

Date: _____, 2019

To: Beth Cannestra, PE
Director, Bureau of Project Development
Attn: David Stertz, PE, Design Standards and Oversight Chief

From: Michael Hoelker, PE
Project Development Chief
Southwest Region

| | | |
|-----------------|------------------------------------------------------------------|-------------------------|
| Subject: | NEW CONSTRUCTION, RECONSTRUCTION AND REHABILITATION DESIGN STUDY | |
| REPORT | | |
| | Project I.D. 5155-04-05 | Project I.D. 5155-00-09 |
| | Oregon – Evansville | Madison – Evansville |
| | STH 138 – STH 92 | STH 92 Intersection |
| | USH 14 | USH 14 |
| | Dane County | Dane County |

Having considered the economic and social effects of this project, its impact on the environment, and its consistency with the goals of community planning, we request your approval of the attached design study report.

| | |
|----------------------------------|-------|
| _____ | _____ |
| Region Project Development Chief | Date |

Concur:

| | |
|--------------------------------------|-------|
| _____ | _____ |
| Bureau of Project Development | Date |
| Design Standards and Oversight Chief | |

NEW CONSTRUCTION, RECONSTRUCTION AND REHABILITATION DESIGN STUDY REPORT

Project I.D. 5155-04-05
Oregon – Evansville
STH 138 – STH 92
USH 14
Dane County

Project I.D. 5155-00-09
Madison – Evansville
STH 92 Intersection
USH 14
Dane County

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July 2019

MSA Project #00093386

NEW CONSTRUCTION, RECONSTRUCTION AND REHABILITATION DESIGN STUDY REPORT

1.0 Project Description and Need

1.1 Federal Oversight Project (Yes or No): No

1.2 Project Length and Termini

Project Length:

USH 14: 4.81 miles (4.51 miles Project I.D. 5155-04-05; 0.30 miles Project I.D. 5155-00-09)

STH 92: 0.12 miles (Project I.D. 5155-00-09)

Termini/Limits:

The project begins on USH 14 approximately 1,450 feet south of the STH 138 underpass (at the beginning of the STH 138 ramp gores) and extends to 750 feet south of the STH 92 intersection.

The length of the project is divided into two Project I.D.s. Project I.D. 5155-04-05 starts at the beginning of the project and ends 830 feet north of STH 92 at the end of the tapers required for the construction of a roundabout at the USH 14/STH 92 intersection. From this location, Project I.D. 5155-00-09 begins for the construction of the roundabout and terminates at the end of the project, 750 feet south of the STH 92 intersection.

On STH 92, the project begins 690 feet west of USH 14 and ends at the intersection with USH 14 (Project I.D. 5155-00-09).

PS&E date is February 1, 2021 with a letting of July/August 2021 for surcharging construction scheduled for fall of 2021 and completion of the remaining construction in the spring/summer of 2022.

See Attachment 1 – Project Location Map and Project Overview

1.3 Existing Roadway Information

| Roadway | Functional Class (Principal or Minor Arterial, Collector or Local) | Surrounding Development Type? (Rural, Urban or Transitional) | Corridors 2030 or Backbone (No or State Which) | NHS Route (Yes or No) | Long Truck Route (No or State Federal or State) | Access Control Tier | On Ped Trans. Plan (Yes or No) | On Bike Trans. Plan (Yes or No) |
|---------|-----------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------|-----------------------|-------------------------------------------------|---------------------|--------------------------------|---------------------------------|
| USH 14 | Principal Arterial | Rural | Corridors 2030 Connector | Yes | State | Tier 2A | No | Yes |
| STH 92 | Minor Arterial | Rural | No | No | No | Tier 3 | No | No |

Comments:

1.4 Need for Project

The need for Project ID 5155-04-05 is to extend the serviceable life of the existing USH 14 roadway and to improve the safety of the corridor. The current USH 14 pavement structure is experiencing longitudinal and transverse cracking throughout the project limits. The corridor has also shown a history of crashes. Poor sight lines (blocked by vegetation and trees) and substandard horizontal/vertical curves contribute to some of the crashes along the corridor.

The need for Project ID 5155-00-09 is to improve the safety of the STH 92 intersection. The number and severity of crashes at the STH 92 intersection prompted the intersection to be placed on WisDOT's Locations of Interest Report. In 2018, the State secured Highway Safety Improvement Program (HSIP) funding to improve the safety of the intersection.

2.0 Existing Facility Information

2.1 Posted Speed

| Roadway or Roadway Segment | Posted Speed | Advisory Speed |
|----------------------------|--------------|----------------|
| USH 14 | 55 mph | 45 mph, 50 mph |
| STH 92 | 55 mph | None |
| Biglow Road | 45 mph | None |

2.2 Geometrics

2.2.1 Horizontal Alignment Features Outside of Design Criteria

| Horizontal Feature* (Curve, P.I. Deflection, etc.) | Location (Stationing) | Size* (Radius, P.I. Deflection, etc.) | Super-Elevation* (S.E.) | Speed Rating |
|----------------------------------------------------|-----------------------|---------------------------------------|-------------------------|--------------|
| Curve (H-2) | 132+65 | 970 | 5.3% - 7.2% | 50 mph |
| Curve (H-8) | 195+03 | 1958 | 4.0% - 6.6% | 50 mph |
| Curve (H-9) | 205+31 | 1160 | 5.0% - 7.2% | 55 mph |
| Curve (H-11) | 231+73 | 1210 | 5.5% - 6.5% | 55 mph |
| Curve (H-15) | 322+89 | 960 | 5.3% - 7.7% | 50 mph |
| Curve (H-16) | 331+84 | 1165 | 5.5% - 6.5% | 55 mph |
| Curve (H-17) | 351+19 | 1325 | 3.9% - 4.6% | 40 mph |

* Controlling Criteria for Design Speed \geq 50 mph

Comments:

Based on 60 mph design speed, $e_{max} = 6\%$

2.2.2 Vertical Alignment Features/SSD* Outside of Design Criteria

| Vertical Feature (Curve, Vertical Grade Deflection, etc.) | Location (Stationing) | Sag or Crest | % Grades* | K Value/ Grade Deflection | Speed Rating | SSD** Met *(Yes or No) Length | DSD Met (Yes or No) Length |
|-----------------------------------------------------------|-----------------------|--------------|-----------------|---------------------------|--------------|-------------------------------|----------------------------|
| Curve (V-3) | 138+21 | Sag | 0.7% to 3.0% | 85 | 45 mph | N/<570 | N/<990 |
| Curve (V-4) | 141+28 | Crest | 3.0 % to -0.70% | 95 | 50 mph | N/<570 | N/<990 |
| Curve (V-5) | 156+58 | Sag | -0.1% to 3.0% | 112 | 50 mph | N/<570 | N/<990 |
| Curve (V-11) | 209+12 | Sag | -2.7% to -0.7 % | 100 | 50 mph | N/<570 | N/<990 |
| Curve (V-12) | 229+80 | Sag | -0.2% to 1.1% | 120 | 55 mph | N/<570 | N/<990 |
| Curve (V-13) | 246+09 | Crest | 1.5% to -2.1% | 55 | 40 mph | N/<570 | N/<990 |
| Curve (V-14) | 249+72 | Sag | -2.12% to 0.1% | 91 | 45 mph | N/<570 | N/<990 |

| | | | | | | | |
|--------------|--------|-------|----------------|-----|--------|--------|--------|
| Curve (V-15) | 258+45 | Sag | 0.1% to 4.1% | 123 | 55 mph | N/<570 | N/<990 |
| Curve (V-16) | 263+20 | Crest | 4.1% to 2.6% | 128 | 55 mph | N/<570 | N/<990 |
| Curve (V-17) | 268+39 | Crest | 2.6% to -1.0% | 70 | 45 mph | N/<570 | N/<990 |
| Curve (V-18) | 272+91 | Sag | -1.0% to 1.7% | 118 | 55 mph | N/<570 | N/<990 |
| Curve (V-19) | 277+50 | Crest | 1.7% to -5.1% | 44 | 40 mph | N/<570 | N/<990 |
| Curve (V-20) | 282+59 | Sag | -5.1% to -0.4% | 120 | 55 mph | N/<570 | N/<990 |
| Curve (V-22) | 297+97 | Crest | 1.6% to 0.3% | 113 | 50 mph | N/<570 | N/<990 |

* Controlling Criteria for Design Speed \geq 50 mph, **SSD = Stopping Sight Distance

Comments:

Speed Rating based on K value for Category 1, Minimum Criteria. SSD and DSD values based on 60 mph design speed.

2.2.3 Grades* and Vertical Clearance* Outside of Design Criteria

| Location (Stationing, Overpass Structures, etc.) | % Grade* | Vertical Clearance* |
|--------------------------------------------------|----------|---------------------|
| Sta. 193+00 to Sta. 198+50 | -3.3% | N/A |
| Sta. 260+95 to Sta. 262+20 | 4.1% | N/A |
| Sta. 279+00 to Sta. 279+74 | -5.1% | N/A |

* Controlling Criteria for Design Speed \geq 50 mph

Comments:

Grades identified based on criteria for level terrain, 60 mph design speed (3% maximum grade allowed).

2.3 Side-Roads/ Intersections/ Interchanges Information/Geometrics

2.3.1 Side-Roads Design Information

| Roadway | Functional Class | Posted Speed (MPH) | Existing Traffic*** (AADT) | Approach Grades | Pedestrian Facilities (Yes or No) | Bicycle Facilities (Yes or No) |
|-------------------|-----------------------|-----------------------|----------------------------|-------------------------|-----------------------------------|--------------------------------|
| Hill Road | Rural Local Road | 45 | <100 | -2.5% to 2.5% | No | No |
| Oak Hill Road | Rural Local Road | 45 | >100 | 1% to 5% | No | No |
| CTH A | Rural Minor Collector | 45 | 750 (2016) | 1% to 5% / -2% to -4.5% | No | No |
| Waterman Road | Rural Local Road | Not Posted (Dead End) | <100 | -2.5% | No | No |
| Rome Corners Road | Rural Local Road | 45 | >100 | 0.5% | No | No |

| | | | | | | |
|----------------|----------------------|----|-------------|------|----|----|
| Old Stage Road | Rural Local Road | 45 | >100 | 1% | No | No |
| W Rutland Road | Rural Local Road | 45 | >100 | 0.5% | No | No |
| STH 92 | Rural Minor Arterial | 55 | 2150 (2016) | 0.8% | No | No |
| Biglow Road | Rural Local Road | 45 | >100 | -1% | No | No |

*** If Existing Traffic volumes are not available, then state at a minimum whether AADT is assumed to be <100 or >100.

Comments:

2.3.2 Intersections Geometrics Outside of Design Criteria

| Intersecting Roadway | Intersect. Type | Intersect. Angle | Traffic Control | SSD** Met* (Y/N)/ Length | ISD** Met (Y/N)/ Length | DSD** Met (Y/N)/ Length | Vision Triangle (Y/N) | Corner Clearance to Driveways Present (Y/N) |
|----------------------|-----------------|------------------|------------------|--------------------------|-------------------------|-------------------------|-----------------------|---------------------------------------------|
| Hill Road | Rural C | 90 | Side Street Stop | Y/>570' | Y/>840' | N/<990' | Y | N |
| Oak Hill Road | Rural B2 | 78 | Side Street Stop | Y/>570' | Y/>840' | N/<990' | N | N |
| CTH A | Rural B1 | 90 | Side Street Stop | Y/>570' | N/<960' | N/<990' | N | Y |
| Waterman Road | Rural C | 83 | Side Street Stop | Y/>570' | N/840' (1) | N/<990' | N | Y |
| Rome Corners Road | Rural B2 | 90 | Side Street Stop | Y/>570' | Y/>840' | N/<990' | Y | Y |

* Controlling Criteria for Design Speed \geq 50 mph

** SSD=Stopping Sight Distance, ISD=Intersection Sight Distance, and DSD=Decision Sight Distance (See FDM 11-25-1).

Comments:

SSD & DSD in this table are measured on the mainline (60 mph design speed) using minimum criteria to a 24-inch object. ISD is measured from the side street based on Case B1, minimum values for an SU vehicle.

(1) ISD blocked by trees

Has intersection control evaluation (ICE) worksheet been coordinated (Yes or No)? Yes

A Phase 1 ICE Memorandum was completed for the USH 14 and STH 92 intersection. The Memorandum considered the existing traffic control (two-way stop) and a roundabout. The determination of the Phase 1 ICE was that the existing traffic control does not address the type of crashes that are occurring at the intersection and that the only feasible alternative to address safety is to construct a roundabout. An ICE was not conducted for the other intersections within the project limits.

2.3.3 Interchange Geometrics Outside of Design Criteria

None.

2.4 Cross Section Geometrics Outside of Design Criteria

| | USH 14 |
|----------------------------------------------------|-------------------------------------------|
| Shoulder width* (Total and Paved or Curb & Gutter) | Varies 6-ft to 10-ft (3-ft to 5-ft paved) |
| Super-elevation* | Varies by curve, 3% to 7.7% |
| Clear zone | 18-ft |
| Side-slopes and ditch sections | Varies 6:1 to 2:1 |

* Controlling Criteria for Design Speed \geq 50 mph

See Attachment 2 – Existing Typical Sections

2.5 Pavement Structure/Condition

| Roadway | Pavement Types and Thicknesses | Physical Description |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USH 14 | 7.5-13 inches asphaltic pavement over 12 inches aggregate base over 6.5-9 inches concrete pavement 7.5-13 inches asphaltic pavement over 6.5-9 inches concrete pavement 5.5-7.5 inches asphalt pavement over 12 inches aggregate base | Moderate levels of transverse cracking. Moderate to high levels of cracking along the longitudinal centerline joint and shoulder joints. Some rutting is evident. |
| STH 92 | 4 inches asphaltic pavement over 10 inches aggregate base over 12 inches breaker run stone | Low levels of fatigue cracking and transverse cracking. |
| Biglow Road | Asphalt pavement, structure unknown | Severe block and fatigue cracking. Cracks are beginning to spall and deteriorate. Limited patching. |

Comments:

2.6 Right-of-Way

2.6.1 Encroachments

| Location (Station and Distance Left or Right) | Encroachment Type |
|-----------------------------------------------|-----------------------|
| STA 179+07, 32' RT | Private Sign |
| STA 181+33, 29' RT | Stone Wall |
| STA 181+51, 27' RT | Private Sign |
| STA 181+92 - STA 182+40, 25' RT | Metal Art |
| STA 185+01, 31' RT | Landscaping Rock |
| STA 247+42, 31' RT | Private Sign and Post |
| STA 262+13 - STA 262+94, 27' LT | Concrete Posts |
| STA 327+97, 32' LT | Private Sign |

2.6.2 Unique Right-of-Way Issues

| |
|-------|
| None. |
|-------|

2.7 Structures

| Existing Structure I.D. # | Feature Crossed | Structure Type | Sufficiency Rating | Clear Roadway Width* | Railing Type | Structurally Deficient or Functionally Obsolete* | Inventory Load Rating* |
|---------------------------|-----------------|------------------------------------|--------------------|----------------------|--------------|--------------------------------------------------|------------------------|
| C-13-152 | Creek | 12'-3"x7'-3" Aluminum Arch Culvert | N/A | 34' | Guard Rail | N/A | HS20 |
| C-13-3009 | Cattle Pass | 60"x42" Concrete Cattle Pass | N/A | 30' | None | N/A | HS10 |

* Controlling Criteria for Design Speed \geq 50 mph

Comments:

Additional concrete box culvert crossings are located within the project limits. The culvert boxes are generally 2'x2', 2'x4', 2'x5', and 3'x4'.

