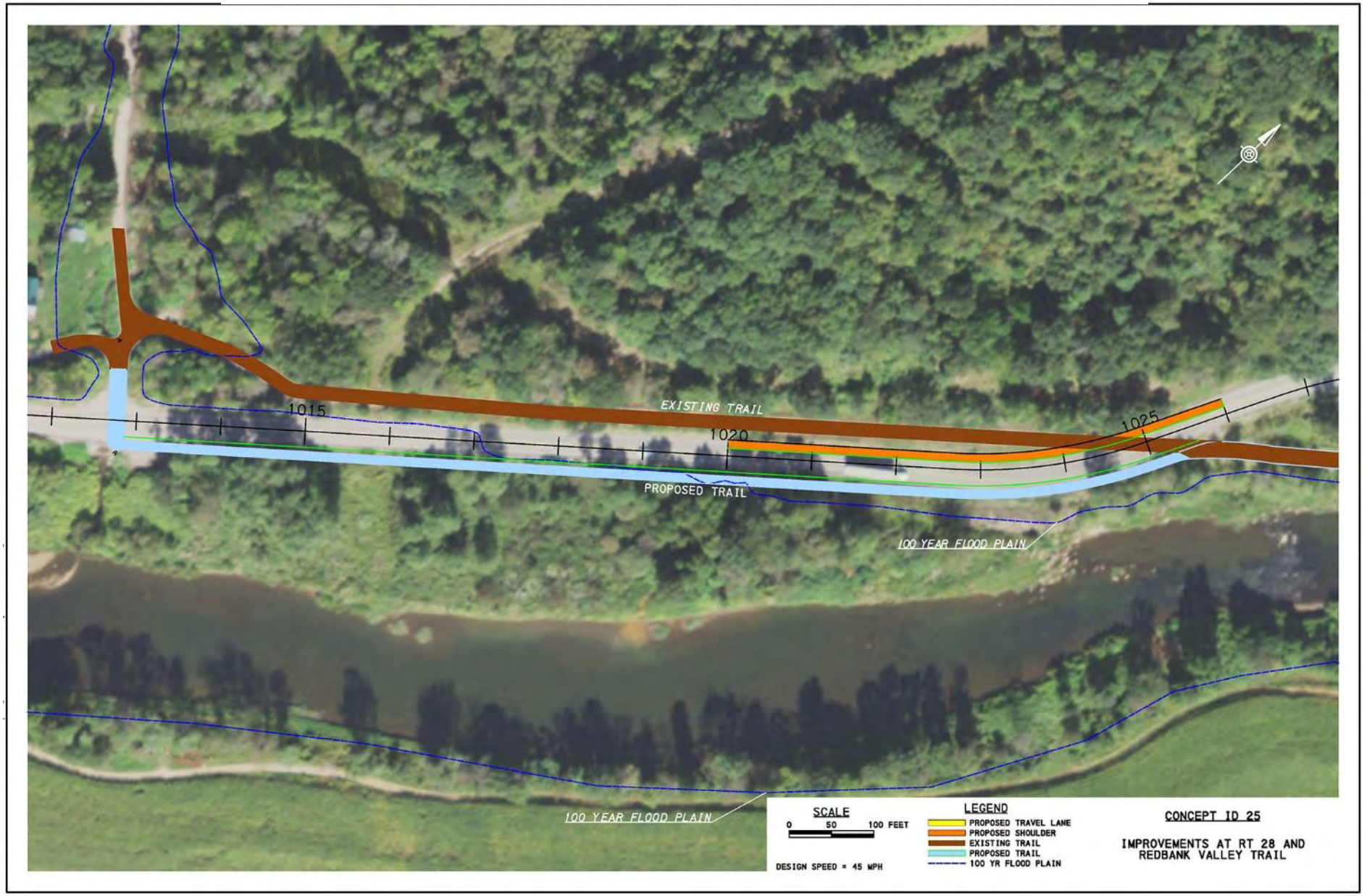


Exhibit 38 - Concept 29: Route 28 & SR 0536 (Mayport Road)