2.8 Utilities

| Utility Name | Type of Utility | General Location | Underground /Overhead/ Both |
|----------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| ATC Management, Inc. | Electricity/Transmission | Facilities located along west side of CTH MM and north side of STH 138. | Overhead |
| Alliant Energy | Electricity | Facilities located along the east side of USH 14 from Sta. 116+00 to 120+60, crossing USH 14 to the west side at Sta. 120+60 and continuing along the west side to Sta. 138+19. Facilities cross USH 14 at Sta. 138+19 to the east side and continue along the east side of USH 14 until the CTH A intersection. Facilities are located along the north side of CTH A, crossing USH 14 at Sta. 196+00 and crossing CTH A 100-ft west of the | Both (Primarily overhead with short underground runs connecting to private properties) |

| | | | |
|-----------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| | | <p>intersection.</p> <p>Facilities continue on the west side of USH 14 from the CTH A intersection to the southern limits of the project, Sta. 368+00, crossing STH 92 150-ft west of the intersection.</p> <p>Facilities are located along the north side of STH 92 and the north side of Biglow Rd, crossing USH 14 at Sta. 359+25.</p> <p>Overhead lateral crossings of USH 14 are located throughout the project to service private properties and side roads.</p> | |
| Alliant Energy | Gas | <p>Facilities located along the west side of USH 14 from STH 138 to Oak Hill Road, crossing USH 14 at Oak Hill Road and continuing along the east side of USH 14 to CTH A. Facilities located along the south side of CTH A, crossing USH 14 at Sta. 196+77.</p> | Underground |
| Charter Communications | Communication | Facilities located along north side of STH 138. | Underground |
| Frontier Communications of WI LLC | Telephone | <p><u>Underground</u></p> <p>Facilities located along west side of USH 14 from Sta. 114+00 to Rome Corners Rd (Sta. 251+00) and Sta. 263+60 to Sta. 272+50.</p> <p>Facilities located along the east side of USH 14 from Old Stage Rd (Sta. 259+00) to Sta. 345+50, crossing USH 14 to the west at Sta. 345+50 and continuing along the west side of USH 14 until the STH 92 intersection at Sta. 358+50.</p> <p>Facilities are located along the north side of CTH A, crossing USH 14 at Sta. 195+00 and are located on the south side of CTH A along the west leg of the intersection.</p> <p>Facilities are located along the north side of STH 92, crossing USH 14 to the north side of Biglow Rd at Sta. 358+50. Facilities cross Biglow Rd 260-ft east of the USH 14 intersection, and run along the south side of Biglow Rd and the east side of USH 14 to the southern limits of the project, Sta. 368+00.</p> <p>Underground lateral crossings of USH 14 are located throughout the project to service private properties and side roads.</p> <p><u>Overhead</u></p> <p>Facilities located along west side of USH 14 from Rome Corners Rd (Sta. 251+50) to Old Stage Rd (Sta. 258+00), crossing USH 14 at Sta. 258+00.</p> <p>Facilities are located along the north side of STH 92 and the north side of Biglow Rd, crossing USH 14 at Sta. 359+25.</p> | Both (Primarily underground) |

| | | | |
|----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| PaeTec Communications, LLC | Fiber Optic | Facilities located along east side of USH 14 from Oak Hill Rd (Sta. 169+50) to southern limits of the project, Sta. 368+00, crossing CTH A 30-ft east of the intersection and crossing STH 92 40-ft east of the intersection. | Underground |
|----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|

Comments:

2.9 Railroad Crossings

None.

2.10 Special Soils Conditions

Wet silts with low shear strength and no shear strength were identified at the USH 14/STH 92 intersection. Excavation of these poor soils is required for the integrity of the proposed roundabout intersection. A shallower depth of excavation can be performed by separating the operation of excavation/backfill from construction of the pavement structure. Excavation of poor soil 4 to 5 feet below the proposed pavement structure subgrade elevation will occur in the fall prior to roadway construction. Select borrow will be used at that time to fill the excavated area and allow for settlement over the winter. The final pavement structure constructed the following spring will include 12 inches of select crushed material and geogrid to enhance stability.

2.11 Unique Project Features

None.

3.0 Traffic Information

3.1 Traffic Volumes/Conditions

3.1.1 Traffic Forecast Report Attachment

See Attachment 3 – Traffic Forecast Report

3.1.2 Highway Capacity Analysis

| Location (Roadway Segment or Intersection) | Existing Level of Service | Construction Year Level of Service | Construction Year + 10 Level of Service |
|--------------------------------------------|---------------------------|------------------------------------|-----------------------------------------|
| USH 14 | D to E (2018) | D to E (2022) | E (2032) |
| USH 14 and STH 92 Intersection | F (2016) | A (2022, roundabout) | B (2032, roundabout) |

Comments:

Level of Service values for USH 14 were obtained from Meta-Manager data received in 2017. Level of Service values for USH 14 and STH 92 Intersection were based on Wisconsin calibrated HCM capacity methodologies for roundabouts using traffic volumes from the Traffic Forecast Report.

3.2 Crash Analysis

3.2.1 Project Crash Information

| | | | Number and Severity of Crashes | | | |
|---------|-----------------------|---------------------------------|--------------------------------|--------|-----------------|-------------------|
| Roadway | Crash Rate (1) (Year) | Statewide Crash Rate (1) (Year) | Fatal | Injury | Property Damage | Total No. Crashes |
| USH 14 | 123 (2013-2017) | 98.83 (2013-2017) | 5 | 42 | 80 | 127 |

(1) Crash rate based on 100 million vehicles miles traveled (100 MVMT)

Comments:

Crash rate is based on an AADT of 11,410 vehicles (a weighted average from the MetaManager data) and a total corridor length of 5-miles. Statewide crash rate is based on rural 2-lane highways with AADT greater than 7,000 vehicles.

3.2.2 Significant Crash Locations or Patterns

| Location or Pattern | Year | Number and Severity of Crashes | | | | Crash Rate(2) | Possible Factors Contributing to Crashes |
|----------------------------|-------------|--------------------------------|--------|-----------------|-------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| | | Fatal | Injury | Property Damage | Total | | |
| USH 14/CTH A Intersection | 2013 - 2017 | 0 | 8 | 11 | 19 | 0.61 | Substandard intersection sight distance from CTH A west approach. High speeds on USH 14. |
| USH 14/STH 92 Intersection | 2013 - 2017 | 0 | 9 | 8 | 17 | 0.45 | Poor level of service for traffic turning onto USH 14 from STH 92. High speeds on USH 14. Crest curve south of intersection limits visibility. |

(2) Crashes per million entering vehicles (MEV)

Comments:

Entering vehicle ADTs established from counts (16,463 vehicles for CTH A intersection; 15,165 vehicles for STH 92 intersection).

4.0 Proposed Design Criteria

4.1 Design Class

| Roadway or Roadway Segment | Design Class |
|----------------------------|--------------|
| USH 14 | A2 |
| STH 92 | A1 |
| Biglow Road | RT1 |

4.2 Design Speed*

| Roadway or Roadway Segment | Design Speed* | Posted Speed |
|----------------------------|---------------|--------------|
| USH 14 | 60 mph | 55 mph |
| STH 92 | 60 mph | 55 mph |
| Biglow Road | 50 mph | 45 mph |

* Controlling Criteria for all Design Speeds

4.3 S-2/S-3 Design Justifications (DJs)

A Safety Screening Analysis (SSA) was completed for USH 14 from STH 138 to STH 92 to evaluate the relationship between crashes and roadway features and whether or not sub-standard controlling criteria (SS-CC) may be a contributing factor in high crash locations. MetaManager data from 2013 to 2017 was used in the SSA. The attached SSA worksheet (Attachment 4) summarizes the results of the analysis.

A SSA design justification (formerly known as a Programmatic Exception to Standards (PES)) applies to the sub-standard roadway features that did not have an investigation flag identified in MetaManager (Column 15 of the attached worksheet indicates a 'Yes' response). See the attached SSA worksheet for Design Justification of these roadway features.

A Controlling Criteria Design Justification applies to the sub-standard roadway features that did have an investigation flag identified in MetaManager (Column 15 of the attached worksheet indicates a 'No' response). See Section 4.3.1 for Design Justifications of these roadway features.

4.3.1 Controlling Criteria Design Justifications (DJs)

This section contains a summary of the Design Justifications that apply to the sub-standard roadway features with investigation flags identified in MetaManager. See the attached SSA (Attachment 4) for crash flag information at each location. The Design Justification areas are illustrated on the attached existing plan and profile sheets (Attachment 5).

Design Justification #1: Horizontal Curve H-2 and Hill Road Intersection, Sta 130+30 to Sta 135+00

Horizontal Curve H-2 and the Hill Road intersection were flagged in MetaManager as crash spots with above normal crash rates. Seven crashes were reported at the location of Curve H-2 (all of which were run-off-the-road crashes), and ten crashes were reported at the Hill Road intersection. One of the crashes at the Hill Road intersection was of the incapacitating injury type.

Curve H-2 is located immediately north of the Hill Road intersection. Run-off-the-road crashes are prevalent on the curve and at the intersection. Substandard horizontal curve geometry can be attributed to the crashes on the curve. The proximity of Curve H-2 to the Hill Road intersection may contribute to the crashes at the Hill Road intersection.

SS-CC for Curve H-2 and the Hill Road Intersection

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curve H-2 is 50 mph. To reconstruct this curve to meet 60 mph design standards would require the curve to have a radius of 1,330-ft. Reconstruction of this curve to a larger radius would require the purchase of right-of-way and would result in impacts to an agricultural property. Reconstruction of the Hill Road intersection would also be required.
2. Horizontal Radius – Curve H-2 has a radius of 970-ft, which does not meet the 60 mph design speed of USH 14. A reconstruction of this curve to a minimum radius of 1,330-ft is required to meet design standards.
3. Stopping Sight Distance – The Hill Road intersection meets stopping sight distance (SSD) requirements, but does not meet decision sight distance (DSD) requirements.

Cost

Additional estimated costs to reconstruct Curve H-2 and the Hill Road intersection to meet standards:

- Construction (~0.12 miles): \$230,000
- Real Estate (0.38 acres): \$3,800

Total additional estimated cost of reconstruction for Design Justification #1: \$233,800

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes:

- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.
- Install centerline and shoulder rumble strips outside of the intersection area.
- Enhance signing to better alert USH 14 drivers of the upcoming horizontal curve (advisory speed 50 mph) and intersection.

Design Justification #2: Vertical Curves V3 and V-4, Sta 136+75 and Sta 145+00

A KAB crash spot with above normal crash rates was flagged in MetaManager approximately 600 feet south of Vertical Curve V-3 and 300-400 feet south of Vertical Curve V-4. Two crashes were reported at this crash spot, one of which was of the incapacitating injury type. Crashes at this location are run-off-the-road and head-on.

Substandard sag (V-3) and crest (V-4) vertical curve geometry may contribute to crashes south of these curves. The crest curve, located approximately 350-ft south of the Hill Road intersection and Horizontal Curve H-2, may also limit sight of substandard Curve H-2, and may contribute to crashes at Curve H-2 and the Hill Road intersection (which were previously discussed in Design Justification #1).

SS-CC for Curve V-3 and Curve V-4

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curve V-3 is 45 mph and the speed rating for Curve V-4 is 50 mph. To reconstruct these curves to meet 60 mph

design standards would require the K-value of V-3 to increase from 85 to a minimum of 136 and the K-value of V-4 to increase from 95 to a minimum of 151. Reconstruction of these curves to larger K-values would require regrading the roadway. The profile would likely be lowered, which would require regrading of the ditches for drainage and would result in right-of-way impacts.

2. Stopping Sight Distance – Vertical Curves V-3 and V-4 do not meet the required stopping sight distances for the roadway design speed, based on the K-values of the curves. As discussed above regarding design speed, the roadway would need to be regraded to meet the design criteria.

Cost

Additional estimated costs to reconstruct Curve V-3 and Curve V-4 to meet standards:

- Construction (~0.19 miles): \$339,000
- Real Estate (~0.70 acres): \$7,000

Total additional estimated cost of reconstruction for Design Justification #2: \$346,000

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes:

- Widen paved shoulders from 3-ft to 5-ft.
- Install centerline and shoulder rumble strips, which allows for more avoidance maneuvers.
- Clear and grub trees and vegetation within the right-of-way, approximately 200-ft north of the KAB crash spot, to improve sight and reduce roadside hazards.

Design Justification #3: Grade between Vertical Curves V-8 and V-9, Sta 193+00 to Sta 198+50 and CTH A Intersection

The CTH A intersection was flagged in MetaManager as a crash spot with above normal crash rates. Eighteen crashes were reported at the intersection. There were no fatal or incapacitating crashes. The grade of USH 14 through the intersection is 3.3% (between vertical curve V-8 and V-9), which exceeds the maximum allowable grade of 3% based on the criteria for level terrain and a 60 mph design speed. An investigation flag was not identified in MetaManager for this grade; however, the grade may contribute to the crashes at the intersection.

SS-CC for Grade between Vertical Curves V-8 and V-9 and the CTH A Intersection

1. Grade – The grade between vertical curves V-8 and V-9 of 3.3% exceeds the maximum allowable grade of 3%. To meet requirements, this section of roadway would require reconstruction to a lesser grade. Profile changes would require the reconstruction of the CTH A intersection and regrading of the ditches for drainage, which would result in right-of-way impacts.

Cost

Additional estimated costs to reconstruct the grade between vertical curves V-8 and V-9 to meet standards:

- Construction (~0.23 miles): \$407,000
- Real Estate (~0.65 acres): \$6,500

Total additional estimated cost of reconstruction for Design Justification #3: \$413,500

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes at the CTH A intersection:

- Improve intersection sight distance by cutting back slopes and providing better vision in the northwest corner of the CTH A intersection.
- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.

Design Justification #4: Horizontal Curve H-11 and Vertical Curve V-12, Sta 228+50 to Sta 233+50

Horizontal Curve H-11 and Vertical Curve V-12 were flagged in MetaManager as KAB crash spots with above normal crash rates. Two crashes were reported at this location, both of which were run-off-the-road crashes.

One of the crashes was fatal.

Vertical Curve V-12 is a sag curve located on the north end of Horizontal Curve H-11. Substandard horizontal and vertical curve geometry may be attributed to the crashes.

SS-CC for Curve H-11 and Curve V-12

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curve H-11 is 55 mph and the speed rating for Curve V-12 is 55 mph. To reconstruct these curves to meet 60 mph design standards would require Curve H-11 to have a radius of 1,330-ft and Curve V-12 to have a K-value of 136. Reconstruction of these curves to meet the design speed would require the purchase of right-of-way and would result in impacts to a culvert structure.
2. Horizontal Radius – Curve H-11 has a radius of 1,210-ft, which does not meet the 60 mph design speed of USH 14. A reconstruction of this curve to a radius of 1,330-ft is required to meet design standards.
3. Stopping Sight Distance – Vertical Curve V-12 does not meet the required stopping sight distance for the roadway design speed, based on the K-value of the curve. As discussed above regarding design speed, the roadway would need to be reconstructed to meet the design criteria.

Cost

Additional estimated costs to reconstruct Curve H-11 and Curve V-12 to meet standards:

- Construction (~0.08 miles): \$147,500
- Real Estate (~0.20 acres): \$2,000

Total additional estimated cost of reconstruction for Design Justification #4: \$149,500

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes:

- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.
- Install centerline and shoulder rumble strips.
- Clear and grub trees and vegetation within the right-of-way, within the KAB crash spot and approximately 100-ft to 400-ft south of Curve H-11, to improve sight and reduce roadside hazards.

Design Justification #5: Vertical Curve V-13, Vertical Curve V-14, and Rome Corners Road Intersection, Sta 245+00 to Sta 252+50

The Rome Corners Road intersection was flagged in MetaManager as a crash spot with above normal crash rates. Eight crashes were reported at the intersection. There were no fatal or incapacitating crashes.

Vertical Curve V-13 is a crest curve located approximately 500-ft north of the Rome Corners Road intersection. Vertical Curve V-14 is a sag curve located approximately 150-ft north of the Rome Corners Road intersection. Investigation flags were not identified in MetaManager for these curves; however, substandard vertical curve geometry for both curves may contribute to the crashes at the intersection.

SS-CC for Curve V-13, Curve V-14, and the Rome Corners Intersection

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curve V-13 is 40 mph and the speed rating for Curve V-14 is 45 mph. To reconstruct these curves to meet 60 mph design standards would require the K-value of V-13 to increase from 55 to a minimum of 151 and the K-value of V-14 to increase from 91 to a minimum of 136. Reconstruction of these curves to meet the design speed would require the purchase of right-of-way. Reconstruction of the Rome Corners Road intersection would also be required.
2. Stopping Sight Distance – Vertical Curves V-13 and V-14 do not meet the required stopping sight distance for the roadway design speed, based on the K-values of the curves. As discussed above regarding design speed, the roadway would need to be reconstructed to meet the design criteria. The Rome Corners intersection meets stopping sight distance (SSD) requirements, but does not meet decision sight distance (DSD) requirements.

Cost

Additional estimated costs to reconstruct Curve V-13 and Curve V-14 to meet standards:

- Construction (~0.19 miles): \$339,000
- Real Estate (~0.86 acres): \$8,600

Total additional estimated cost of reconstruction for Design Justification #5: \$347,600

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes at the Rome Corners Road intersection:

- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.
- Install centerline and shoulder rumble strips outside of the intersection area.
- Enhance signing to better alert USH 14 drivers of the upcoming intersection.
- Clear and grub trees and vegetation within the right-of-way approximately 300-ft north of the Rome Corners Road intersection to improve sight and reduce roadside hazards

Design Justification #6: Old Stage Road Intersection, Vertical Curve V-15, Vertical Curve V-16, and Grade between Vertical Curves V-15 and V-16, Sta 255+50 to Sta 264+20

The Old Stage Road intersection was flagged in MetaManager as a crash spot with above normal crash rates. Six crashes were reported at the intersection. There were no fatal or incapacitating crashes.

Vertical Curve V-15 is a sag curve located within the Old Stage Road intersection. Vertical Curve V-16 is a crest curve located approximately 400-ft to 600-ft south of the Old Stage Road intersection. The grade between vertical curves V-15 and V-16 is 4.1%, which exceeds the maximum allowable grade of 3% based on the criteria for level terrain and a 60 mph design speed. An investigation flag was not identified in MetaManager for the vertical curves or the grade between; however, substandard vertical curve geometry and the grade between all may contribute to the crashes at the Old Stage Road intersection.

SS-CC for Curve V-15, Curve V-16, and the Grade between V-15 and V-16

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curves V-15 and V-16 is 55 mph. To reconstruct these curves to meet 60 mph design standards would require the K-value of V-15 to increase from 123 to a minimum of 136 and the K-value of V-16 to increase from 128 to a minimum of 151. Reconstruction of these curves to meet the design speed would require the purchase of right-of-way. Reconstruction of the Old Stage Road intersection would also be required.
2. Grade – The grade between vertical curves V-15 and V-16 of 4.1% exceeds the maximum allowable grade of 3%. To meet requirements, this section of roadway would require reconstruction to a lesser grade. Profile changes would require the reconstruction of the Old Stage Road intersection and regrading of the ditches for drainage, which would result in right-of-way impacts.
3. Stopping Sight Distance – Vertical Curves V-15 and V-16 do not meet the required stopping sight distance for the roadway design speed, based on the K-values of the curves. As discussed above regarding design speed, the roadway would need to be reconstructed to meet the design criteria.

Cost

Additional estimated costs to reconstruct Curve V-15 and Curve V-16 to meet standards:

- Construction (~0.19 miles): \$339,000
- Real Estate (~0.74 acres): \$7,400

Total additional estimated cost of reconstruction for Design Justification #6: \$346,400

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes at the Old Stage Road intersection:

- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.
- Install centerline and shoulder rumble strips outside of the intersection area.
- Enhance signing to better alert USH 14 drivers of the upcoming intersection.

- Clear and grub trees and vegetation within the right-of-way approximately 200-ft to 500-ft south of the Old Stage Road intersection to improve sight and reduce roadside hazards.

Design Justification #7: Horizontal Curve H-15 and W Rutland Road Intersection, Sta 318+50 to Sta 326+75

Horizontal Curve H-15 and the W Rutland Road intersection were flagged in MetaManager as a crash spot with above normal crash rates. Six crashes were reported at this location, one of which was an incapacitating injury crash.

The W Rutland Road intersection is located on the outside of Horizontal Curve H-15. Run-off-the-road crashes are prevalent on the curve and at the intersection. Substandard horizontal curve geometry may contribute to the crashes at this location.

SS-CC for Curve H-15 and the W Rutland Road Intersection

1. Design Speed – The design speed for USH 14 is 60 mph; however, the speed rating for Curve H-15 is 50 mph. To reconstruct this curve to meet 60 mph design standards would require the curve to have a radius of 1,330-ft. Reconstruction of this curve to a larger radius would require the purchase of right-of-way and would result in impacts to an agricultural property. Reconstruction of the W Rutland Road intersection would also be required.
2. Horizontal Radius – Curve H-15 has a radius of 960-ft, which does not meet the 60 mph design speed of USH 14. A reconstruction of this curve to a minimum radius of 1,330-ft is required to meet design standards.
3. Superelevation Rate – The superelevation rate of 7.7% for Curve H-15 exceeds the maximum rate of 6% for this roadway classification. Regrading of the roadway to a lower super elevation rate would be required to meet design standards.

Cost

Additional estimated costs to reconstruct Curve H-15 to meet standards:

- Construction (~0.22 miles): \$416,500
- Real Estate (~1.02 acres): \$10,200

Total additional estimated cost of reconstruction for Design Justification #7: \$426,700

Safety Enhancements

As an alternative to the reconstruction of this area, the following safety enhancements are proposed, which should result in fewer crashes at the W Rutland Road intersection:

- Widen paved shoulders from 3-ft to 5-ft, which allows for more avoidance maneuvers.
- Install centerline and shoulder rumble strips outside of the intersection area.
- Enhance signing to better alert USH 14 drivers of the upcoming horizontal curve (advisory speed 50 mph) and intersection.

Concurrence with Design Justifications #1 through #7

A signature below indicates concurrence with the above presented design justifications.



Name, Title

Date

4.3.2 Non-Controlling Criteria Design Justifications (DJs)

The existing clear zone for USH 14 is 18-ft and will be maintained throughout the resurfacing project limits (Project ID 5155-04-05) except as noted in the encroachment report and roadside hazard report.

Bicycle and pedestrian facilities were considered throughout the corridor. The available existing shoulder width on USH 14 allows for widening the paved shoulder to 5-ft, which provides on-road bicycle accommodation. A 6-ft paved shoulder is preferred given the traffic volume on USH 14; however, narrow right-of-way grading

constraints do not allow for a 6-ft paved shoulder.

Bicycle and pedestrian facilities were also considered at the proposed roundabout at the STH 92 intersection. Due to the low volume of bicyclists and pedestrians observed and anticipated at this intersection, and the lack of maintenance of the facilities, multiuse paths will not be constructed with this project. Space for the paths will be graded with this project and cut-throughs will be provided in the splitter islands to accommodate any future paths. On-road bicyclists will navigate the roundabout through the driving lanes.

4.4 Safety and Contributing Geometric Analysis (CGA) Design Justification (FDM 11-38) 3R projects and Preventive Maintenance (PM) Group I and Group II Pavement Strategy Projects (FDM 3-5 Exhibit 5.1)

See attached Safety Screening and Contributing Geometric Analysis worksheets (Attachment 4) for locations and details of Crash Flags, Improvement Flags, and Design Justifications within the project limits.

National Highway System (NHS) Roadway - Substandard Geometric Features Outside of Controlling Design Criteria Covered by Design Justifications (3R & PM Projects)**

NHS Roadway Name: USH 14

| Location | | | | Feature Type | Magnitude of Variance |
|----------|---------|-----|-------|-------------------------------|----------------------------------------|
| Sta. | to Sta. | RP | to RP | | |
| 154+83 | 158+33 | N/A | N/A | Sag Vertical Curve (V-5) | K-value of 112 instead of 136 |
| 192+68 | 197+36 | N/A | N/A | Horizontal Curve (H-8) | Superelevation ~4.5% instead of 5.5% |
| 203+50 | 207+09 | N/A | N/A | Horizontal Curve (H-9) | Radius 1160-ft instead of 1,330-ft |
| 208+12 | 210+12 | N/A | N/A | Sag Vertical Curve (V-11) | K-value of 100 instead of 136 |
| 267+14 | 269+64 | N/A | N/A | Crest Vertical Curve (V-17) | K-value of 70 instead of 151 |
| 271+21 | 274+41 | N/A | N/A | Sag Vertical Curve (V-18) | K-value of 118 instead of 136 |
| 276+00 | 279+00 | N/A | N/A | Crest Vertical Curve (V-19) | K-value of 44 instead of 151 |
| 279+00 | 279+74 | N/A | N/A | Grade (between V-19 and V-20) | Grade of 5.1% instead of 3% |
| 276+74 | 285+44 | N/A | N/A | Sag Vertical Curve (V-20) | K-value of 120 instead of 136 |
| 297+22 | 298+72 | N/A | N/A | Crest Vertical Curve (V-22) | K-value of 113 instead of 151 |
| 329+94 | 333+69 | N/A | N/A | Horizontal Curve (H-16) | Radius of 1,165-ft instead of 1,330-ft |

** This documentation is required only for 3R projects on the National Highway System.

These geometric features outside of controlling design criteria are located on highway segments containing no flags or only crash type flags. These features do not contribute significantly to the crash situation on these segments of highway, so these highway segments are covered by Design Justifications.

See attached SSA worksheet (Attachment 4) and existing plan and profile sheets (Attachment 5).

Comments:

Geometric Features Outside of Controlling Design Criteria NOT Covered by Design Justifications and NOT corrected as part of PM project (PM Group I and Group II pavement strategy projects)

None.

Roadway Name: _____

| Location | | | | Feature Type | Magnitude of Variance | Operational Improvements |
|----------|---------|----|-------|--------------|-----------------------|--------------------------|
| Sta. | to Sta. | RP | to RP | | | |
| None. | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Construction is required for safety improvements or to correct the above controlling geometric features outside of design criteria. The region will either consider this construction for HSIP funding or address this construction with future programming. Operational improvements will be incorporated into the PM project at these locations that are consistent with the scope of the preventive maintenance work and appropriate based on the analysis of crash types.


Comments:

4.5 Typical Cross Section(s) Alternative Features Considered

The project proposes widening the paved shoulder through the resurface portion of the project by 2-ft, resulting in a total of 5-ft of paved shoulder. Wider paved shoulders help to improve the safety of the corridor, provide more space for edgeline rumble strips, can accommodate bicyclists, and are in accordance with FDM 11-15 Attachment 1.5 paved shoulder policy.

Adding left-turn or right-turn lanes to intersections throughout the corridor were considered but not implemented. Based on the crash analysis, it was determined that adding turn lanes would have not be a cost effective treatment for crash reduction. Also, the additional pavement width would require the purchase of right-of-way and the additional lanes were not necessary for intersection capacity.

Traffic volumes at the STH 92 intersection dictate two-lane entries on the USH 14 approaches for adequate traffic operations through the design year.

Multi-use paths were considered around the proposed roundabout at the STH 92 intersection. Due to the low volume of bicyclists and pedestrians observed and anticipated at this intersection, and the lack of maintenance of the facilities, the paths will not be constructed with this project. Space for the paths will be graded with this project and cut-throughs will be provided in the splitter islands to accommodate any future paths. 

5.0 Proposed Design Improvement(s)

5.1 Improvement Type(s)

FIIPs Legislative Program Number 303 – State Highway Rehabilitation

Project ID 5155-00-09: Reconstruction

Project ID 5155-04-05: Resurface

5.2 Proposed Geometrics Information

5.2.1 Horizontal Alignment* Information

The proposed horizontal alignment will match the existing alignment for the resurface portion of the project (Sta. 113+98 to Sta. 352+00; Project ID 5155-04-05). Horizontal curves meet 60 mph criteria except where noted in Section 2.2.1. The superelevation will be corrected on horizontal curve H-17 to update the curve to current design standards. The combination of the superelevation correction and the construction of a roundabout south of the curve is expected to reduce crashes at this location.

Some roadway realignment is proposed for the roundabout portion of the project at the STH 92 intersection (Project ID 5155-00-09). Horizontal curves meet criteria for the approach design speeds, with decreasing design speeds as vehicles near the roundabout entries.

See Attachment 6 – Preliminary Plan Sheets for horizontal alignment information for the entire project.

5.2.2 Vertical Alignment/Stopping Sight Distance* Information

The proposed vertical alignment will match the existing profile for the resurface portion of the project (Sta. 113+98 to Sta. 352+00; Project ID 5155-04-05). Vertical alignment information is not provided in the plans for the resurface portion of the project as the profile will not change. Vertical curves meet 60 mph Minimum criteria except where noted in Section 2.2.2.

The proposed vertical alignment for the roundabout portion of the project at the STH 92 intersection (Project ID 5155-00-09) will vary from the existing roadway profile by less than 2-ft. The proposed profiles meet or exceed minimum curve and stopping sight distance values for the approach design speeds, with decreasing design speeds as vehicles near the roundabout entries.

See Attachment 6 – Preliminary Plan Sheets for vertical alignment information for the roundabout portion of the project.

5.2.3 Grades* and Vertical Clearances* Information

The proposed profile grades on USH 14 in the resurface portion of the project (Sta. 113+98 to Sta. 352+00; Project ID 5155-04-05) range from 0.1% to 5.1% and are within the design standards for the roadway except where noted in Section 2.2.3.

The proposed profile grades for the roundabout portion of the project at the STH 92 intersection (Project ID 5155-00-09) range from 0.22% to 2.7% and are within the design standards for the roadway.

See Attachment 6 – Preliminary Plan Sheets for grade information for the roundabout portion of the project.