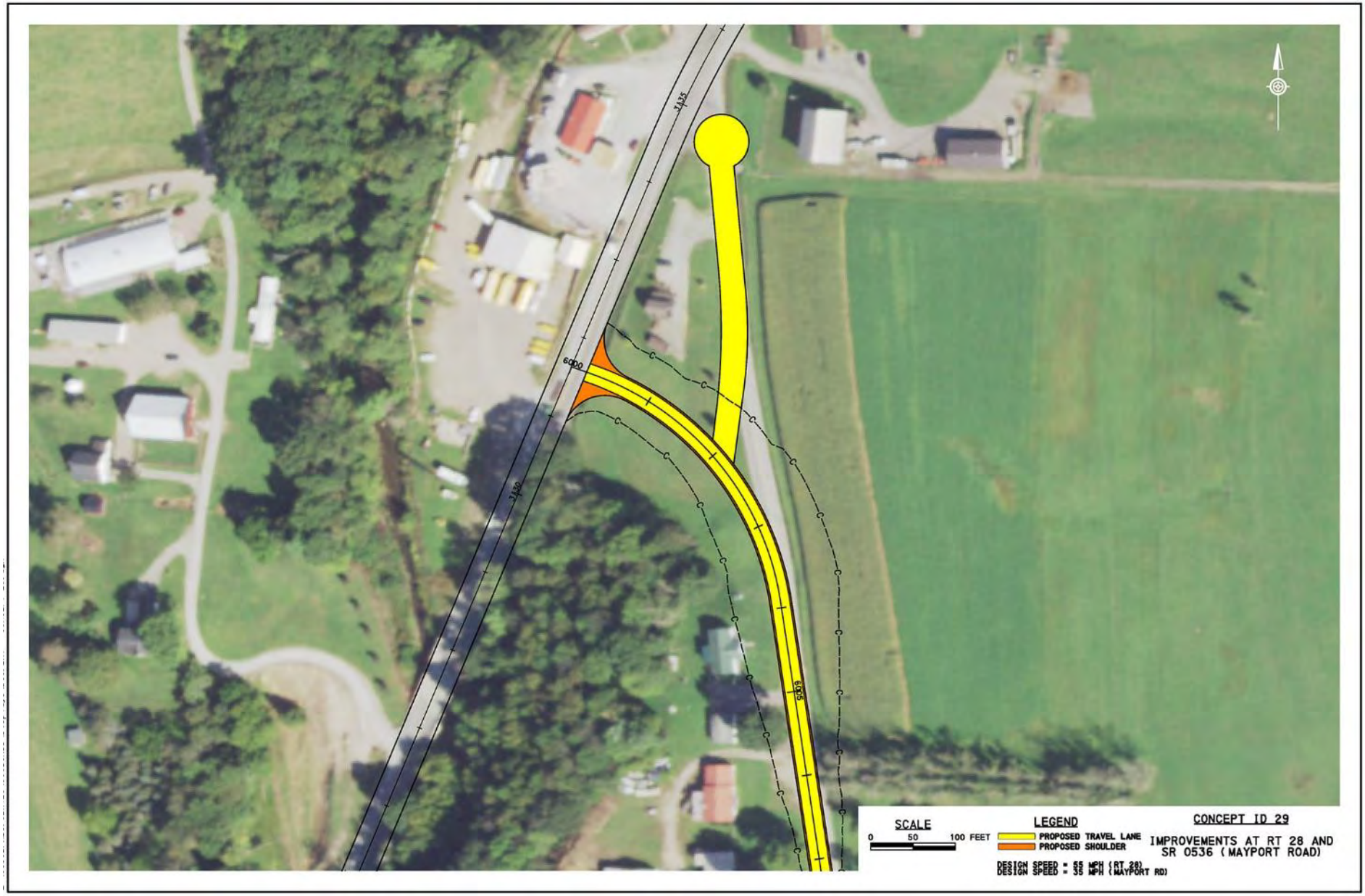


Exhibit 39 - Concept 33: Route 28 & Moore Road

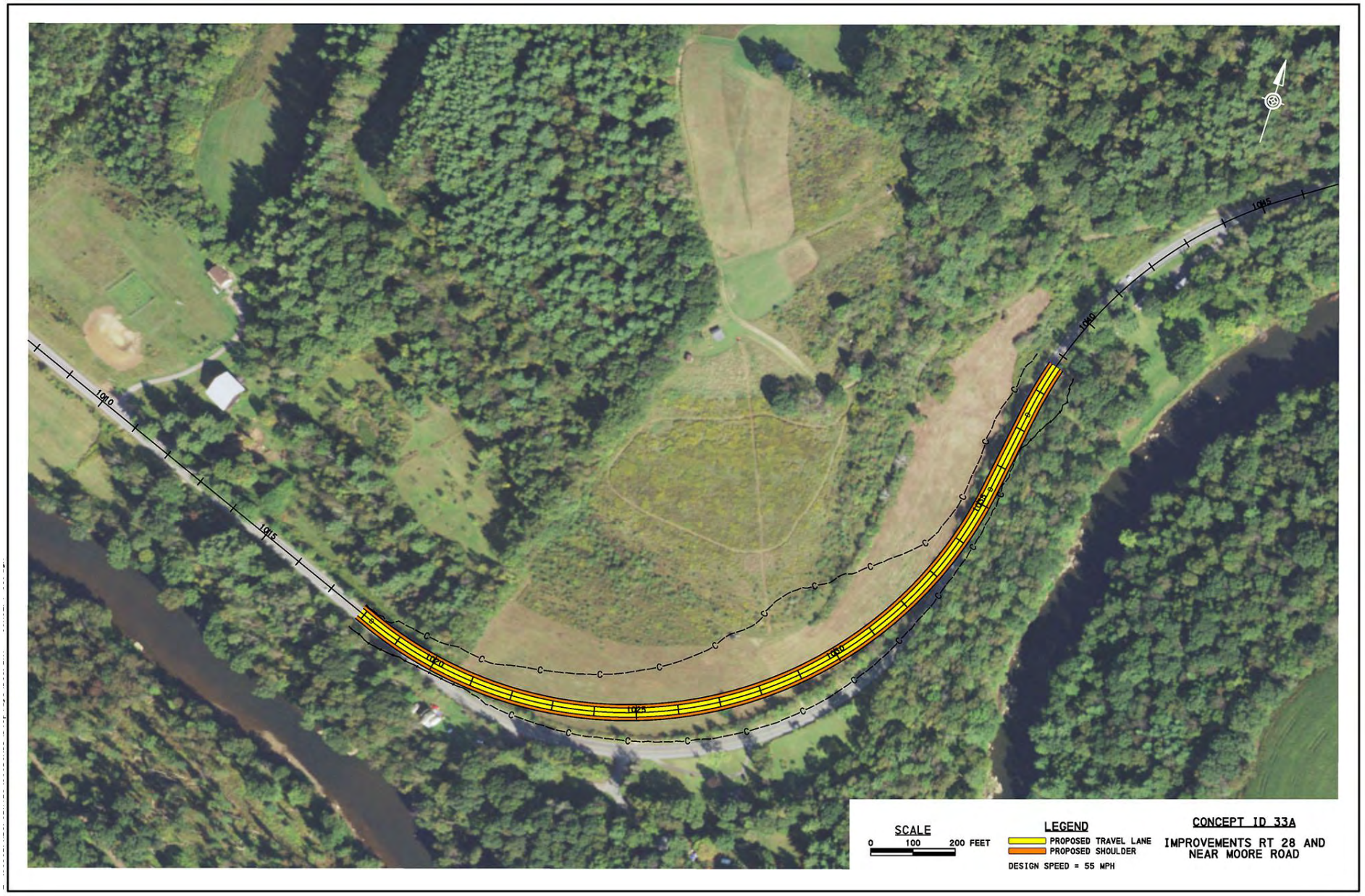


Exhibit 40 - Concept 35: Route 28 & Snyder, Seldom Seen, Coder, T-396

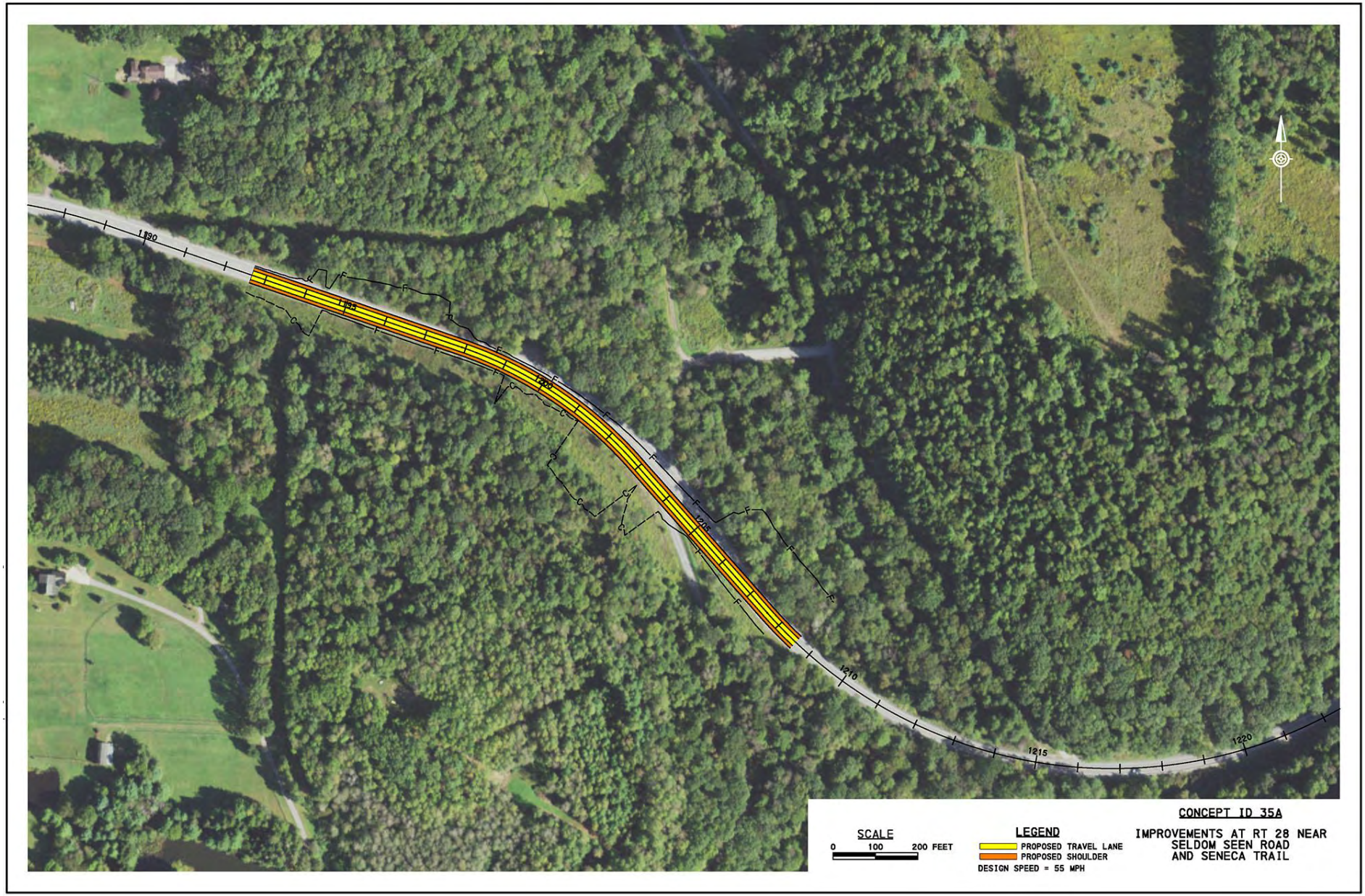


Exhibit 41 - Concept 33-35 (1 of 4): RT 28 Geometric Improvements