*Controlling Criteria for Design Speed \geq 50 mph

5.3 Side-roads/Intersections/Interchanges Information

5.3.1 Side-Roads Information

| Roadway Name | Functional Class | Design Speed (MPH) | Design Year Traffic (AADT) | Design Class | Approach Grades | Ped. Facilities (Y/N) | Bike Facilities (Y/N) |
|--------------|-----------------------|--------------------|----------------------------|--------------|-------------------------|-----------------------|-----------------------|
| CTH A | Rural Minor Collector | 50 | 950 (2042) | C2 | 1% to 5% / -2% to -4.5% | N | N |
| STH 92 | Rural Minor Arterial | 60 | 2900 (2042) | A1 | -0.5% to 1.0% | N | Y |
| Biglow Road | Rural Local Road | 50 | >100 | RT1 | -0.5% | N | N |

Comments:

5.3.2 Intersections Information/Proposed Geometrics

| Intersecting Roadway Names | Intersect. Type | Intersect. Angle | Traffic Control | SSD** Met* (Y/N)/ Length | ISD** Met (Y/N)/ Length | DSD** Met (Y/N)/ Length | Vision Triangles Proposed (Y/N) | Corner Clearance to Driveways Met (Y/N) |
|----------------------------|-----------------|------------------|------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------|-----------------------------------------|
| CTH A | C | 85° | Minor Road Stop | Y/>425' | Y/960' | Y/>465' | N | N |
| STH 92 / Biglow Road | Round-about | 90° | Multi-lane Round-about | USH 14: Y/>570' STH 92: Y/>570' Biglow Rd: Y/>425' | SB USH 14: Y/176' NB USH 14: Y/169' STH 92: Y/198' Biglow Rd: Y/191' | USH 14: Y/>610' STH 92: Y/>610' Biglow Rd: N/<465' | N | Y |

* Controlling Criteria for Design Speed ≥ 50 mph

** SSD = Stopping Sight Distance, ISD = Intersection Sight Distance, DSD = Decision Sight Distance (See FDM 11-25-1).

Comments:

Has intersection control evaluation (ICE) worksheet been coordinated (Yes or No)? Yes

A Phase 1 ICE Memorandum was completed for the USH 14 and STH 92 intersection. The Memorandum considered the existing traffic control (two-way stop) and a roundabout. The determination of the Phase 1 ICE was that the existing traffic control does not address the type of crashes that are occurring at the intersection and that the only feasible alternative to address safety is to construct a roundabout. A Phase II ICE was determined not necessary. An ICE was not conducted for the CTH A intersection.

5.3.3 Interchanges Information/Proposed Geometrics

None.


5.4 Roundabout(s) Information

A roundabout is proposed for the USH 14 and STH 92 intersection. The roundabout was selected as the preferred alternative through the intersection control evaluation and the Highway Safety Improvement Program to improve the safety and operations of the intersection.

See Attachment 7 – Critical Design Parameters Chart

5.5 Cross Section/Pavement Structure Information

| | USH 14 | STH 92 | Biglow Road |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| Number of roadways | 1 | 1 | 1 |
| Number of lanes | 2 4 at STH 92 intersection (two-lane entries/exits) | 2 | 2 |
| Median width/type | 0 from STH 138 to STH 92 Raised curb and gutter median width varies up to 50-ft at STH 92 intersection (roundabout splitter islands). | Raised curb and gutter median width varies up to 30-ft. | Raised curb and gutter median width varies up to 35-ft. |

| | | | |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lane width*/type (Driving, Parking, Bike Lane, etc.) | 12-ft driving lanes. | 12-ft driving lanes. Widens up to 18-ft at roundabout entry. | 11-ft driving lanes. Widens up to 18-ft at roundabout entry. |
| Shoulder width* (Total and Paved or Curb & Gutter) | Varies 6-ft to 10-ft (5-ft to 7-ft paved) from STH 138 to STH 92. 10-ft (6-ft paved) at STH 92 roundabout. Curb and gutter within 180-ft of roundabout, extends 670-ft from roundabout on west side of northwest leg. | 6-ft (5-ft paved). Curb and gutter within 120-ft of roundabout. | 2-ft (0-ft paved). Curb and gutter within 90-ft of roundabout. |
| Bike facilities proposed | None marked. Paved shoulders. | None marked. Paved shoulders. | None. |
| Pedestrian facilities / sidewalk proposed | None. Grading provided for future 10-ft path at STH 92 roundabout intersection. Splitter island cut-throughs provided for future path connection. | None. Grading provided for future 10-ft path at USH 14 roundabout intersection. Splitter island cut-throughs provided for future path connection. | None. Grading provided for future 10-ft path at USH 14 roundabout intersection. Splitter island cut-throughs provided for future path connection.  |
| Cross slope* | 2% normal crown | 2% normal crown | 2% normal crown |
| Super-elevation* | Match existing super-elevations from STH 138 to STH 92. 3.7% to 2.0% approaching roundabout northwest leg (STA 352+00 to 353+57) | 5.7% to 2.0% approaching roundabout (STA 100+00 to 102+10) | N/A |
| Horizontal clearance | Varies 8-ft to 12-ft from STH 138 to STH 92. 12-ft at STH 92 roundabout in shoulder areas. 2-ft in curb and gutter sections. | 8-ft in shoulder areas. 2-ft in curb and gutter sections. | 6-ft in shoulder areas. 2-ft in curb and gutter sections. |
| Vertical clearance* | 18.25-ft (sign structures) | N/A | N/A |
| Pavement structure | <u>USH 14 Mainline:</u> Mill and relay 3.5-inch HMA <u>STH 92 Roundabout Approaches:</u> 6-inch HMA 12-inch Base Aggregate 12-inch Select Crushed Geogrid <u>STH 92 Roundabout Intersection & Circle (within 175-ft of entries/exits):</u> 8-inch Concrete 6-inch Base Aggregate 12-inch Select Crushed Geogrid | <u>Roundabout Approaches:</u> 4-inch HMA 12-inch Base Aggregate 12-inch Select Crushed Geogrid <u>Roundabout Intersection (within 125-ft of entry/exit):</u> 8-inch Concrete 6-inch Base Aggregate 12-inch Select Crushed Geogrid | <u>Roundabout Approaches:</u> 4-inch HMA 12-inch Base Aggregate 12-inch Select Crushed Geogrid <u>Roundabout Intersection (within 90-ft of entry/exit):</u> 8-inch Concrete 6-inch Base Aggregate 12-inch Select Crushed Geogrid |
| Clear zone | ID 5155-04-05 (USH 14 Resurface): 18-ft ID 5155-00-09 (USH 14/ STH 92 Intersection): 36-ft | 32-ft | 12-ft |
| Side-slope/Ditch Sections | 6:1 – 4:1 Typical | 6:1 – 4:1 Typical | 4:1 Typical, 3:1 max back slope outside clear zone. |

* Controlling Criteria for Design Speed \geq 50 mph

See Attachment 8 – Finished Typical Sections

5.6 Street Lighting Improvements

| Location | Type | Break-away Requirements |
|----------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| USH 14 intersection with STH 92 (roundabout) | WisDOT Standard Type 6 light pole with Standard LED Type C Fixture | Breakaway transformer bases will be included in all locations. Street lights will be installed outside the horizontal clearance requirements for curb and gutter sections within the roundabout. |

5.7 Structures Improvements Information

5.7.1 Bridge Structures

None.

5.7.2 Box Culverts and Multiple Pipe Structures

| Structure I.D. # | Location | Type | Length | No. Pipes |
|------------------|-----------------------------------------------------------------------------------------------------------|--------------------|--------|-----------|
| N/A | Sta. 357+88'REB' to 357+99'REB' | Twin Culvert Pipes | 112' | 2 |
| | Proposed Improvement: New dual CPRCHE Class HE-IV 29x45-INCH pipe crossing USH 14 north of STH 92. | | | |
| N/A | Sta. 105+28'EB' to 105+69'EB' | Twin Culvert Pipes | 106' | 2 |
| | Proposed Improvement: New dual CPRCHE Class HE-IV 19x30-INCH pipe crossing STH 92 west of USH 14. | | | |
| N/A | Sta. 200+10'BLW' to 200+24'blw' | Twin Culvert Pipes | 165' | 2 |
| | Proposed Improvement: New dual CPRC Class IV 24-INCH pipe crossing Biglow Road east of USH 14. | | | |

Comments:

Twin culvert pipes are necessary due to shallow ditches and flat terrain.

5.7.3 Retaining Walls and Noise Barrier Structures

None.

5.7.4 Sign Bridge Structures

| Structure I.D. # | Location | Type | Length | Clear Roadway Width | Vertical Clearance* | Horizontal Clearance* | Clear Zone Under |
|------------------|----------------------------------------------------------------------------------|-----------------------|----------|---------------------|---------------------|-----------------------|------------------|
| Not Yet Assigned | Sta. 352+78.87'EB' | Overhead Sign Support | 43.48-ft | 31.48-ft | 18.25' Minimum | 4' Minimum | N/A |
| | Proposed Improvement: Provide overhead signing for roundabout lane usage. | | | | | | |
| Not Yet Assigned | Sta. 362+04.22'WB' | Overhead Sign Support | 38.57-ft | 31.45-ft | 18.25' Minimum | 3' Minimum | N/A |
| | Proposed Improvement: Provide overhead signing for roundabout lane usage. | | | | | | |

* Controlling Criteria for Design Speed \geq 50 mph

Comments:

5.7.5 Tunnel Structures

None.

5.7.6 Touchdown Points on Local Bridge Program Projects

None.

5.8 Permanent Traffic Control

Will permanent signs be installed (Yes or No)? Yes

Are non-standard sign layout details needed (Yes or No)? Yes

Comments:

Special signing plates (designated and designed by WisDOT) will be needed for advanced diagrammatic, overhead lane designation, destination/distance, and roundabout exit signs.

5.9 Safety Enhancements/Mitigation Measures

- The following safety enhancements along the USH 14 mainline will aid in reducing crashes throughout the corridor, especially run-off-the-road crashes and head-on crashes where vehicles cross the roadway centerline. Visibility along the corridor will also improve.
 - Widen asphalt shoulders by 2-ft
 - Install centerline and shoulder rumble strips in a sinusoidal pattern, also known as mumble strips
 - Clear and grub vegetation within the right-of-way
 - Install fresh asphalt pavement (mill and relay) and pavement markings
- Grading improvements in the northwest corner of the CTH A intersection will allow intersection sight distance criteria to be met.
- The construction of a roundabout at the USH 14/STH 92 intersection will help to improve intersection safety. Roundabouts typically have lower fatality and injury rates than signalized intersections or high-volume stop-controlled intersections.



5.10 Real Estate

5.10.1 Real Estate Acquisition

Plat I.D.: 5155-00-27 (USH 14/STH 92 Intersection) and 5155-04-27 (USH 14 Mainline)

| Relocations | | Land (Acres) | Permanent Easements | Temporary Easements | Construction Permits |
|-------------|--------|-----------------------|---------------------|---------------------|----------------------|
| Type | Number | | | | |
| None | N/A | 0.066 (ID 5155-00-27) | 0 | 0 | 0 |
| None | N/A | 0.180 (ID 5155-04-27) | 0 | 0 | 0 |

Comments:

5.10.2 Encroachment Actions

| Encroachment Location | Encroachment Type | What is to be Done? (Removed, Revocable Permit, etc.) |
|---------------------------------|-----------------------|-------------------------------------------------------|
| STA 179+07, 32' RT | Private Sign | To be determined |
| STA 181+33, 29' RT | Stone Wall | To be determined |
| STA 181+51, 27' RT | Private Sign | To be determined |
| STA 181+92 - STA 182+40, 25' RT | Metal Art | To be determined |
| STA 185+01, 31' RT | Landscaping Rock | To be determined |
| STA 247+42, 31' RT | Private Sign and Post | To be determined |
| STA 262+13 - STA 262+94, 27' LT | Concrete Posts | To be determined |
| STA 327+97, 32' LT | Private Sign | To be determined |

Comments:

5.11 Utilities

Is Project Trans 220 Utility Project (Yes or No)? Yes

Describe any special design features to accommodate utilities:

None.

Major Utility Agreements:

None.

Comments:

Due to slope grading at the CTH A intersection and the construction of the roundabout, non-compensable utility relocations will be necessary prior to and during construction.

5.12 Railroads

Describe improvements to Railroad Facilities:

N/A

Railroad Agreements:

None.

Comments:

5.13 Financing and Scheduling

| Construction I.D. | Cost Estimate | Type of Funding | | | Proposed Timeframe for Construction | Ties to Other Work or Projects | Incentive / Disincentive Clauses (Yes or No) |
|-------------------|---------------|-----------------|---------|---------|-------------------------------------|--------------------------------|----------------------------------------------|
| | | % Fed. | % State | % Local | | | |
| 5155-00-79 | | 90* | 10* | 0 | Fall 2021 – Fall 2022 | 5155-04-81** | No |
| | | 80* | 20* | | | | |
| 5155-04-81 | | 0 | 100 | 0 | Summer 2022 | 5155-00-79** | No |

*90% Federal funding capped at \$1,530,000, then 80% Federal and 20% State. Federal funding through Highway Safety Improvement Program (HSIP) funds.

**The two projects will be tied together in one set of plans and LET at the same time. Initial grading outside the exiting roadway for Construction Project ID 5155-00-79 will begin in Fall 2021 to address poor soil concerns. Remaining construction for both projects will start in Spring 2022 and end in Fall 2022.

Describe Incentive/Disincentive Clauses:

None.

Non-participating Work:

None.

Deferred Construction Work (Preventative Maintenance Projects):

None.

5.14 Unique or Non-Standard Features

5.14.1 Hazardous Waste

None.

5.14.2 Environmental Commitments

Several environmental commitments exist; see Attachment 9 – Environmental Commitments.

5.14.3 Community Sensitive Design/Public Involvement

No community sensitive design dollars are being used on this project. The first public involvement meeting was held on October 24, 2018. Overall feedback at the meeting revealed that the public is generally in favor of addressing safety on the USH 14 corridor. Following the public meeting, the design team refined the safety improvements proposed along the USH 14 corridor considering the comments provided. Visibility will be improved at the CTH A intersection and along the USH 14 mainline, wider shoulders will be provided where possible, and the locations of centerline rumble strips will be assessed. Rumble strips will be installed with a sinusoidal pattern, which helps to reduce noise. Shoulder rumble strips will also be added (in a sinusoidal pattern) along the USH 14 mainline for additional safety improvements. One additional public involvement meeting will be held in 2019.

5.14.4 Value Engineering

No value engineering studies were required for this project.