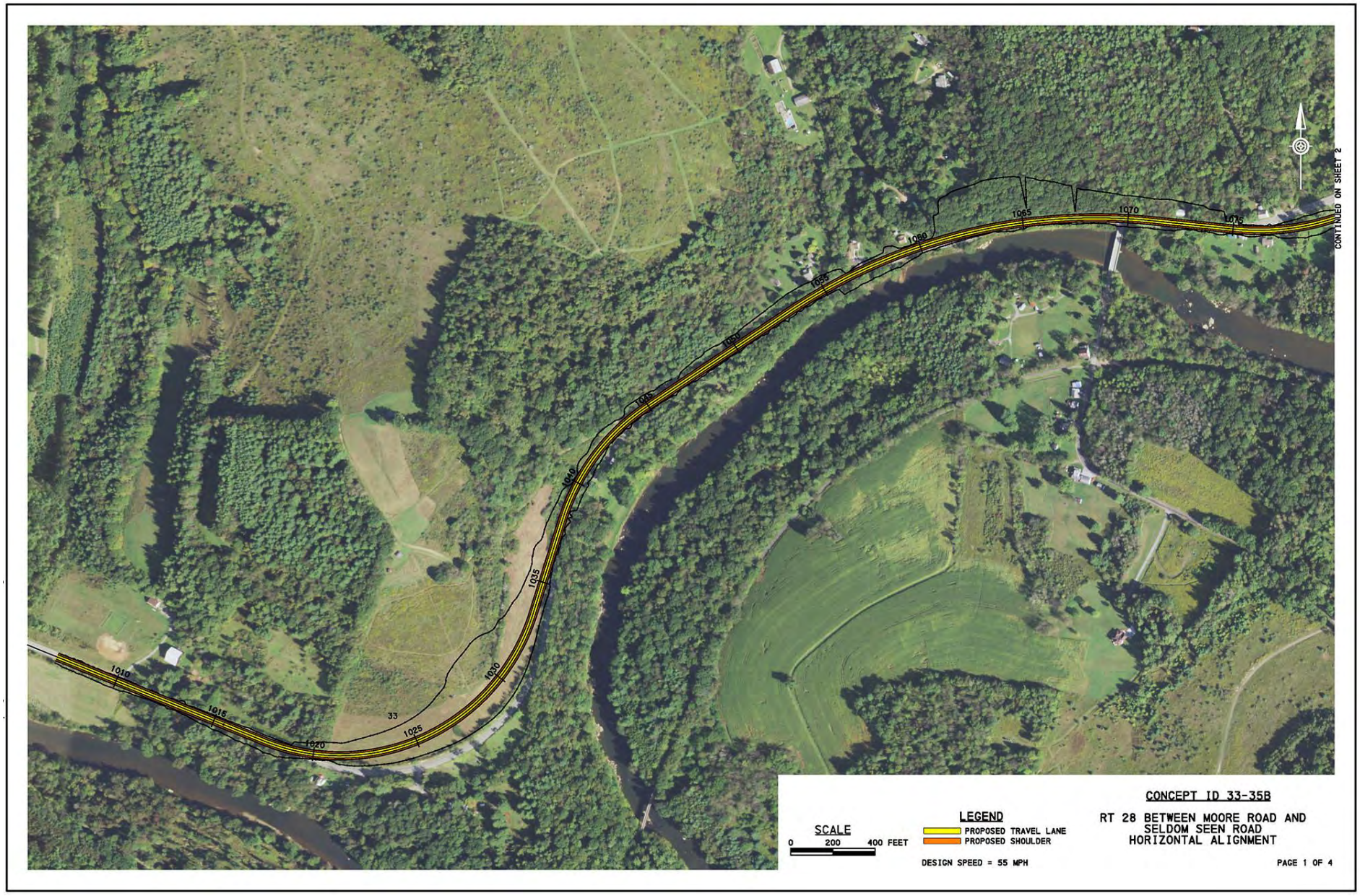


Exhibit 42 - Concept 33-35 (2 of 4): RT 28 Geometric Improvements

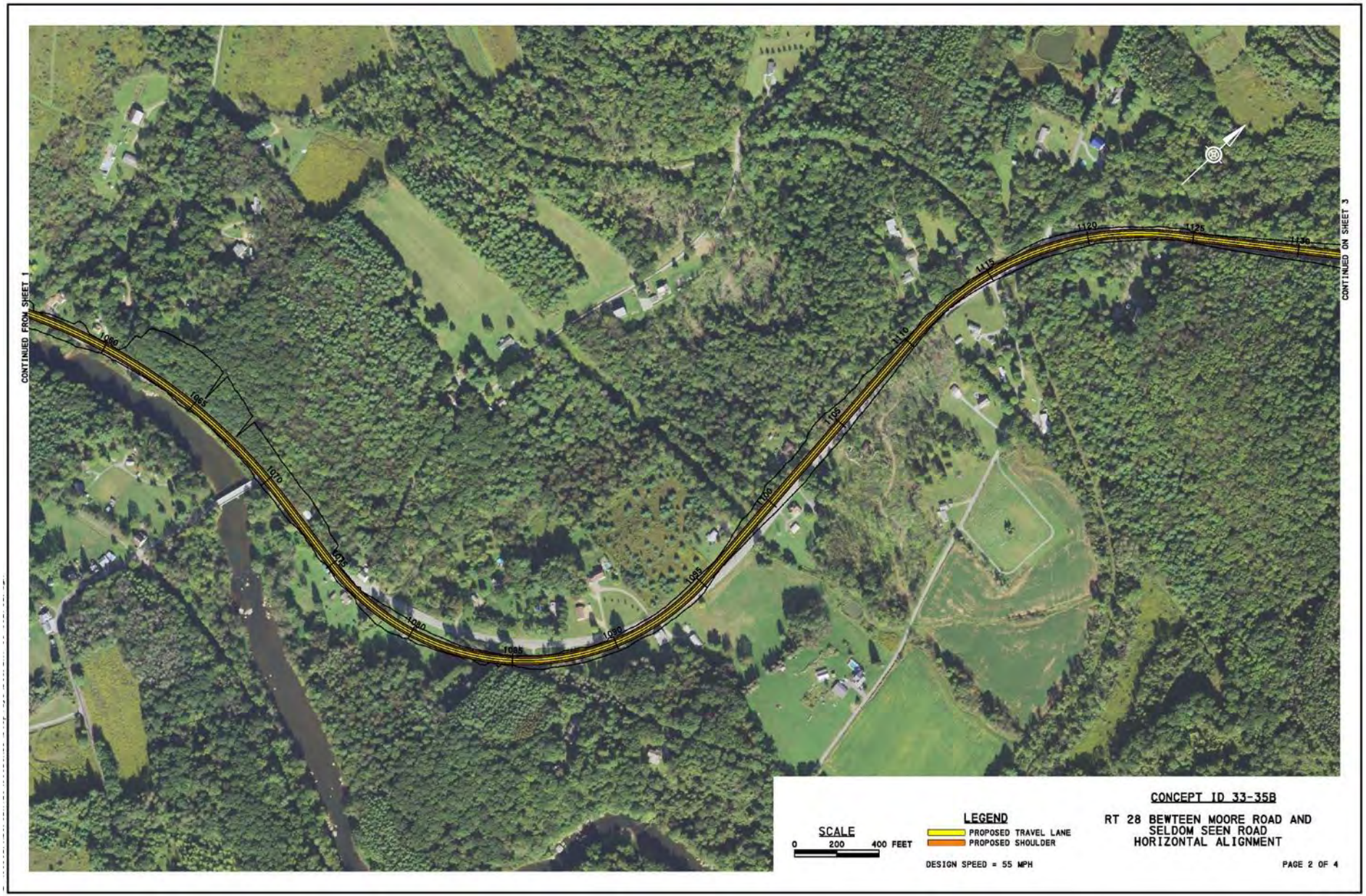


Exhibit 43 - Concept 33-35 (3 of 4): RT 28 Geometric Improvements

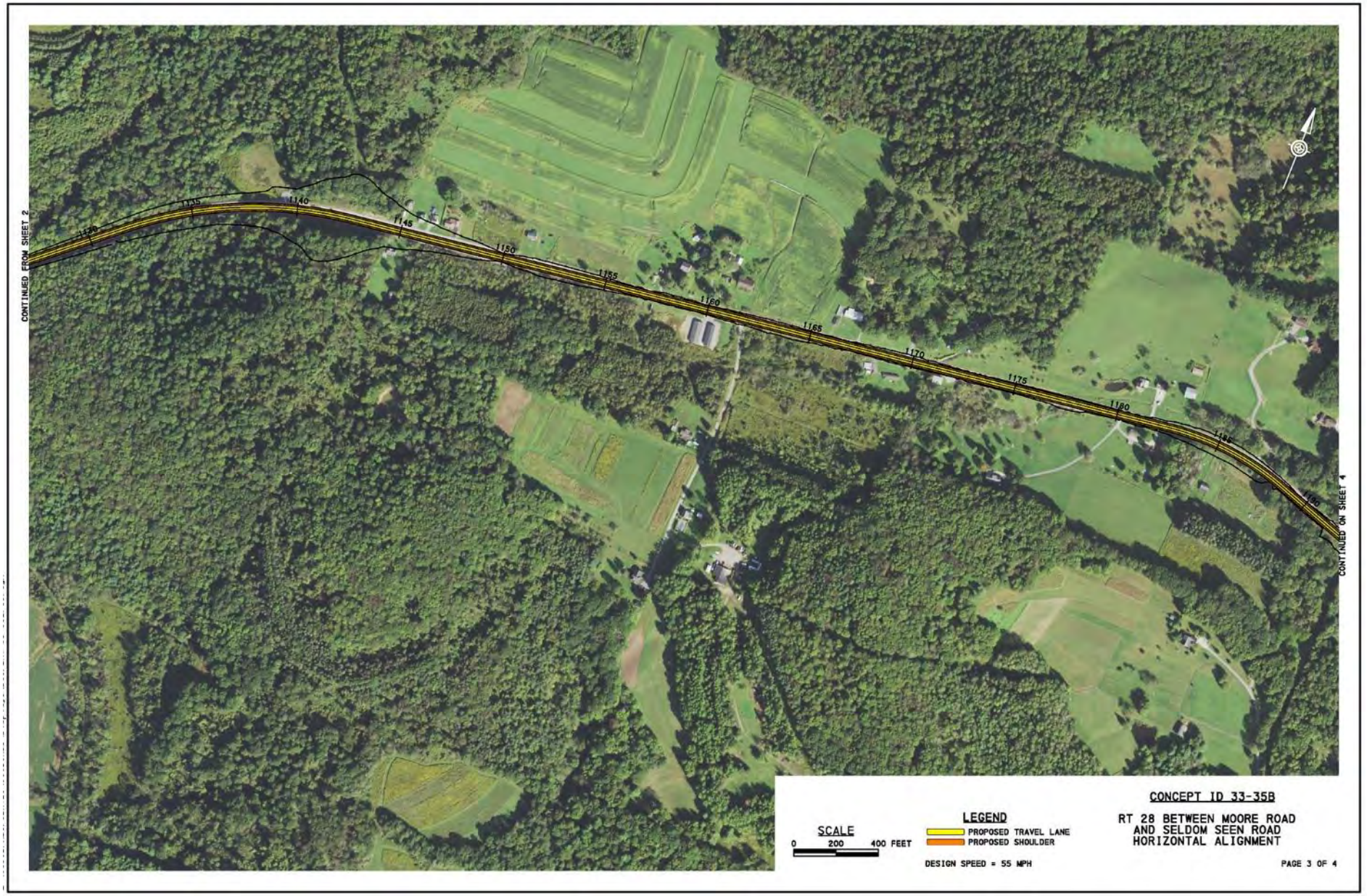
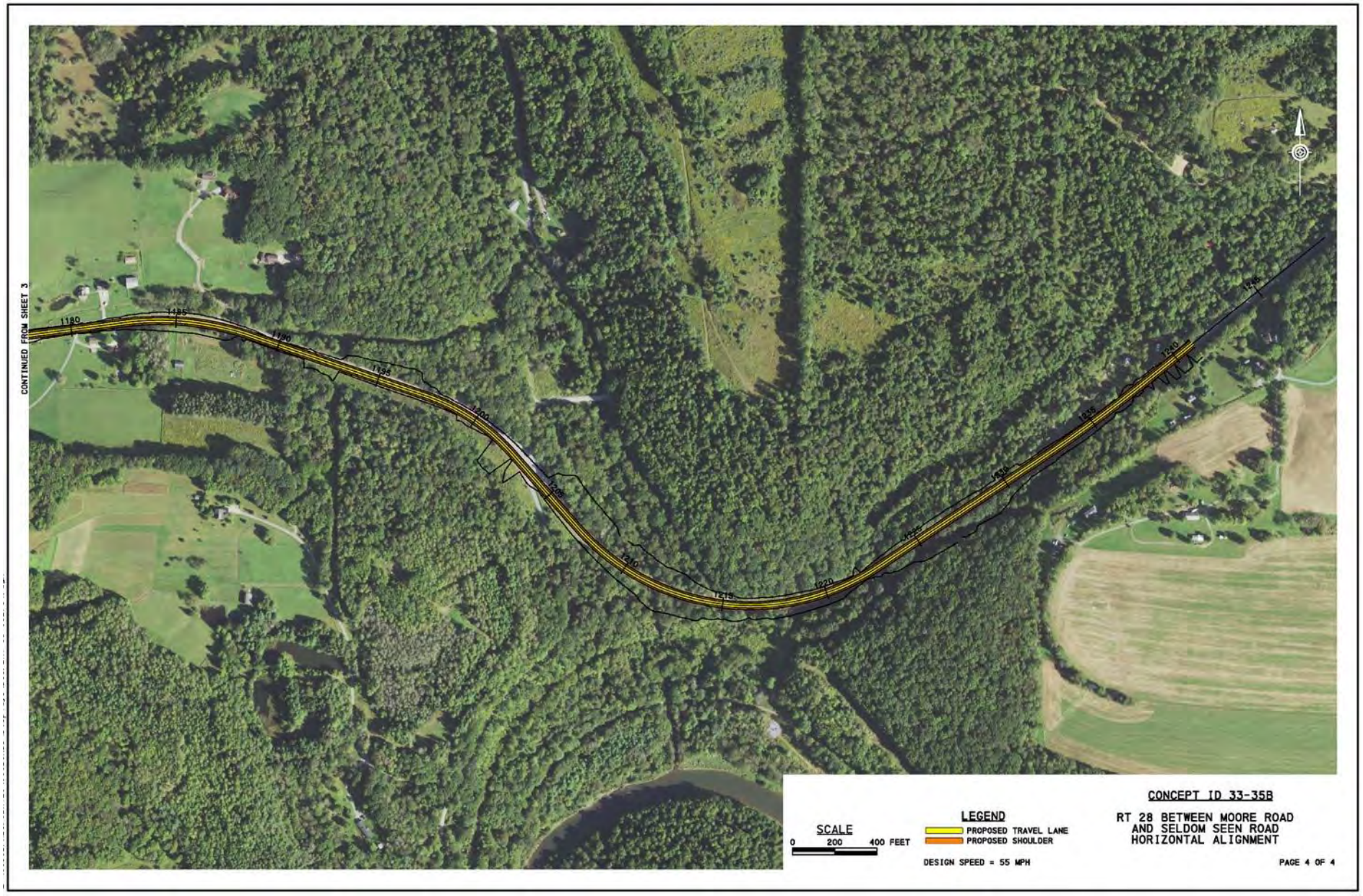


Exhibit 44 - Concept 33-35 (4 of 4): RT 28 Geometric Improvements



Additional improvement concepts were considered to address concern areas. Conceptual plans were not developed for these improvement concepts.

Concept 11 - Route 28 & SR 1016 (Calhoun School Road)

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Horizontal Curvature, Vertical Grade, Crash History, PennDOT Safety Screening*

This section of Route 28 is near the transition of lanes from the end of a northbound truck climbing lane to the south of SR 1016 and taper for a left turn lane at the Calhoun School Road and Kuhns Road intersection. The series of closely spaced transitions and tapers for the northbound movements and turning movements within the intersection may be causing driver confusion.

An improvement would be to consider providing greater distance between the transition of the Route 28 climbing lane ending and the northbound left turn taper. Adding advanced lane control signing on Route 28 northbound and southbound approaches may better help drivers to identify the upcoming left turn lanes. This improvement should consider adding street name sings to Kuhn Road and Calhoun School Road at intersections along with "SLOW" pavement markings approaching Calhoun School Road as part of the low-cost Intersection Safety Package Improvements. Additionally, SR 1016 intersects with Route 28 at a slight skew, reconfiguring this intersection to be closer to a 90-degree intersection may improve sight distance and traffic operation.

Concept 17 - Route 28 at South Bethlehem (15 mph curve)

***Associated Concern Groups**: Previous Studies, Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, PennDOT Safety Screening*

The sharp 15 mph curve along Main Street in South Bethlehem does not meet current standards for 35 mph design criteria. Currently, the curve in the area has a radius of approximately 75 feet, the minimum radius for 35 mph would be 340 feet. The challenge to proposing any roadway realignment in this area is the tight corridor with numerous houses and businesses present. The prospect of improving the roadway in this area would likely displace many properties, including a gas station, and prove to be cost prohibitive. A more effective improvement may be to utilize vehicle detection system to alert motorists traveling too fast to negotiate the curve. The detection system and associated signing would provide motorist's actual speeds next to the advisory speed at each approach to the curve, and specifically at the northbound approach transitioning from a higher speed section of Route 28 to a more urbanized area, may be particularly effective.

Systematic Improvement Concepts

The Route 28 Study Corridor spans approximately 40 miles from Kittanning (south) to Interstate 80 (north). The existing conditions and evaluation of the overall corridor found common concerns and problem areas within the corridor. The primary concerns were related to safety, geometry that does not meet current standards for the facility type and use, and driver recognition of intersection and access points along Route 28. Rather than evaluating each one of these common concern types individually, a corridor improvement approach evaluating appropriate Systematic Improvements was considered.

Systematic improvements were applied to correct common concerns that affect the overall corridor. These improvements allow the concerns to be addressed in a uniform manner and enable the improvement to be consistently applied. Additionally, these improvements allow a proportionate saving in costs when applied to a larger corridor rather than as applied separately. The systematic improvements evaluated were generally low-cost improvements with an emphasis on safety. This approach is consistent with the concerns found within the existing corridor.

The development of the systematic improvements is based on guidance provided by the FHWA's *Low-Cost Safety Enhancements for Stop-Controlled and Signalized Intersections*, FHWA's *Low-Cost Treatments for Horizontal Curve Safety 2016*, PennDOT *District Guidance for Intersection Safety Implementation Plan*, and PennDOT Publication 111. The systematic improvements considered for the Route 28 Corridor Study consist of the following:

Intersection Safety Treatments

The Route 28 Study Corridor consists of several intersections that were identified as concerns by project stakeholders, the public, and safety screening files (one for each study area county) that were produced by PennDOT Central Office. These intersections are noted in the Concerns Area Matrix. Field observations noted lack of signing or inconsistent signing in advance of these intersections, lack of or hard to recognize street signing, and lack of specific pavement markings alerting drivers to the intersections.

Example application of Intersection Safety Treatment (Route 910)

Similar to other primary arterial roadways within PennDOT District 10, such as Routes 8 and 68, consistent signing and delineation would better alert drivers approaching key intersections throughout the Route 28 Corridor. The intersection safety treatments to be uniformly applied at the intersections identified on the Summarized Areas of Concern Matrix are as follows:

- Intersection Ahead Warning Sign W2-1 - Larger (36” X 36”)
- Street name(s) D3-2 (48” X 8” or X 16” with two street names) attach to the warning signs
- White Epoxy Pavement Marking “SLOW” at each approach
- Two Consecutive- White Epoxy 24-inch lines to show intersection configuration as a plus, “t”, or skewed configuration
- Street Name Signs (D3-1) that can be attached to existing or new stop signs on the side roads or standalone signs
- Large Double Arrow Sign W1-7 (48” X 24”) located across from minor stop sign at “T” intersection