6.0 Synopsis

| Reports, Documents and Coordination | Completion/ Approval Dates (xx/xx/xxxx) | Status of Coordination or Other Information as Needed |
|-------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------|
| Concept Definition Report (CDR) | 07/07/2018 05/13/2016 | ID 5155-00-09; HSIP ID 5155-04-05; CDR |
| Risk Assessment (RA) (if needed) | N/A | |
| Signed Pavement Design Report (PDR) | 02/18/2019 | Supplemental email providing guidance on concrete pavement structure sent 05/14/2019 |
| Public Involvement Plan (PIP) | 02/03/2019 | Ongoing |
| Structure Survey Report (SSR) (if needed) | N/A | |
| Public Information Meeting(s) (PIM(s)) | 10/24/2018 | Additional PIM to be held in Fall 2019 |
| Signed State Municipal Agreement(s) (SMA(s)) (if needed) | N/A | |
| SHPO Coordination Acceptance (Section 106, etc.) (SHPO) | 03/20/2019 05/31/2019 | ID 5155-00-09; Signed Form DT1635 ID 5155-04-05; Screening List |
| DNR Coordination Acceptance (401 Cert., etc.) (DNR) | 01/22/2019 | Initial Concurrence |
| Preliminary Plan Review Complete (PPRC) | xx/xx/xxxx | |
| Preliminary Structure Plan Review Complete (PSPRC) (if needed) | N/A | |
| Signed Environmental Document (ED) (Type: PCE) | 07/09/2019 | |
| Transportation Management Plan (TMP(s)) (Type: 2) | | Submitted for review on 07/11/2019 |
| Freight/OSOW Accommodations Coordination (FOAC) | | Submitted for review on 07/12/2019 |
| Roadside Hazard Analysis Sheet (RHA) (if needed) | | Submitted for review on 07/12/2019 |
| Drainage Design Report (DDR) (if needed) | | Ongoing |
| Status of Statutory Actions (if needed) | N/A | |

Comments:

7.0 Attachments

1. Project Location Map and Project Overview
2. Existing Typical Sections
3. Traffic Forecast Report
4. Safety Screening Analysis Worksheet
5. Existing Alignments and Profiles with Design Justification Areas
6. Preliminary Plan Sheets
7. Critical Design Parameters Chart
8. Finished Typical Sections
9. Environmental Commitments
10. Roadside Hazard Analysis

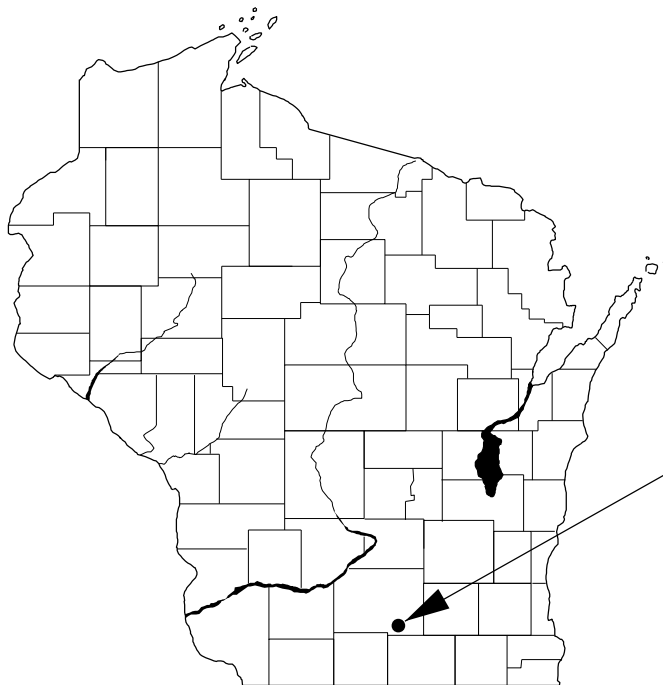
Exhibit 1

Project Location Map and Project Overview

PROJECT LOCATION MAP

PROJECT I.D. 5155-04-05
OREGON – EVANSVILLE
STH 138 – STH 92
USH 14
DANE COUNTY

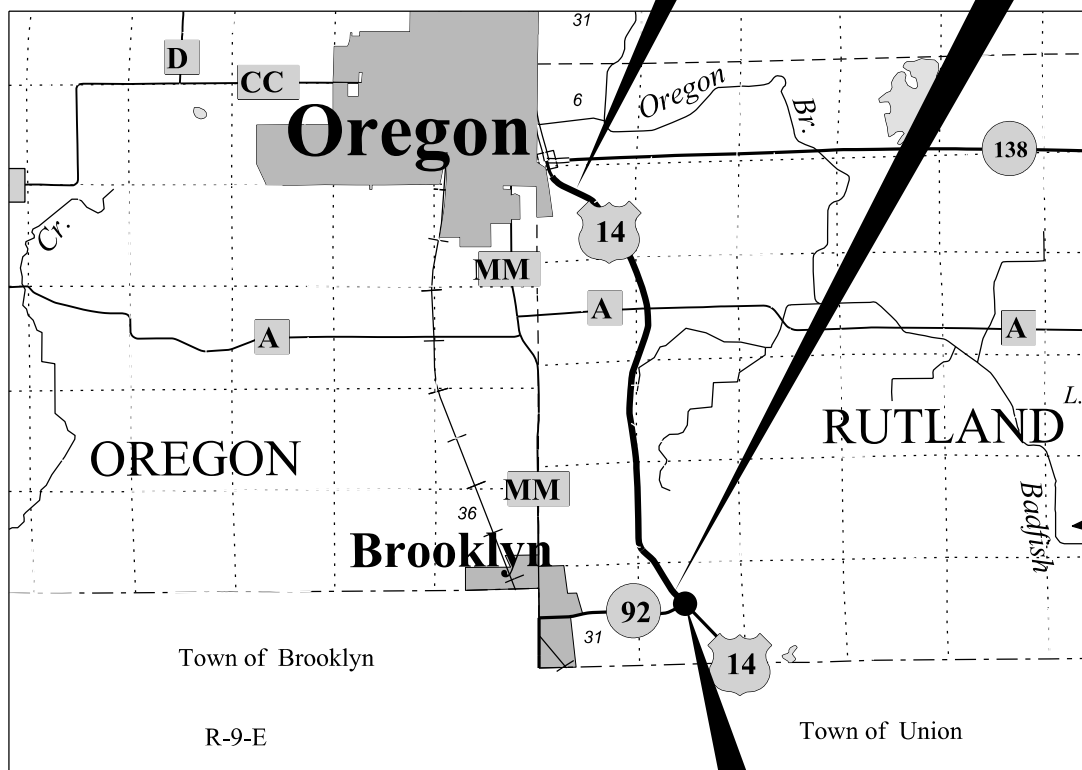
PROJECT I.D. 5155-00-09
MADISON – EVANSVILLE
STH 92 INTERSECTION
USH 14
DANE COUNTY



PROJECT LOCATION
DANE COUNTY, WI

BEGIN PROJECT 5155-04-05

END PROJECT 5155-04-05



PROJECT LOCATION

5155-00-09

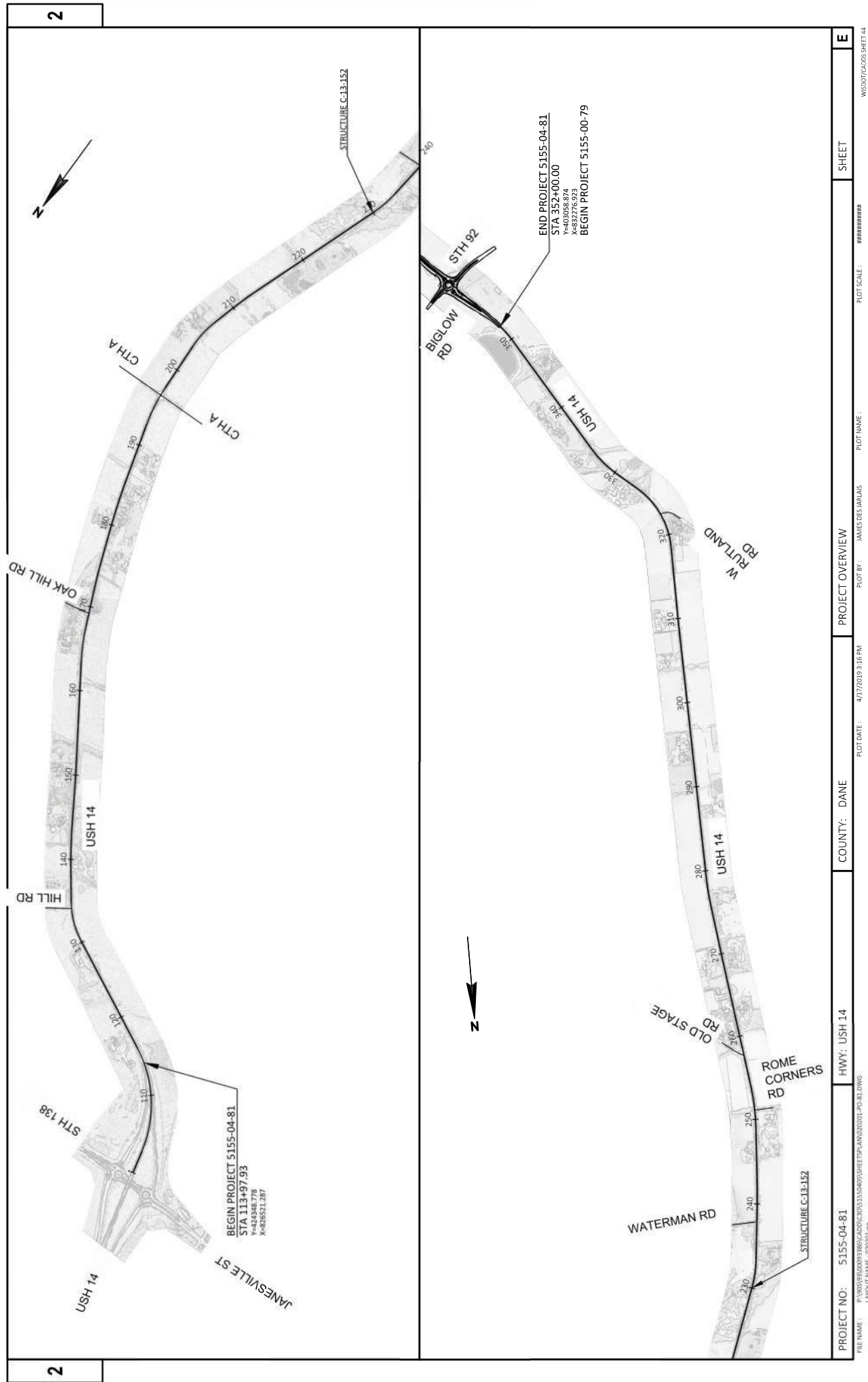
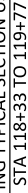
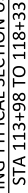
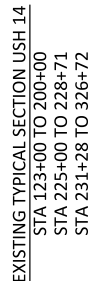