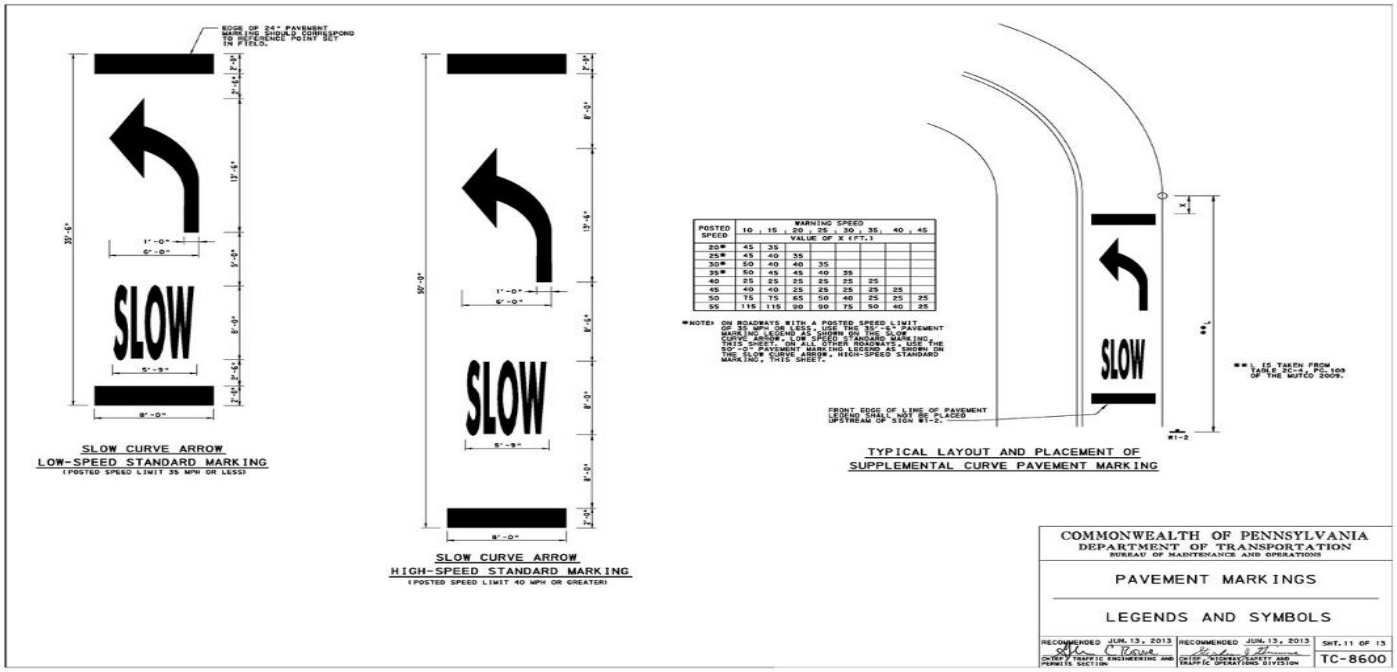
Full intersection safety treatments should not be applied to each intersection within the corridor. Site specific variations of this treatment, for example, street name signing, should be considered. This treatment is more effective applied to curves leading into the intersection, skewed intersections, or intersections noted in the Summarized Areas of Concern Matrix. The treatments applied in these situations are likely to be more noticeable and more effective to motorists than if applied at all intersection locations.

Curve Safety Treatments

The Route 28 corridor has multiple horizontal curves located throughout the corridor. A number of these locations and curves have been noted on the Summarized Areas of Concern Matrix. Field observations noted some of these curves have curve ahead warning signs with advisory speeds. However, the signs are not consistently placed and new and larger signs with greater reflectively would increase the visibility to drivers. Additionally, there is a lack of pavement marking or legends that could provide motorists a greater advanced warning ahead of the curve. The improvement should be consistently applied using PennDOT’s Publication 111 Standard Drawing for a “Slow Curve Arrow High-Speed Standard Marking” (See **EXHIBIT 45**). The treatment should include a larger (36” X 36”) curve ahead warning sign that may include an attached street name sign, if a roadway intersection is located within the curve. Additionally, where appropriate chevron arrows (new or replacement) should be considered to better delineate each curve for the directions.

Where applicable within the corridor, components of the Intersection Safety Treatments and Curve Safety Treatments noted above can be customized to fit site conditions and avoid sign or pavement marking clutter that could lead to driver confusion. Curve safety treatments applied to Route 28 will be able to provide a low-cost safety improvement consistently throughout the corridor.

Exhibit 45 - Slow Curve Arrow High-Speed Standard Marking



High Friction Surface Treatment (HFST)

The horizontal curves within the Route 28 corridor have experienced several Lane Departure and Hit Fixed Object type crashes through the curves. In addition, field observations noted damaged guiderail along the outside of the curves within some sections of roadway. An improvement focusing on adding surface friction to help keep motorists within the roadway travel lanes would potentially enhance the safety through these curves and reduce lane departures.

High Friction Surface Treatments (HFST) place a thin layer of specially engineered high friction aggregate to the roadway to assist motorist in negotiating curves and avoid skidding or excessive braking. HFST was vetted by the Pennsylvania State Transportation Innovation Council (STIC) and has been used successfully throughout Pennsylvania. HFST applied to the travel lanes through the curves noted within the Concern Areas Matrix would provide increased friction to assist motorists to stay within their travel lanes and avoid roadway departures. A pavement inventory would need to occur to identify any areas where the existing pavement may be failing or cracking to avoid applying this treatment on top of a pavement structure that is not sound. This would more quickly wear the applied HFST surface and limit the effectiveness on the HFST. Ideally, a mill and overlay or base repairs, as needed, to the existing asphalt would be completed prior to the application of the HFST.

Application of HFST on State Roadway

Centerline, Shoulder, and Edgeline Rumble Strips

The Route 28 corridor has a number of observed crashes involving vehicles departing the roadway. A safety countermeasure and low-cost safety improvement to alert distracted drivers when leaving the travel lane are centerline and edgeline rumble strips. These rumble strips have been proven to be an effective safety improvement to create a noise loud enough to alert distracted or fatigued drivers[3]. Field observations have found some areas where rumble strips have been applied, but not consistently throughout the corridor. Shoulder rumble strips require a minimum shoulder approximately six feet or greater. Edgeline rumble strips allow the application of a rumble strips for shoulders less than five feet and along the painted white edgeline. The Route 28 Corridor has a number of areas where the shoulders are less than five feet, where the edgeline rumble strips would be more applicable than the shoulder rumble strips.

Centerline rumble strips and a combination of shoulder (greater than 6 feet) and edgeline (less than 6 feet) should be considered and applied uniformly throughout the Route 28 Study Corridor.

Lack of Destination Signing to Pittsburgh along I-80 and within the Route 28 Study Corridor

The Route 28 corridor provides direct access to the City of Pittsburgh. The City of Pittsburgh corporate limits are located approximately 75 miles from the Interstate 80 Brookville Interchange via Route 28 and approximately 115 miles using a combination of I-80 to I-79 to I-279. In addition to providing a shorter distance to Pittsburgh, based upon peak hour congestion, construction, and incidents along I-80, I-79 and I-279, the Route 28 corridor provides the regional travelers a viable alternative option to avoid congestion.

Currently, there is a lack of destination signs to the City of Pittsburgh along Interstate 80 and within the Route 28 study corridor. The I-80 signing at Brookville in the westbound and eastbound directions does not indicate Pittsburgh is a destination using Route 28 southbound. Additionally, there were no observed distance signs to the City of Pittsburgh along Route 28 until south of Kittanning.

Interstate and regional drivers may benefit from signing the use of Route 28 from Interstate 80 as a viable travel option to the City of Pittsburgh. Depending on the congestion present along the interstate access to Pittsburgh, Route 28 may provide an effective congestion management strategy to catch drivers heading towards Pittsburgh before adding to the congestion. In addition, alerting drivers to the Route 28 corridor would provide greater access and visibility to the Route 28 corridor businesses, community and recreational activities. Potential improvement to consider providing increased signing and connectivity to the City of Pittsburgh via the Route 28 corridor, as follows:

Interstate 80

- Intelligent Transportation System (ITS) - Dynamic message sign (DMS) along I-80 in the westbound direction alerting travelers to the travel time to Pittsburgh via Route 28 and travel time to Pittsburgh via I-80 and I-79.
- Installation of static Type A Destination sign in the westbound and eastbound directions alerting travelers that Pittsburgh is a destination using Route 28 southbound.

Route 28

- Locate destination and distance signs to Pittsburgh at I-80 westbound and eastbound ramp junctions.
- Provide post mounted destination and distance signs to the City of Pittsburgh located along Route 28 southbound until the Pittsburgh signs pick up to the south of Kittanning.

[3] NCHRP Report 641 (2009)

Guiderail damage, pavement deterioration, and slope erosion

During the course of the study, several areas were identified with guiderail or guiderail end section damage and pavement shoulder deterioration or signs of potential slope erosion adjacent to the guiderail. It was observed in some areas that the slopes behind guiderail was eroding and causing the guiderail to lean back or move away from the roadway. These areas could be problematic for the effectiveness of the guiderail and the safe operation of the roadway.

A corridor improvement project to replace existing damaged or ineffective guiderail and end sections would enhance the effectiveness of the roadway. However, this investment would be more effective if any underlying concerns with pavement deterioration or localized slope erosion were addressed with a proposed improvement. Additionally, field observations noted guiderail end sections may be damaged or no longer crash worthy and need to be replaced. Consideration of offsetting new end sections further away from the roadway may help to avoid nuisance hits. Reducing potential nuisance hits by offsetting end sections further away from the roadway, where practical, and the application of edgeline rumble strip to allow drivers to take corrective actions earlier, will likely reduce PennDOT maintenance costs associated with guiderail repairs.

Route 28 between SR 1028 and Lower Hayes Road

Other Improvement Concepts

Other Improvement Concepts have been identified at specific locations along the Route 28 corridor that may be less time consuming to implement than the specific priority improvement concepts identified and would not be categorized as systematic improvement. These improvements would likely require limited or no right-of-way acquisition, limited utility involvement, and a small environmental footprint. The improvements are a response to concerns identified within the concerns area matrix at specific locations within the Route 28 study corridor. The Other Improvement Concepts are further detailed below.

Concept 18 to 24 - Route 28 at SR 839 to Redbank Valley High School

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, PennDOT Safety Screening*

The corridor along New Bethlehem had several spots of concern from the stakeholder interviews and public surveys. The Route 28 corridor along New Bethlehem could be evaluated from a multimodal standpoint to ensure a consistent pedestrian/bicyclist template through this area.

The Redbank Valley High School crossing is a concern for students crossing Route 28 during peak and non-peak times to access the school. This crossing is mid-block between Center and Penn Streets. The current configuration of the crossing is two transverse white lines that define the boundary of the cross walk. There are two portable in-street pedestrian crossing devices “State Law - Yield to Pedestrian” on each side of the crosswalk.