Exhibit 2

Existing Typical Sections







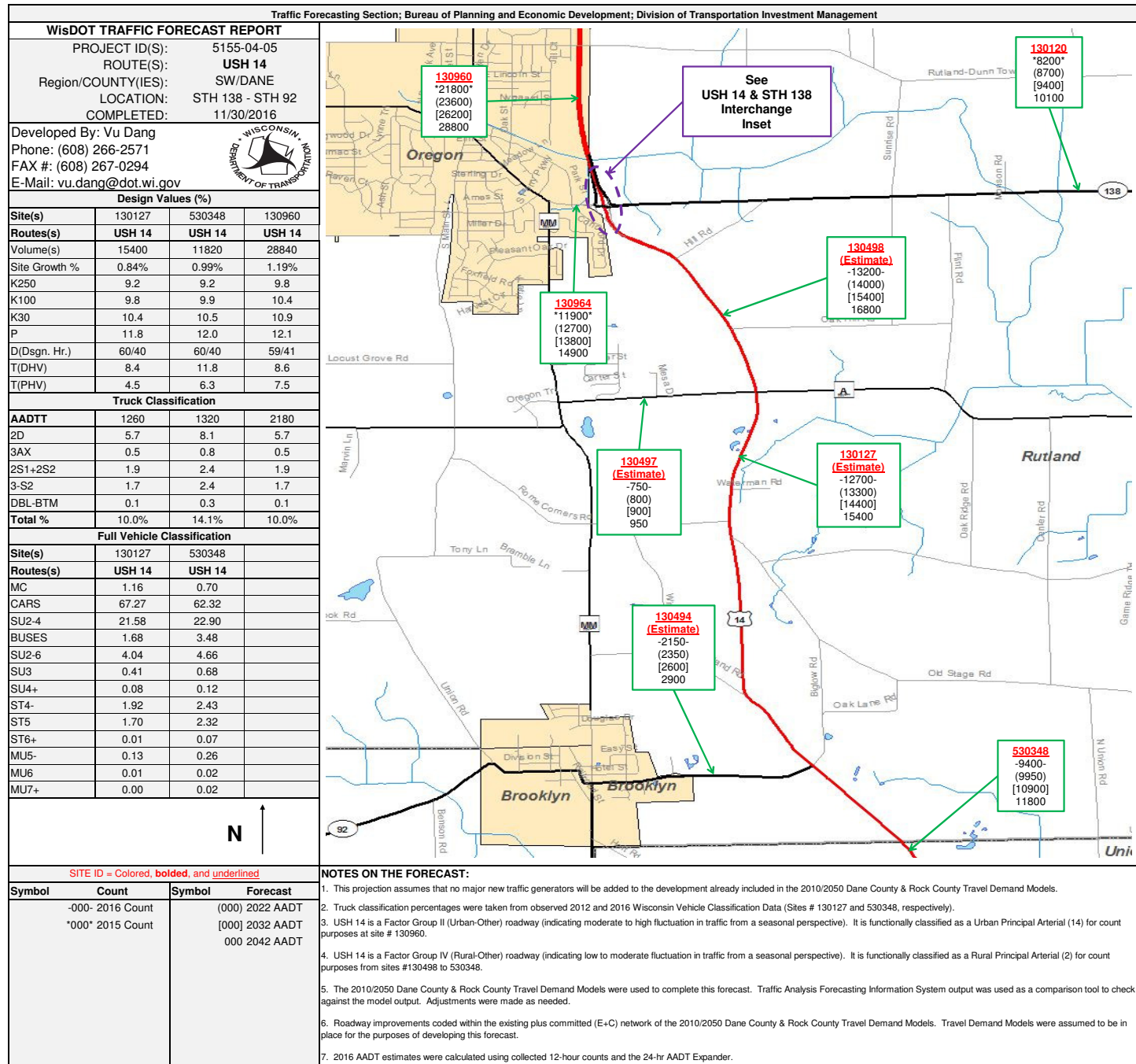


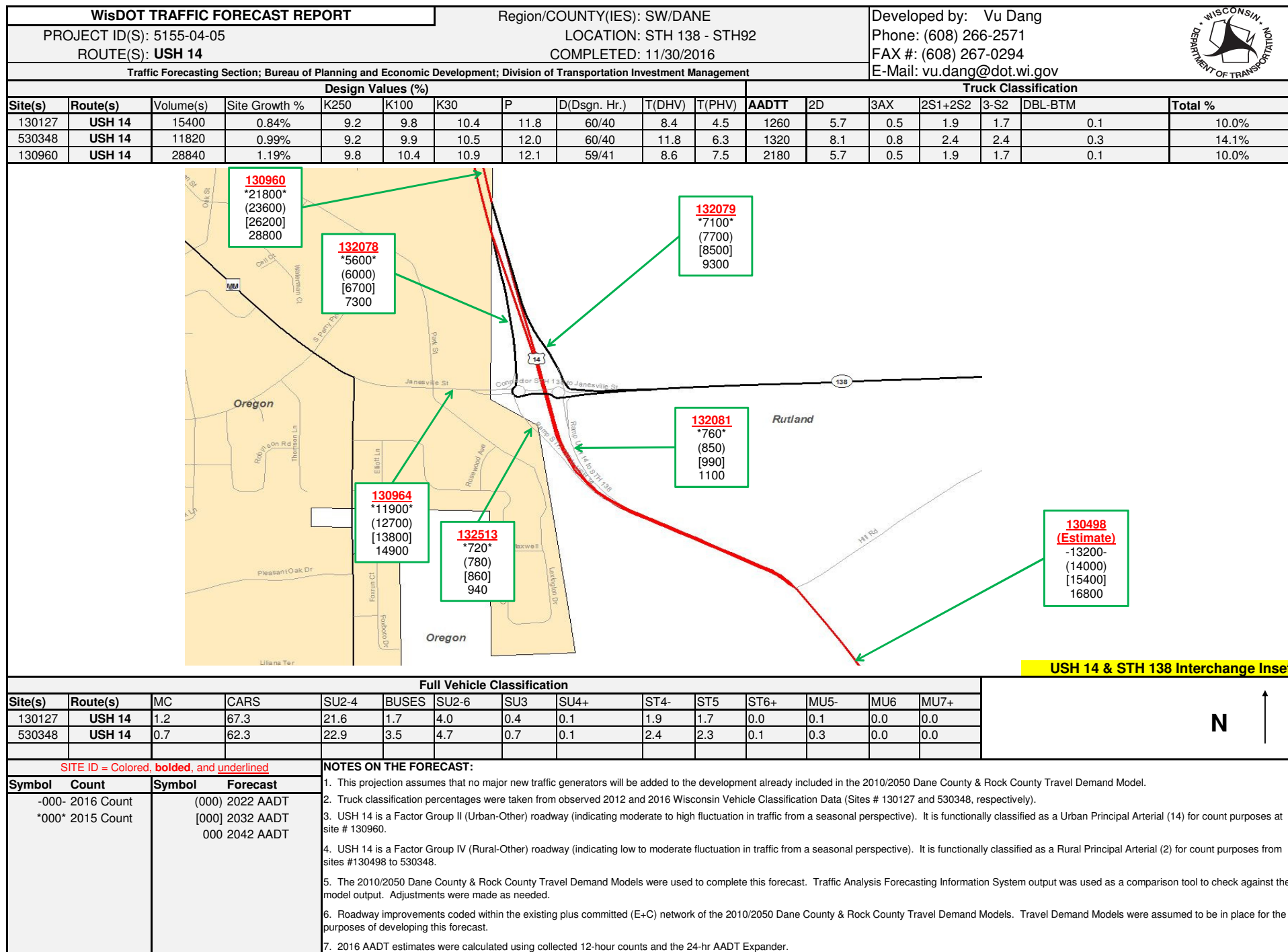
| | | | | | |
|----------------------------------------------------------------------------|-----------------------------------|-------------|-----------------------|---------------------------|-------------------------|
| FILE NAME : P:\05\93\000933860\CADD\CD3\51550405\SHEET50W\020301-TS.DWG | PROJECT NO: 5155-04-81\5155-00-79 | HWY: USH 14 | COUNTY: DANE | EXISTING TYPICAL SECTIONS | E |
| PLOT DATE : 7/11/2019 12:35 PM | | | PLOT BY : NATHAN COOK | | PLOT SCALE : 1 IN=10 FT |
| DRAWN NAME : 020305-16-79 | | | WISDOT/CADD/SHEET 42 | | |



Exhibit 3

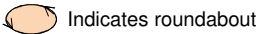
Traffic Forecast Report





WisDot Bureau of Planning
Traffic Forecasting Section
Forecast by: Vu Dang
Phone: 608-266-2571
Email: vu.dang@dot.wi.gov

Projected AM Design Hour Traffic Volumes



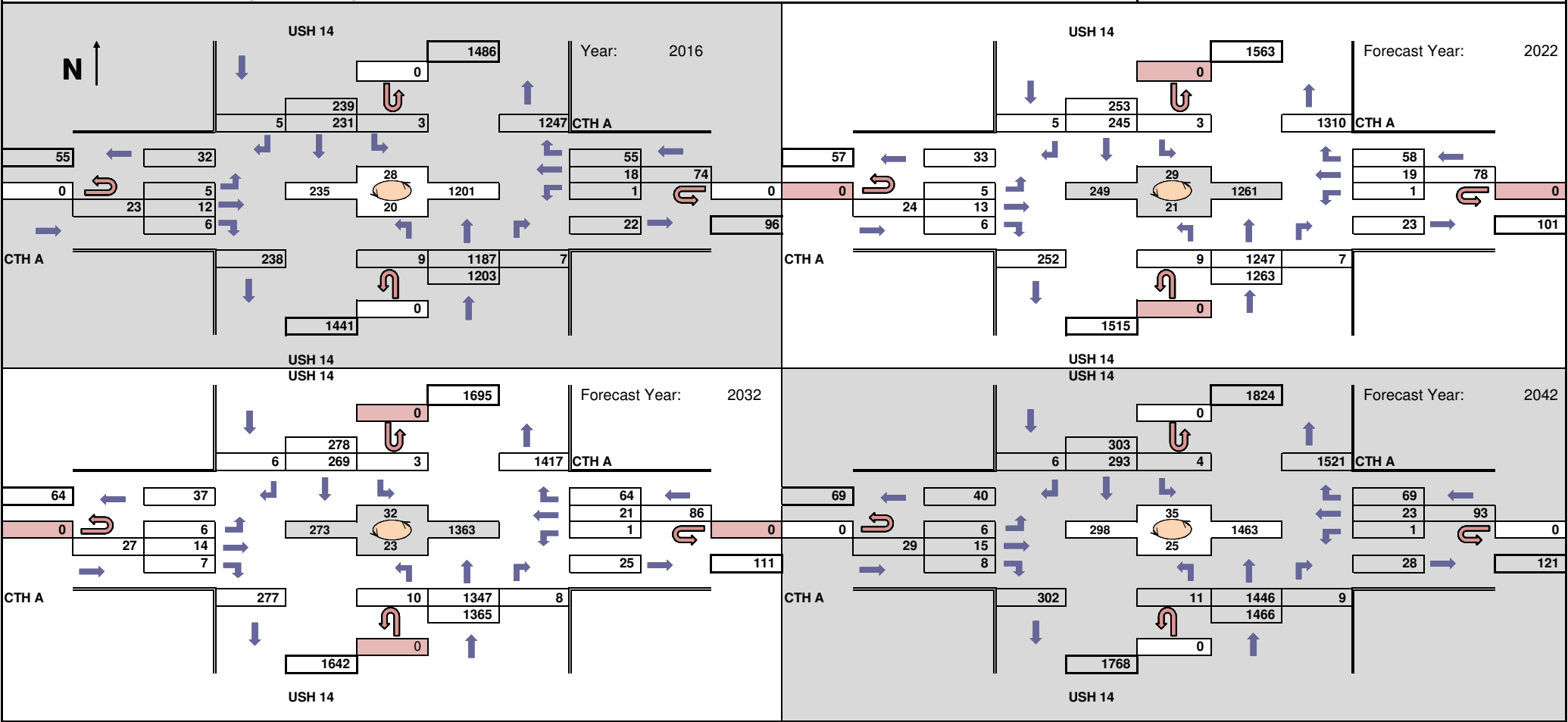
Design Hour: 7:00-8:00am

Forecast Completed: 11/30/2016

Project Description

Project ID(s): 5155-04-05
Route(s): USH 14
Region/COUNTY(IES): SW/DANE
Location: USH 14 @ CTH A

Design Hour Turning Movement Data



WisDot Bureau of Planning
Traffic Forecasting Section
Forecast by: Vu Dang
Phone: 608-266-2571
Email: vu.dang@dot.wi.gov

Projected PM Design Hour Traffic Volumes



Indicates roundabout

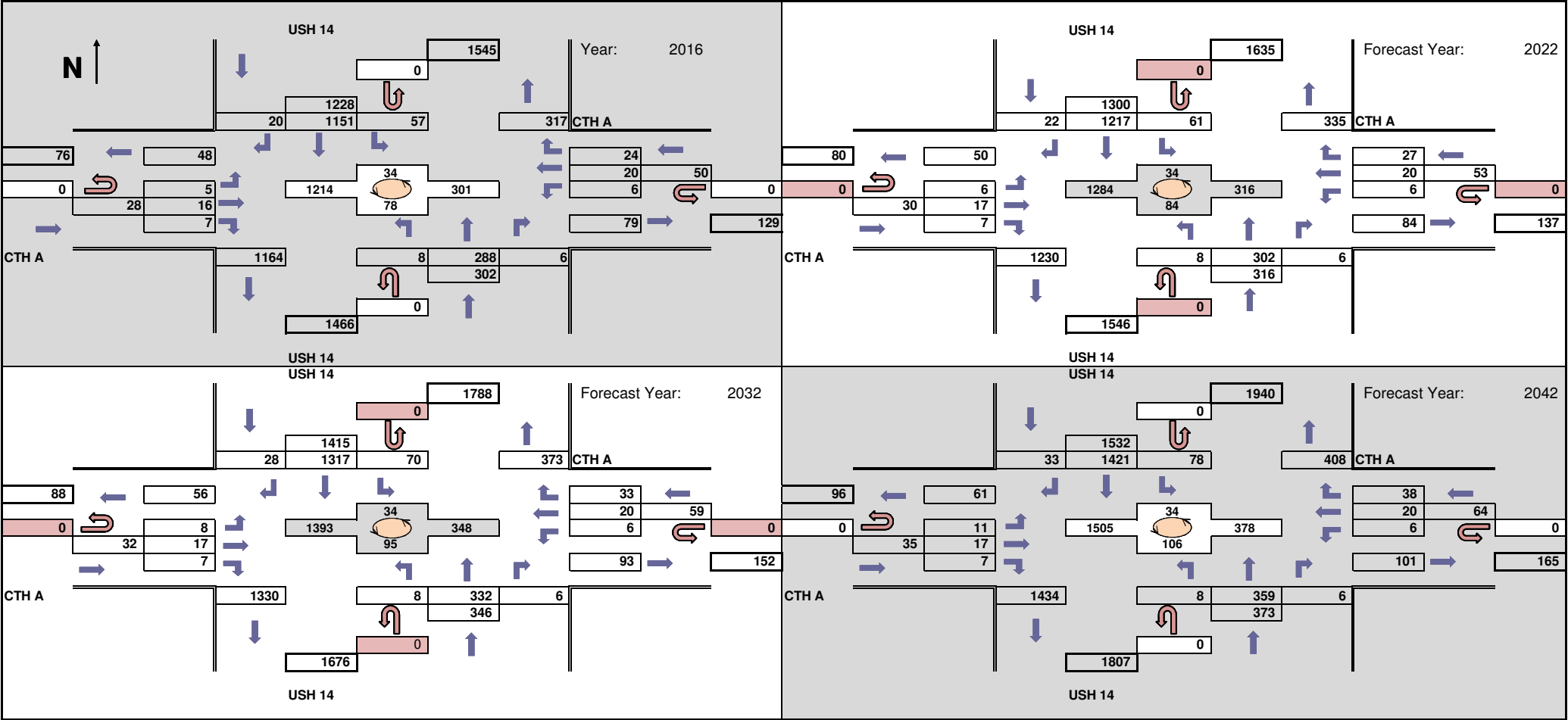
Design Hour: 4:30-5:30pm

Forecast Completed: 11/30/2016

Project Description

Project ID(s): 5155-04-05
Route(s): USH 14
Region/COUNTY(IES): SW/DANE
Location: USH 14 @ CTH A

Design Hour Turning Movement Data



WisDot Bureau of Planning
Traffic Forecasting Section
Forecast by: Vu Dang
Phone: 608-266-2571
Email: vu.dang@dot.wi.gov

Projected AM Design Hour Traffic Volumes



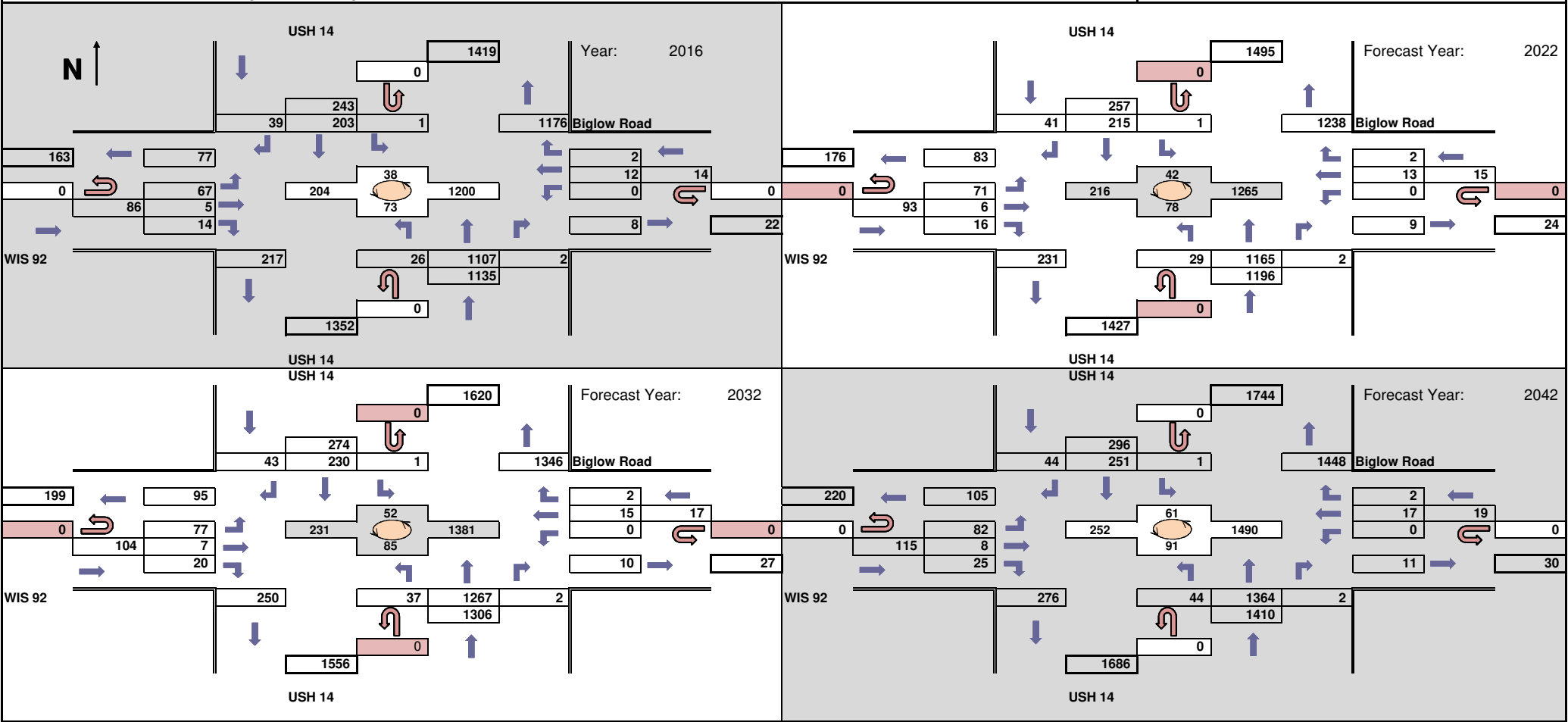
Design Hour: 7:00-8:00am

Forecast Completed: 11/30/2016

Project Description

Project ID(s): 5155-04-05
Route(s): USH 14
Region/COUNTY(IES): SW/DANE
Location: USH 14 @ STH 92

Design Hour Turning Movement Data



WisDot Bureau of Planning
Traffic Forecasting Section
Forecast by: Vu Dang
Phone: 608-266-2571
Email: vu.dang@dot.wi.gov

Projected PM Design Hour Traffic Volumes



Design Hour: 4:30-5:30pm

Forecast Completed: 11/30/2016

Project Description

Project ID(s): 5155-04-05
Route(s): USH 14
Region/COUNTY(IES): SW/DANE
Location: USH 14 @ STH 92