Improvements to this crosswalk to increase visibility for pedestrians include a higher visibility and reflective painted crosswalk using wider transverse striping such as a “piano key” crosswalk. Also, a larger, more visible post-mounted sign in advance of the intersection “Yield Here to Pedestrian” (36” X 36”) located on the right and left of Route 28 placed approximately 20 feet to 50 feet in advance of the crosswalk line based upon field conditions. This would provide more visible advanced warning to drivers of the crossing approaching the crosswalk.

RRBF in front of Washington Elementary School – Allegheny County State Route 19

A proposed improvement that would provide an enhancement to alert the motorists of this crossing is a Rectangular Rapid Flashing Beacons (RRFB) warning device installed at each side of the crosswalk. If evaluated individually, the RRFB is defined as **Concept 24**. This would provide a visible flashing response to pedestrians present in the crosswalk to alert motorists traveling in each direction of pedestrian activity. The flashing response would be particularly effective during nighttime operation and lower visibility with heavy rain or fog. Also, the flashing response to the presence of pedestrians may be particularly useful during times when a Redbank Valley High School Crossing Guard is not present at this intersection.

Concept 20 - Route 28 and Route 66 (Broad and Wood St)

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, PennDOT Safety Screening*

This intersection exhibits evidence of larger vehicles tracking into opposing travel lanes and onto the adjacent sidewalk. Given the build-up condition within the intersection, widening to improve radii connections would likely not be reasonable considering impacts to buildings and businesses at each quadrant of the intersection. Improvement options could consider updating pavement markings to narrow through lanes to provide more room for turning trucks to negotiate the Route 66 and Route 28 turning movement. Using dashed tracking lines to connect turning movements would better define the turning radii at this intersection. Further evaluating any areas where trucks may be leaving the travel lane and conflicting with pedestrians as part of a turning movement may identify the need for localized improvement to avoid this conflict. Additionally, further evaluating the optimal location of the stop bars to maximize the turning radii, where needed, and adding “piano key” crosswalks would provide greater visibility for the location of the pedestrian crossings at each leg of the intersection.

Concept 25: Route 28 at Redbank Valley Trail Crossing

***Associated Concern Groups**: Stakeholder Interviews, Public Survey, Field Inventory, Horizontal Curvature, Crash History, PennDOT Safety Screening*

The Redbank Valley Trail crossing was a concern identified through stakeholder and public outreach, and an analysis of the field inventory, horizontal geometry, crash history, and PennDOT's safety screening. The sharp curves on existing Route 28 to the north and south approaching the trail and the sharp skew of the pedestrian crossing seem to be factors contributing to this concern. Currently, there are angled piano striped keys bounded by a thicker white line to define the perimeter of this striping.

The previous Priority Improvement Concept 25 would be more of a long-term improvement requiring more capital investment associated with the proposed relocation of the crossing. A shorter-term, less costly and time-consuming solution to enhance safety and visibly of the approaching motorists is the application of a pole mounted pedestrian and bike flashing warning device. This flashing device can be actuated based upon the presence of pedestrians or bikes within the vicinity of the trail crossing or push button initiated by the pedestrians or bicyclists. See the photo of the application of this device to the right for the Westmoreland Heritage Trail crossing of a two-lane roadway.

Westmoreland Heritage Trail Crossing

Concept 28 - Route 28 through Hawthorn Area

***Associated Concern Groups**: Field Inventory, Crash History, PennDOT Safety Screening*

The section of Route 28 through Hawthorn could be improved with upgraded signage and delineation through the area. Improvements could consist of added advanced warning signs, wayfinding signs, and improved roadway pavement markings.

Concept 30 - Route 28 and Jefferson County Maintenance and School Bus Turnaround

***Associated Concern Groups**: Stakeholder Interviews, Horizontal Curvature, Vertical Grade, PennDOT Safety Screening*

This existing condition was a concern of the project stakeholders and included geometric and safety concerns. This area is located on a crest curve with potentially limited stopping sight distance from Route 28. An improvement option could consider a proposed left turn lane with a minimum length into the turnaround in the northbound direction. This would allow maintenance vehicles or buses to wait to turn onto the turnaround outside of the Route 28 travel lanes. Additionally, the Curve Safety Treatment could be considered at the location as a measure to reduce vehicle speed. The addition of post-mounted delineators would help to better define the limits of turnaround. Special signing to alert vehicles of school bus pull off could be developed to better alert drivers of these turning vehicles in advance of the intersection.

Concept 37: Intersection of Route 28 and US 322

***Associated Concern Groups**: Previous Studies, Public Survey, Field Inventory, Horizontal Curvature*

The existing condition was a concern cited with a previous study, public survey, field observations, and horizontal geometric concerns approaching the intersection. The intersection is located along Route 28 to the south of the Route 28/Interstate 80 Interchange. This intersection is a critical link to access Interstate 80 for vehicles traveling within the Route 28 corridor. An intersection improvement could be an option to consider for this location. This improvement could focus on the turning movements, especially larger trucks, tracking through the intersection to avoid entering opposing lanes or damage to adjacent guiderail; operations of the signal and equipment; intersection geometry and approach grades; and operation of the intersection during a detour of Interstate 80.

Concept 38 - Route 28 and US 322

***Associated Concern Groups**: Stakeholder Interviews, Public Survey*

This existing condition was a concern from the previous studies and public survey. There are some horizontal and vertical geometry concerns at this location including the feasibility of larger truck turning movements through the intersection. Key improvements in this area could be made by evaluating turning movements at the intersection and modifying the intersection to better accommodate tracking of turning movements within the roadway template.

Next Steps & Implementation

The Route 28 Corridor Study presents a number of areas of concern along the roadway and several potential improvement concepts or combinations of improvement concepts to address these concerns. There have already been positive steps towards improving the Route 28 corridor with PennDOT District 10-0 currently developing the Goheenville Dip Safety Improvement Project. This project will address geometric concerns, realign intersections, add turning lanes, and extend a truck climbing lane along Route 28 from Route 1027 to Route 1016 (Calhoun School Road). This project provides a great start for implementing long-term improvements to address existing safety concerns along the Route 28 corridor. In a similar manner, the study concepts have been developed to make lasting improvements to the transportation infrastructure for daily use by residents along the corridor, to support businesses and economic development, and enhance recreational opportunities.

The types of improvements identified were categorized as Priority Improvement Concepts, Systematic Improvement Concepts, and Other Improvement Concepts. Each of the concepts was developed to apply consistent improvements to the corridor uniformly to increase driver expectations and awareness of the roadway conditions. This study identified 38 locations within the Summarized Areas of Concern Matrix. Specific improvement concepts were developed for 13 of these locations. The majority of the remaining locations will be able to benefit from the implementation of systematic improvements throughout the corridor. The improvement concepts are further organized by location, MPO/RPO, type, estimated utility and right-of-way involvement, costs, and potential funding sources indicated on the Route 28 Corridor Conceptual Mini-TIP (See **EXHIBIT 46**).

The implementation of Systematic Improvement Concepts could be in combination with the Other Improvements Concepts identified. The combination of these improvement types would still be able to maintain relatively low-cost improvements requiring minimal right-of-way and utility impacts. The Priority Improvement Concepts would typically be implemented as separate projects constructed based upon available funding. In areas with overlapping improvements identified, it is likely that the construction of the Priority Improvement would eliminate the need for the Systematic Improvement. However, considering the major investment to construct some of the Priority Improvements, the overlapping systematic improvements should still be considered as a viable long-term improvement option.

Funding Options

Funding options for each improvement concept are identified in the conceptual Mini-TIP. The funding options are potential available resources intended to provide a variety of options for funding each improvement concept. Based upon the specific concept to be advanced, further planning of applicable funding will be required. Potential funding sources include the MPO/RPO Surface Transportation Program (STP); Highway Safety Improvement Program (HSIP); ACT 13 (Greenways, Trails and Recreation Program); PennDOT Transportation Alternatives Set-Aside (TASA); PennDOT Multimodal Transportation Fund (MTF); Automated Red Light Enforcement Program (ARLE); the DCNR Community Conservation Partnership Program (C2P2); USDOT Infrastructure for Rebuilding America (INFRA) and Better Utilizing Investments to Leverage Development (BUILD) Grants; and potential future Transportation Stimulus (STIM) Funding. See **Appendix I** for more detailed description of funding sources and requirements.

Route 28 Corridor Conceptual Mini-TIP

The **Route 28 Corridor Conceptual Mini-TIP**, **EXHIBIT 46**, was created to assist the MPO/RPOs with future planning and programming of the conceptual improvements. The Mini-TIP is a Transportation Improvement Program (TIP) type matrix that includes the improvement concept description, priority level, implementation timeframe, estimated costs for Design Preliminary Engineering (PE) and Final Design (FD) and Construction (CONS) for each concept, relative Right-of-Way and Utility involvement, and potential funding sources. The improvement concepts included on the Mini-TIP were identified based on the concern area locations that were determined from an analysis of the key study findings and direction and input from the Project Steering Committee. The Mini-TIP is intended for use as a planning level tool providing improvement concepts to consider as future transportation improvements within the 40-mile Route 28 study corridor.

Conceptual cost estimates in the Mini-TIP are provided for each type of improvement identified. In order to help keep the Mini-TIP to a single page, concept costs are displayed in terms of thousands. The approach to the development of the cost estimates for each improvement type is further detailed as follows:

Priority and Other Improvement Concepts

- Based upon construction costs from a similar PennDOT two-lane roadway, construction costs per linear foot were applied to anticipated concept lengths measured along the Route 28 Roadway.
- Concepts with minimal reconstruction with primarily improvements to signing or stripping were estimated using PennDOT unit costs.
- Preliminary and final design were estimated at 20% of the conceptual construction cost.
- Right-of-way acquisition and utility relocation costs were qualitatively assessed in terms of low (less than $10,000), medium (less than $100,000), and high (greater than $100,000).

Systematic Improvement Concepts

- Recent PennDOT pay items and associated costs were used to develop construction estimates.
- Utilized a 30% to 40% construction contingency for planning purposes.
- Based upon the application of a standard template to fit existing site conditions, final design was estimated at 10% of the conceptual construction cost.
- Right-of-way acquisition and utility relocation costs were expected to be minimal or avoided entirely.

The intended use of the Conceptual Mini-TIP is for SPC, Northwest Commission, and North Central RPO/ MPO, Armstrong, Clarion, and Jefferson Counites as well as PennDOT to have a working document to consider transportation concerns and improvement opportunities along the corridor. These concepts would likely need to be further detailed as part of Linking Planning and NEPA process to be programed on the MPO/RPO's actual TIP. This will allow each of the agencies to approach corridor improvements in a consistent manner to be able to maximize the investment and resulting upgrades to the Route 28 corridor.

Exhibit 46 - Conceptual Route 28 Mini-TIP

Concept ID - MPO/ RPO	Concept Description	Priority (L, M, H)/ Implement (S, I, L)*	Estimated Priority Costs**** ($1,000)				Systematic Improvement** ($1,000)					Other Concept ($1,000)				Potential Funding Types*****
			PE/FD	CONS	UTIL***	ROW***	IST	CST	HFST	FD	CONS	PE/FD	CONS	UTIL***	ROW***	
1 - SPC	RT 28 & SR 0085 (Clearfield Pike)	M/S					X			0.4	4					STP, HSIP, NHPP
2 - SPC	RT 28 near Poverty Hill Road	M/S					X			0.4	4					STP, HSIP, NHPP
3 - SPC	RT 28 & Jaraly Rd/Tickle Lane	M/S					X			0.4	4					STP, HSIP, NHPP
4 - SPC	RT 28 near SR 1028 (Anderson Creek Road)	M/S					X			0.4	4					STP, HSIP, NHPP
5 - SPC	RT 28 North of Iron Bridge Rd to Lower Hayes Rd	H/S						X	X	10	104					STP, HSIP, NHPP
6 - SPC	RT 28 & Sloan Hill Road & Mechling Rd	H/I	140	700	H	H		X	X	10	104					STP, HSIP, NHPP
7 - SPC	RT 28 & SR 1030 (Ridge Road)	L/S						X	X	10	104					STP, HSIP, NHPP
8 - SPC	RT 28 & SR 1035 (Oscar Road)	H/L	1,820	9,100	H	H		X	X	10	104					STP, HSIP, STIM, NHPP
9 - SPC	RT 28/1018 near Hogback Hill/Orchardville	H/S						X	X	10	104					STP, HSIP, NHPP
5 to 9 - SPC	Route 28 from Sloan Hill Road to SR 1018 near Hogback Hill/Orchardville	H/L	12,060	60,300	H	H										PIB, STP, STIM, BUILD, INFRA, NHPP
10 - SPC	RT 28 between SR 1027 & Kuhns Rd	M/S					X	X		0.8	8					STP, HSIP, NHPP
11 - SPC	RT 28 & SR 1016 (Calhoun School Rd)	H/I	35	350	M	M	X			0.4	4					STP, HSIP, STIM, NHPP
12 - SPC	RT 28 near T 602 (Tipple Rd)	M/S					X			0.4	4					STP, HSIP, NHPP
13 - SPC	RT 28 north of Wadding Road	M/S					X			0.4	4					STP, HSIP, NHPP
14 - SPC	SR 1004 (Kohlersburg/Madison Rd)	H/I	140	700	M	M										STP, HSIP, STIM, NHPP
15 - SPC	RT 28 & SR 1025 (Putneyville Road)	M/S					X			0.4	4					STP, HSIP, NHPP
16 - SPC	RT 28 north of Golf Link Road	M/S						X		0.4	4					STP, HSIP, NHPP
17 - SPC	South Bethlehem (15mph Curve)	H/S	3	25	M	M										STP, ARLE, NHPP
20 - NW	RT 28 & RT 66 (Broad at Wood St)	M/S										1	10	L	L	STP, ARLE, NHPP
24 - NW	RT 28 at Redbank Valley High School Crossing	M/I										3	30	M	M	TASA, C2P2, PMTF, ARLE
18 to 24 - NW	RT 28 at SR 839 to Redbank Valley High School	L/I										63	125	L	L	TASA, C2P2, PMTF, ARLE
25 - NW	RT 28 at Redbank Valley Trail Crossing	H/L	280	1400	M	M						3	30	M	M	TASA, C2P2, PMTF, ARLE, ACT13
26 - NW	RT 28 & TR 921 (45mph curve)	M/I					X	X		0.8	8					STP, HSIP, NHPP
27 - NW	RT 28 & Oak Ridge Road	L/S					X			0.4	4					STP, HSIP, NHPP
28 - NW	RT 28 through Hawthorn Area	M/S										1	8	L	L	STP, NHPP
29 - NW	RT 28 & SR 0536 (Mayport Road)	H/L	320	1600	M	M	X			0.4	4					STP, HSIP, NHPP
30 - NW	RT 28 & Jefferson County line maint/bus turnaround	M/I						X		0.4	4	35	350	M	M	STP, HSIP, PMTF, NHPP
31 - NC	RT 28 & Toadtown Road/Anderson Rd/Creek Street	M/S					X			0.4	4					STP, HSIP, NHPP
32 - NC	RT 28 & Carrier Street	L/S					X			0.4	4					STP, HSIP, NHPP
33 - NC	RT 28 & Moore Road	H/L	920	4,600	H	H	X	X	X	11	108					PIB, STP, HSIP, STIM, NHPP
34 - NC	RT 28 & SR 3003 (Weaver Rd) & SR 3035 (Mendenhall Rd)	M/S					X	X	X	11	108					STP, HSIP, NHPP
35 - NC	RT 28 & Snyder/Seldom Seen/Coder/T396	H/L	700	3,500	H	H	X	X	X	11	108					PIB, STP, HSIP, STIM, NHPP
33 to 35 - NC	RT 28 Geometric Improvements	H/L	10,400	52,800	H	H										PIB, STP, STIM, BUILD, INFRA, NHPP
36 - NC	RT 28 & South Main Street	M/S					X			0.4	4					STP, HSIP, NHPP
37 - NC	RT 28 & US 322	M/I										550	1100	H	H	STP, ARLE, NHPP
38 - NC	RT 28 & I-80 Interchange	L/I										30	300	M	M	STP, DMTF, NHPP
39 - ALL	RT 28 Corridor Wide CL, EL, and/or Shlr Rumble Strips	H/S								50	500					STP, HSIP, NHPP
40 -ALL	RT 28 Guide Rail Improvements	H/I										120	1200	M	M	STP, NHPP
									Totals	139.8	1412	806	3153			

* Priority consists of Low, Medium, and High based upon number of Concern Area Matrix Groups Noted as 0-2-Low (L); 3-5 Medium (M); and > 5 High (H). Implement consists of Short Term (< 1-yr), Intermediate Term (1 to 3-yrs), and Long Term (> 3-yrs) timeframes to complete project. Includes pre-construction phases through construction.

** Systematic Improvements assumed to have no or minimal Utility or Right-of-Way involvement. *** Low (L) < $10k, Medium (M) < $100k, High (H) > $100k ****Environmental impacts were not assessed as part of the cost estimates

*****Potential funding sources include the Surface Transportation Program (STP), Highway Safety Improvement Program (HSIP), Pennsylvania Infrastructure Bank (PIB), National Highway Performance Program (NHPP), ACT 13 (Greenways, Trails and Recreation Program), PennDOT Transportation Alternatives Set-Aside (TASA), DECD Multimodal Transportation Fund (DMTF), Automated Red Light Enforcement Program (ARLE), PennDOT Multimodal Transportation Fund (PMTF), DCNR Community Conservation Partnership Program (C2P2), USDOT Infrastructure for Rebuilding America (INFRA) and Better Utilizing Investments to Leverage Development (BUILD) Grants and Potential Future Transportation Stimulus (STIM) funding.