Design Hour Turning Movement Data

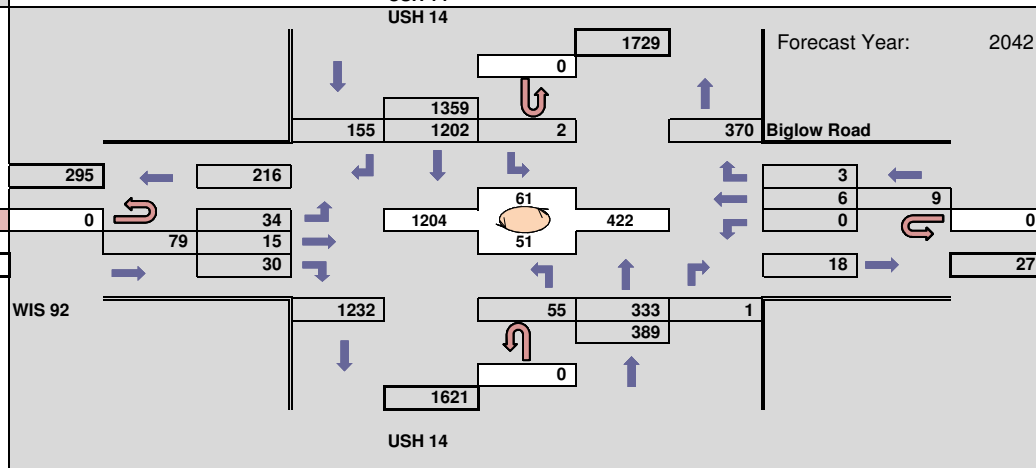
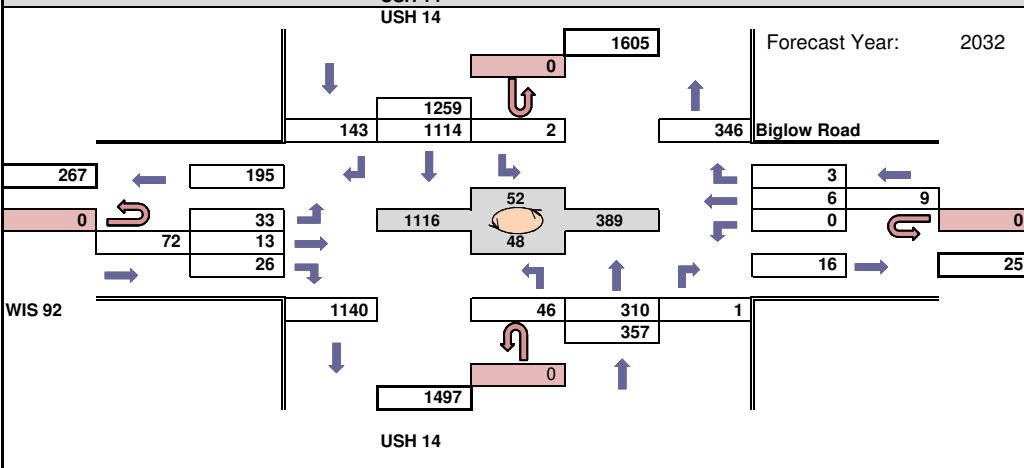
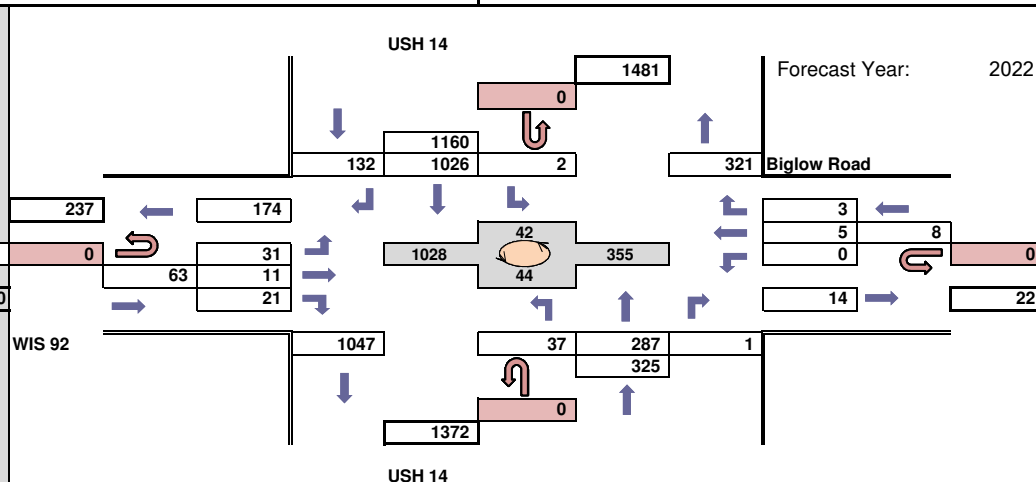
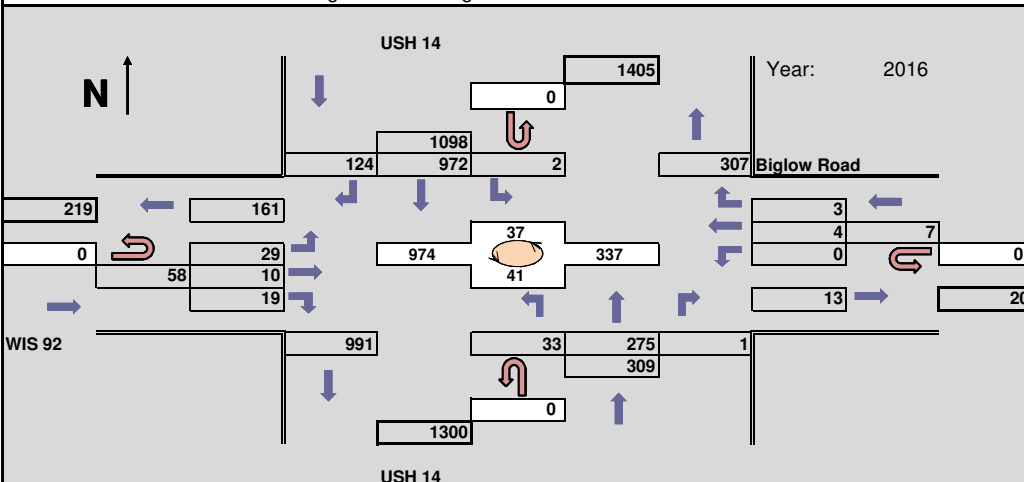


Exhibit 4

Safety Screening Analysis Worksheet

Safety Screening Analysis (SSA) Worksheet

| | |
|----------------------|----------------------------------------|
| Project ID: | 5155-04-05 |
| Highway: | USH 14 |
| Project Limits: | Oregon - Evansville (STH 138 - STH 92) |
| Project Description: | Resurface |
| Design Year: | 2042 |

| Identify Investigation Flags (IF) from MetaManager Safety Analysis (Meta-SA) | | | | | | | | | | Conduct Manual Safety Analysis (Man-SA) to validate MetaManager Safety Analysis (Meta-SA) | | | | | | | |
|------------------------------------------------------------------------------|-----------------|-------------|-----------------------------------------------------|-------------|--------------------------|------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| source | | | (from STN Log) | | PDP_Mile/ in MetaManager | RATEFLAG/ in MetaManager | MMGR_KAB_CRSH_RT/ in MetaManager | RORFLAG/ or INTFLAG/ or CRSHSPOT or MMGR_DRV_FL/ in MetaManager | | (pull from col. 19 in SS-CC worksheet) | (pull from col. 8 in SS-CC worksheet) | | | | | | |
| destination | | | | | | | | | | | | | | | | | |
| notes | | | | | | (Insert value if ≥ 1.0, otherwise leave blank) | (Insert value if ≥ 1.0, otherwise leave blank) | (Insert column name and value(s) if ≥ 1.0, otherwise leave blank) | Yes = Crash Rate Flag or KAB Crash Rate Flag ≥ 1.0 | SS-CC = Sub-Standard Controlling Criteria | | Using engineering judgement, validate the crashes that produced the Investigation Flag. If additional crashes are identified or if crashes were identified to be removed, explain why in column 13. | Identify the most likely cause(s) of the crashes including roadway, human and vehicle factors. If crashes were added or removed, explain why. This information should include a justification for how it was determined whether the existing SS-CC contributed to the Investigation Flag. | Yes if improving the eligible SS-CC would help to reduce the frequency or severity of the crashes that generated the IF No if improving the eligible SS-CC would NOT help to reduce the frequency or severity of the crashes that generated the IF NA (not applicable) if there is no eligible SS-CC in the roadway segment (i.e., col. (10) = No | Yes = PES Applies * if col. (14) = No * OR, if there is an eligible SS-CC but there is no IF No = PES does not Apply * if col. (14) = Yes NA (not applicable) * if there is no eligible SS-CC in the roadway segment (i.e., col. (10) = No | Yes * if there is no eligible SS-CC and no countermeasures have been employed to address the causes of the IF * OR, if a PES Applies and no countermeasures have been employed to address the causes of the IF * OR, if a PES does not Apply and improving the SS-CC is not sufficient to address the causes of the crashes No * if there is no IF * OR, if a PES Applies and other countermeasures have been employed to address the causes of the IF * OR, if a PES does not apply and improving the SS-CC is a sufficient countermeasure | What are proposed countermeasures for IF? Consider countermeasures such as geometric improvements, education, enforcement, other low-cost safety treatments, etc., either singly or in combination Explain if Existing Dimension in col. (14) of Design Criteria Evaluation Worksheet needs to be improved |
| col. No. | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| Heading: | PDP ID | From RP | RP Description | To RP | Length | Crash Rate Flag | KAB Crash Rate Flag | Possible Contributing Factors identified in MetaManager | Did MetaManager generate Investigation Flag? (Yes / No) | Are there existing SS-CC in the roadway segment that are eligible for a PES? (Yes / No) | Which SS-CC Exist? | If Crash Rate Flag or KAB Crash Rate Flag ≥ 1.0, was the flag verified? (Yes / No / N/A) | What are possible causes of the crash trend? | Does the existing eligible SS-CC contribute to the Investigation Flag (i.e. crashes)? (Yes / No / N/A) | Does PES Apply for eligible SS-CC? (Yes / No / N/A) | Does roadway segment contain un-addressed Investigation Flags? (Yes / No) | Proposed Recommendation from SSA |
| | 2792 | 014E216F030 | STH 138 to Hill Road | 014E217B000 | 0.38 | | 2.17 | RORFLAG = 2.17, CRSHSPOT = 1, MMGR_DRV_FL = 1 | Yes | No | | Yes | | | | No | |
| | 2792 Subsection | | Horizontal Curve H-2 | | | | | RORFLAG = 2.04, CRSHSPOT = 1.08 | Yes | | Horizontal Curve Radius Rmin | Yes | There are several run-off-road crashes at this location which can be attributed to a substandard horizontal curve. There is also a substandard vertical curve just south of this curve that may not allow drivers proper sight of the substandard curve. | Yes | No | | Enhance signing to better alert USH 14 drivers of upcoming horizontal curve. Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2793 | 014E217B000 | Hill Road to Oak Hill Road | 014E218000 | 0.67 | | | CRSHSPOT = 1 | Yes | Yes | | | | | | No | |
| | 2793 Subsection | | Hill Road Intersection | | | | | CRSHSPOT = 1.54 | Yes | | | Yes | Horizontal Curve H-2 immediately north of the intersection may contribute to crashes at the intersection as most of the crashes at the intersection are run-off-road crashes. | Yes | No | | Enhance signing to better alert USH 14 drivers of upcoming intersection. Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2793 Subsection | | Vertical Curve V-3 | | | | | SPOT KAB CRSH RT FL = 1.12 | Yes | | Minimum SSD not met | Yes | Substandard vertical curve may contribute to crashes south of vertical curve V-3. Crashes are run-off-road and head-on. | Yes | No | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2793 Subsection | | Vertical Curve V-4 | | | | | SPOT KAB CRSH RT FL = 1.12 | Yes | | Minimum SSD not met | Yes | Substandard vertical curve may contribute to crashes south of vertical curve V-4. Crashes are run-off-road and head-on. | Yes | No | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2793 Subsection | | Vertical Curve V-5 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2794 | 014E218000 | Oak Hill Road to CTH A | 014E219000 | 0.52 | | | | No | No | | | | | N/A | No | |
| | 2795 | 014E219000 | CTH A to Rome Corners Road | 014E221000 | 1.03 | 1.67 | | CRSHSPOT = 1, MMGR_DRV_FL = 1 | Yes | Yes | | Yes | | | | No | |
| | 2795 Subsection | | Horizontal Curve H-8 | | | | | | No | | Superelevation Rate | | | | Yes | | |
| | 2795 Subsection | | CTH A Intersection | | | | | SPOT CRSH RT FL = 3.48 | Yes | | | Yes | Lack of Intersection Sight Distance (ISD) along with grade of mainline (3.29%) may contribute to crashes. | | | | ISD will be improved by cutting back slopes and providing better vision northwest of the intersection. Shoulders will be widened from 3-feet to 5-feet. |
| | 2795 Subsection | | Grade between vertical curves V-8 and V-9 | | | | | | No | | Exceed Maximum Grade of 3.0% | | | | No, contributes to Crash Spot Flag for CTH A intersection. | | |
| | 2795 Subsection | | Horizontal Curve H-9 | | | | | | No | | Horizontal Curve Radius Rmin | | | | Yes | | |
| | 2795 Subsection | | Vertical Curve V-11 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2795 Subsection | | Horizontal Curve H-11 | | | | | SPOT KAB CRSH RT FL = 1.36 | Yes | | Horizontal Curve Radius Rmin | Yes | Horizontal Curve H-11 along with Vertical Curve V-12 are both substandard and may contribute to run-off-road crashes at this location. | Yes | No | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2795 Subsection | | Vertical Curve V-12 | | | | | SPOT KAB CRSH RT FL = 1.36 | Yes | | Minimum SSD not met | Yes | Horizontal Curve H-11 along with Vertical Curve V-12 are both substandard and may contribute to run-off-road crashes at this location. | Yes | No | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |
| | 2795 Subsection | | Vertical Curve V-13 | | | | | | No | | Minimum SSD not met | | | | No, contributes to Crash Spot Flag for Rome Corners Road intersection. | | |
| | 2795 Subsection | | Vertical Curve V-14 | | | | | | No | | Minimum SSD not met | | | | No, contributes to Crash Spot Flag for Rome Corners Road intersection. | | |
| | 2796 | 014E221000 | Rome Corners Road to W Rutland Road | 014E223000 | 1.36 | | | CRSHSPOT = 2, MMGR_DRV_FL = 1 | Yes | Yes | | | | | | No | |
| | 2796 Subsection | | Rome Corners Road Intersection | | | | | SPOT CRSH RT FL = 1.55 | Yes | | | Yes | Vertical Curves V-13 and V-14 do not meet minimum SSD and may contribute to crashes at this location. | Yes | No | | Enhance signing to better alert USH 14 drivers of upcoming intersection and wider paved shoulders allowing more avoidance maneuvers. |
| | 2796 Subsection | | Old Stage Road Intersection | | | | | SPOT CRSH RT FL = 1.16 | Yes | | | Yes | Vertical Curves V-15 and V-16 do not meet minimum SSD and the maximum grade between V-15 and V-16 exceeds 3%, all of which may contribute to crashes at this location. | Yes | No | | Enhance signing to better alert USH 14 drivers of upcoming intersection and wider paved shoulders allowing more avoidance maneuvers. |
| | 2796 Subsection | | Vertical Curve V-15 | | | | | | No | | Minimum SSD not met | | | | No, contributes to Crash Spot Flag for Old Stage Road intersection. | | |
| | 2796 Subsection | | Grade between vertical curves V-15 and V-16 | | | | | | No | | Exceed Maximum Grade of 3.0% | | | | No, contributes to Crash Spot Flag for Old Stage Road intersection. | | |
| | 2796 Subsection | | Vertical Curve V-16 | | | | | | No | | Minimum SSD not met | | | | No, contributes to Crash Spot Flag for Old Stage Road intersection. | | |
| | 2796 Subsection | | Vertical Curve V-17 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2796 Subsection | | Vertical Curve V-18 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2796 Subsection | | Vertical Curve V-19 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2796 Subsection | | Grade between vertical curves V-19 and V-20 | | | | | | No | | Exceed Maximum Grade of 3.0% | | | | Yes | | |
| | 2796 Subsection | | Vertical Curve V-20 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2796 Subsection | | Vertical Curve V-22 | | | | | | No | | Minimum SSD not met | | | | Yes | | |
| | 2797 | 014E223000 | W Rutland Road to 0.04 miles east of W Rutland Road | 014E223004 | 0.04 | 2.51 | | INTFLAG = 1.09, CRSHSPOT = 1 | Yes | No | | Yes | | | | No | |
| | 2797 Subsection | | Horizontal Curve H-15 | | | | | CRSHSPOT = 1.16 | Yes | | Horizontal Curve Radius Rmin | Yes | Substandard horizontal curve H-15 may cause of run-off-road crashes. | Yes | No | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. |