Concept ID - MPO/ RPO	Concept Description	Priority (L, M, H)/ Implement (S, I, L)*	Estimated Priority Costs**** ($1,000)				Systematic Improvement** ($1,000)					Other Concept ($1,000)				Potential Funding Types*****
			PE/FD	CONS	UTIL***	ROW***	IST	CST	HFST	FD	CONS	PE/FD	CONS	UTIL***	ROW***	
SOUTHWESTERN PENNSYLVANIA COMMISSION - ARMSTRONG COUNTY																
1 - SPC	RT 28 & SR 0085 (Clearfield Pike)	M/S					X			0.4	4					STP, HSIP, NHPP
2 - SPC	RT 28 near Poverty Hill Road	M/S					X			0.4	4					STP, HSIP, NHPP
3 - SPC	RT 28 & Jaraly Rd/Tickle Lane	M/S					X			0.4	4					STP, HSIP, NHPP
4 - SPC	RT 28 near SR 1028 (Anderson Creek Road)	M/S					X			0.4	4					STP, HSIP, NHPP
5 - SPC	RT 28 North of Iron Bridge Rd to Lower Hayes Rd	H/S						X	X	10	104					STP, HSIP, NHPP
6 - SPC	RT 28 & Sloan Hill Road & Mechling Rd	H/I	140	700	H	H		X	X	10	104					STP, HSIP, NHPP
7 - SPC	RT 28 & SR 1030 (Ridge Road)	L/S						X	X	10	104					STP, HSIP, NHPP
8 - SPC	RT 28 & SR 1035 (Oscar Road)	H/L	1,820	9,100	H	H		X	X	10	104					STP, HSIP, STIM, NHPP
9 - SPC	RT 28/1018 near Hogback Hill/Orchardville	H/S						X	X	10	104					STP, HSIP, NHPP
5 to 9 - SPC	Route 28 from Sloan Hill Road to SR 1018 near Hogback Hill/Orchardville	H/L	12,060	60,300	H	H										PIB, STP, STIM, BUILD, INFRA, NHPP
10 - SPC	RT 28 between SR 1027 & Kuhns Rd	M/S					X	X		0.8	8					STP, HSIP, NHPP
11 - SPC	RT 28 & SR 1016 (Calhoun School Rd)	H/I	35	350	M	M	X			0.4	4					STP, HSIP, STIM, NHPP
12 - SPC	RT 28 near T 602 (Tipple Rd)	M/S					X			0.4	4					STP, HSIP, NHPP
13 - SPC	RT 28 north of Wadding Road	M/S					X			0.4	4					STP, HSIP, NHPP
14 - SPC	SR 1004 (Kohlersburg/Madison Rd)	H/I	140	700	M	M										STP, HSIP, STIM, NHPP
15 - SPC	RT 28 & SR 1025 (Putneyville Road)	M/S					X			0.4	4					STP, HSIP, NHPP
16 - SPC	RT 28 north of Golf Link Road	M/S						X		0.4	4					STP, HSIP, NHPP
17 - SPC	South Bethlehem (15mph Curve)	H/S	3	25	M	M										STP, ARLE, NHPP
39 - ALL	RT 28 Corridor Wide CL, EL, and/or Shlr Rumble Strips	H/S								50	500					STP, HSIP, NHPP
40 -ALL	RT 28 Guide Rail Improvements	H/I										120	1200	M	M	STP, NHPP
									Totals	104	1060	120	1200			

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** Systematic Improvements assumed to have no or minimal Utility or Right-of-Way involvement. *** Low (L) < $10k, Medium (M) < $100k, High (H) > $100k ****Environmental impacts were not assessed as part of the cost estimates

*****Potential funding sources include the Surface Transportation Program (STP), Highway Safety Improvement Program (HSIP), Pennsylvania Infrastructure Bank (PIB), National Highway Performance Program (NHPP), ACT 13 (Greenways, Trails and Recreation Program), PennDOT Transportation Alternatives Set-Aside (TASA), DECD Multimodal Transportation Fund (DMTF), Automated Red Light Enforcement Program (ARLE), PennDOT Multimodal Transportation Fund (PMTF), DCNR Community Conservation Partnership Program (C2P2), USDOT Infrastructure for Rebuilding America (INFRA) and Better Utilizing Investments to Leverage Development (BUILD) Grants and Potential Future Transportation Stimulus (STIM) funding.

Conceptual Route 28 Mini-TIP

Concept ID - MPO/ RPO	Concept Description	Priority (L, M, H)/ Implement (S, I, L)*	Estimated Priority Costs**** ($1,000)				Systematic Improvement** ($1,000)					Other Concept ($1,000)				Potential Funding Types*****
			PE/FD	CONS	UTIL***	ROW***	IST	CST	HFST	FD	CONS	PE/FD	CONS	UTIL***	ROW***	
NORTHWEST PENNSYLVANIA COMMISSION - CLARION COUNTY																
20 - NW	RT 28 & RT 66 (Broad at Wood St)	M/S										1	10	L	L	STP, ARLE, NHPP
24 - NW	RT 28 at Redbank Valley High School Crossing	M/I										3	30	M	M	TASA, C2P2, PMTF, ARLE
18 to 24 - NW	RT 28 at SR 839 to Redbank Valley High School	L/I										63	125	L	L	TASA, C2P2, PMTF, ARLE, NHPP
25 - NW	RT 28 at Redbank Valley Trail Crossing	H/L	280	1400	M	M						3	30	M	M	TASA, C2P2, PMTF, ARLE, ACT13
26 - NW	RT 28 & TR 921 (45mph curve)	M/I					X	X		0.8	8					STP, HSIP, NHPP
27 - NW	RT 28 & Oak Ridge Road	L/S					X			0.4	4					STP, HSIP, NHPP
28 - NW	RT 28 through Hawthorn Area	M/S										1	8	L	L	STP, NHPP
29 - NW	RT 28 & SR 0536 (Mayport Road)	H/L	320	1600	M	M	X			0.4	4					STP, HSIP, NHPP
30 - NW	RT 28 & Jefferson County line maint/bus turnaround	M/I						X		0.4	4	35	350	M	M	STP, HSIP, PMTF, NHPP
39 - ALL	RT 28 Corridor Wide CL, EL, and/or Shlr Rumble Strips	H/S								50	500					STP, HSIP, NHPP
40 -ALL	RT 28 Guide Rail Improvements	H/I										120	1200	M	M	STP, NHPP
									Totals	52	520	226	1753			

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** Systematic Improvements assumed to have no or minimal Utility or Right-of-Way involvement. *** Low (L) < $10k, Medium (M) < $100k, High (H) > $100k ****Environmental impacts were not assessed as part of the cost estimates

*****Potential funding sources include the Surface Transportation Program (STP), Highway Safety Improvement Program (HSIP), Pennsylvania Infrastructure Bank (PIB), National Highway Performance Program (NHPP), ACT 13 (Greenways, Trails and Recreation Program), PennDOT Transportation Alternatives Set-Aside (TASA), DECD Multimodal Transportation Fund (DMTF), Automated Red Light Enforcement Program (ARLE), PennDOT Multimodal Transportation Fund (PMTF), DCNR Community Conservation Partnership Program (C2P2), USDOT Infrastructure for Rebuilding America (INFRA) and Better Utilizing Investments to Leverage Development (BUILD) Grants and Potential Future Transportation Stimulus (STIM) funding.

Concept ID - MPO/ RPO	Concept Description	Priority (L, M, H)/ Implement (S, I, L)*	Estimated Priority Costs**** ($1,000)				Systematic Improvement** ($1,000)					Other Concept ($1,000)				Potential Funding Types*****
			PE/FD	CONS	UTIL***	ROW***	IST	CST	HFST	FD	CONS	PE/FD	CONS	UTIL***	ROW***	
NORTH CENTRAL PENNSYLVANIA COMMISSION - JEFFERSON COUNTY																
31 - NC	RT 28 & Toadtown Road/Anderson Rd/Creek Street	M/S					X			0.4	4					STP, HSIP, NHPP
32 - NC	RT 28 & Carrier Street	L/S					X			0.4	4					STP, HSIP, NHPP
33 - NC	RT 28 & Moore Road	H/L	920	4,600	H	H	X	X	X	11	108					PIB, STP, HSIP, STIM, NHPP
34 - NC	RT 28 & SR 3003 (Weaver Rd) & SR 3035 (Mendenhall Rd)	M/S					X	X	X	11	108					STP, HSIP, NHPP
35 - NC	RT 28 & Snyder/Seldom Seen/Coder/T396	H/L	700	3,500	H	H	X	X	X	11	108					PIB, STP, HSIP, STIM, NHPP
33 to 35 - NC	RT 28 Geometric Improvements	H/L	10,400	52,800	H	H										PIB, STP, STIM, BUILD, INFRA, NHPP
36 - NC	RT 28 & South Main Street	M/S					X			0.4	4					STP, HSIP, NHPP
37 - NC	RT 28 & US 322	M/I										550	1100	H	H	STP, ARLE, NHPP
38 - NC	RT 28 & I-80 Interchange	L/I										30	300	M	M	STP, DMTF, NHPP
39 - ALL	RT 28 Corridor Wide CL, EL, and/or Shlr Rumble Strips	H/S								50	500					STP, HSIP, NHPP
40 -ALL	RT 28 Guide Rail Improvements	H/I										120	1200	M	M	STP, NHPP
									Totals	83.8	832	700	2600			

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** Systematic Improvements assumed to have no or minimal Utility or Right-of-Way involvement. *** Low (L) < $10k, Medium (M) < $100k, High (H) > $100k ****Environmental impacts were not assessed as part of the cost estimates

*****Potential funding sources include the Surface Transportation Program (STP), Highway Safety Improvement Program (HSIP), Pennsylvania Infrastructure Bank (PIB), National Highway Performance Program (NHPP), ACT 13 (Greenways, Trails and Recreation Program), PennDOT Transportation Alternatives Set-Aside (TASA), DECD Multimodal Transportation Fund (DMTF), Automated Red Light Enforcement Program (ARLE), PennDOT Multimodal Transportation Fund (PMTF), DCNR Community Conservation Partnership Program (C2P2), USDOT Infrastructure for Rebuilding America (INFRA) and Better Utilizing Investments to Leverage Development (BUILD) Grants and Potential Future Transportation Stimulus (STIM) funding.