| Identify Investigation Flags (IF) from MetaManager Safety Analysis (Meta-SA) | | | | | | | | | | | | | | | | | Conduct Manual Safety Analysis (Man-SA) to validate MetaManager Safety Analysis (Meta-SA) | | | | | | | | | | | | | | | | |
|------------------------------------------------------------------------------|--------------------|------------|-----------------------------------------------|------------|-------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| source | | | (from STN Log) | | PDP_Mile in MetaManager | RATEFLAG in MetaManager | MMGR_KAB_CRSH_RT in MetaManager | RORFLAG' or 'INTFLAG' or 'CRSHSPOT' or 'MMGR_DRV_FL' in MetaManager | | (pull from col. 19 in SS-CC worksheet) | (pull from col. 8 in SS-CC worksheet) | | | | | | | | | | | | | | | | | | | | | | |
| destination | | | | | | | | | | | | | | | | Col. 20 of the Design Criteria Evaluation worksheet | | | | | | | | | | | | | | | | | |
| notes | | | | | | (Insert value if ≥ 1.0, otherwise leave blank) | (Insert value if ≥ 1.0, otherwise leave blank) | (Insert column name and value(s) if ≥ 1.0, otherwise leave blank) | Yes = Crash Rate Flag or KAB Crash Rate Flag ≥ 1.0 | SS-CC = Sub-Standard Controlling Criteria | | Using engineering judgement, validate the crashes that produced the Investigation Flag. If additional crashes are identified or if crashes were identified to be removed, explain why in column 13. | Identify the most likely cause(s) of the crashes including roadway, human and vehicle factors. If crashes were added or removed, explain why. This information should include a justification for how it was determined whether the existing SS-CC contributed to the Investigation Flag. | Yes if improving the eligible SS-CC would help to reduce the frequency or severity of the crashes that generated the IF No if improving the eligible SS-CC would NOT help to reduce the frequency or severity of the crashes that generated the IF NA (not applicable) if there is no eligible SS-CC in the roadway segment (i.e., col. (10) = No | Yes = PES Applies * if col. (14) = No * OR, if there is an eligible SS-CC but there is no IF No = PES does not Apply * if col. (14) = Yes NA (not applicable) * if there is no eligible SS-CC in the roadway segment (i.e., col. (10) = No | Yes * if there is no eligible SS-CC and no countermeasures have been employed to address the causes of the IF * OR, if a PES Applies and no countermeasures have been employed to address the causes of the IF * OR, if a PES does not Apply and improving the SS-CC is not sufficient to address the causes of the crashes No * if there is no IF * OR, if a PES Applies and other countermeasures have been employed to address the causes of the IF * OR, if a PES does not apply and improving the SS-CC is a sufficient countermeasure | What are proposed countermeasures for IF? Consider countermeasures such as geometric improvements, education, enforcement, other low- cost safety treatments, etc., either singly or in combination Explain if Existing Dimension in col. (14) of Design Criteria Evaluation Worksheet needs to be improved | | | | | | | | | | | | | | | | |
| col. No. | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | | | | | | | | | | | | | | | | |
| Heading: | PDP ID | From RP | RP Description | To RP | Length | Crash Rate Flag | KAB Crash Rate Flag | Possible Contributing Factors identified in MetaManager | Did MetaManager generate Investigation Flag? (Yes / No) | Are there existing SS- CC in the roadway segment that are eligible for a PES? (Yes / No) | Which SS-CC Exist? | If Crash Rate Flag or KAB Crash Rate Flag ≥ 1.0, was the flag verified? (Yes / No / N/A) | What are possible causes of the crash trend? | Does the existing eligible SS-CC contribute to the Investigation Flag (i.e. crashes)? (Yes / No / N/A) | Does PES Apply for eligible SS-CC? (Yes / No / N/A) | Does roadway segment contain un-addressed Investigation Flags? (Yes / No) | Proposed Recommendation from SSA | | | | | | | | | | | | | | | | |
| | 2797 Subsection | | W Rutland Road Intersection | | | | | CRSHSPOT = 1.16 | Yes | | | Yes | The intersection of W Rutland Road is on the outside of substandard curve H-15, which may contribute to the run-off-road crashes at this location. | | No | | Enhance signing to better alert USH 14 drivers of upcoming intersection and wider paved shoulders allowing more avoidance maneuvers. | | | | | | | | | | | | | | | | |
| | 2798 | 014E223004 | 0.04 mile east of W Rutland Road to STH 92 | 014E224000 | 0.67 | 1.45 | 1.7 | RORFLAG = 1.70, CRSHSPOT = 1, MMGR_DRV_FL = 1 | Yes | Yes | | | | | | No | | | | | | | | | | | | | | | | | |
| | 2798 Subsection | | Horizontal Curve H-16 | | | | | | No | | Horizontal Curve Radius Rmin | | | | Yes | | | | | | | | | | | | | | | | | | |
| | 2798 Subsection | | Spot Location at Sta. 345+00 | | | | | CRSH SPOT KAB = 1.36 | Yes | | | Yes | Driveway locations and possible narrow shoulders. | | N/A | | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. | | | | | | | | | | | | | | | | |
| | 2798 Subsection | | Horizontal Curve H-17 | | | | | CRSHSPOT = 1.35 | Yes | | Superelevation Rate | Yes | Substandard superelevation of horizontal curve H-17 may cause of run-off-road and multi-vehicle crashes. | Yes | N/A | No | Paved shoulders will be widened from 3-feet to 5-feet and rumble strips will be added to both the centerline and shoulder which should result in fewer crashes. Superelevation will be corrected with overlay. Roundabout constructed south of curve is also expected to reduce crashes at the curve. | | | | | | | | | | | | | | | | |

Exhibit 5

*Existing Alignments and Profiles with
Design Justification Areas*

DESIGN JUSTIFICATION #1

DESIGN JUSTIFICATION #2

PI STA = 132+64.60
Y = 423516.605
X = 828191.631
DELTA = 27°08'04"
D = 5°54'11"
T = 234.23'
L = 459.67'
R = 970.62'
PC STA = 130+30.37
PT STA = 134+90.04

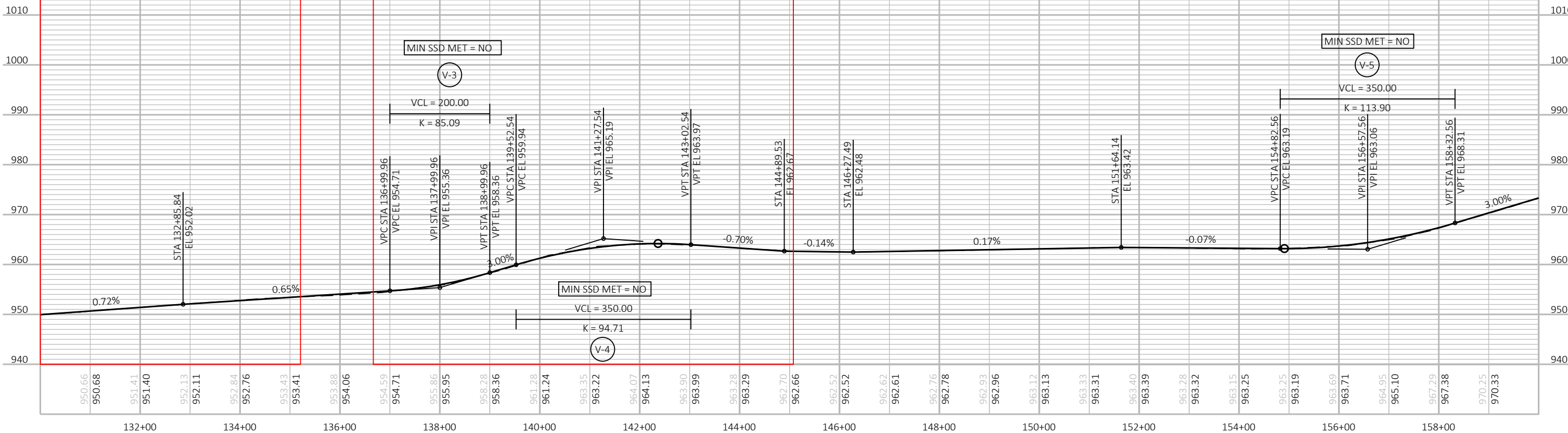
EXIST RADIUS = 970.62'
EXIST e = 5.3% - 7.2%
REQ'D e = 5.9% (50 mph)

PI STA = 141+77.46
Y = 422778.278
X = 828743.275
DELTA = 4°55'09"
D = 0°55'16"
T = 267.23'
L = 534.13'
R = 6221.11'
PC STA = 139+10.23
PT STA = 144+44.36

EXIST RADIUS = 6221.11'
EXIST e = 2.7% - 3.4%
REQ'D e = 2.9%

PI STA = 149+61.32
Y = 422112.130
X = 829157.047
DELTA = 1°33'54"
D = 0°27'02"
T = 173.70'
L = 347.38'
R = 12717.90'
PC STA = 147+87.62
PT STA = 151+35.01

EXIST RADIUS = 12717.90'
EXIST e = 1.2% - 2.4%
REQ'D e = NC



PROJECT NO: 5155-04-05

HWY: USH 14

COUNTY: DANE

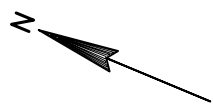
PLAN AND PROFILE: USH 14 - EXISTING

SHEET

E

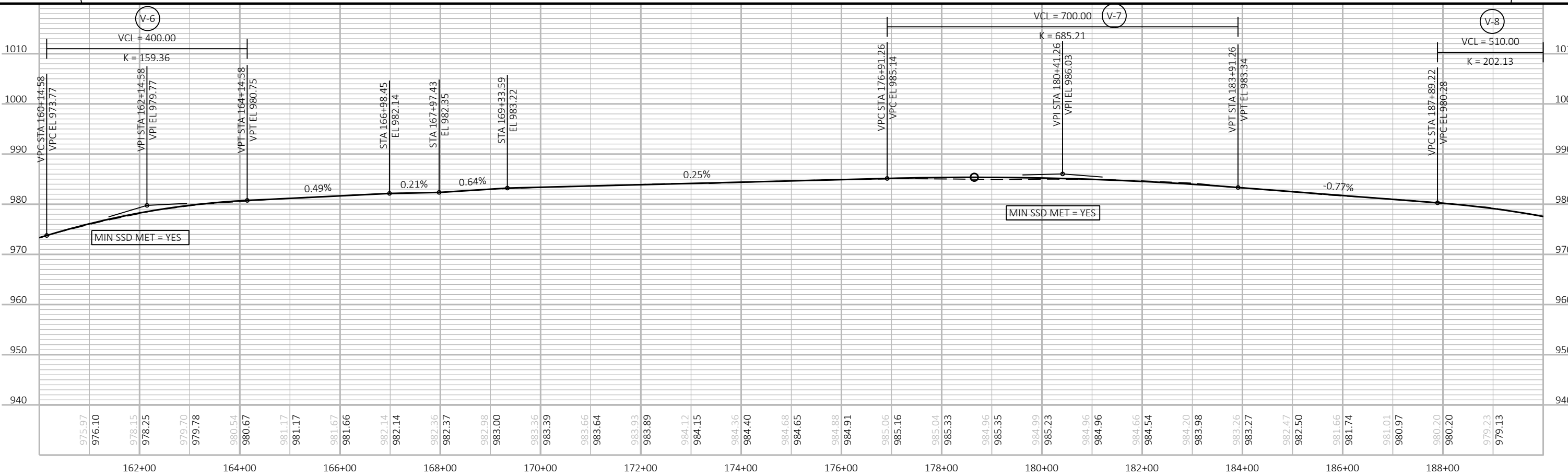
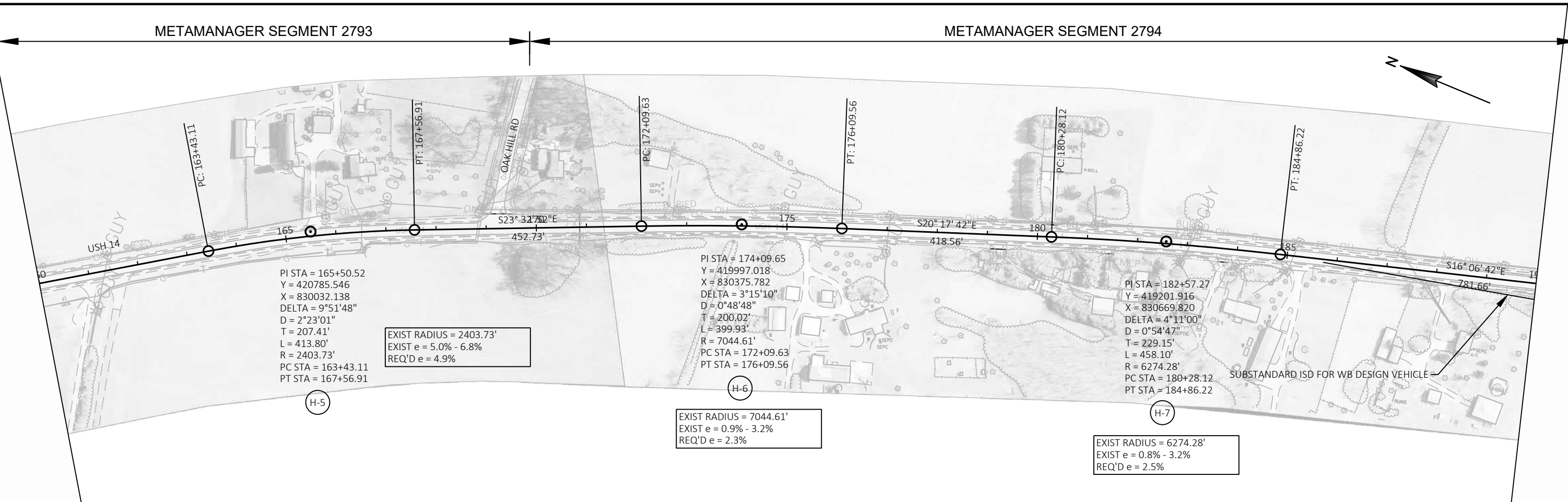
METAMANAGER SEGMENT 2793

METAMANAGER SEGMENT 2794

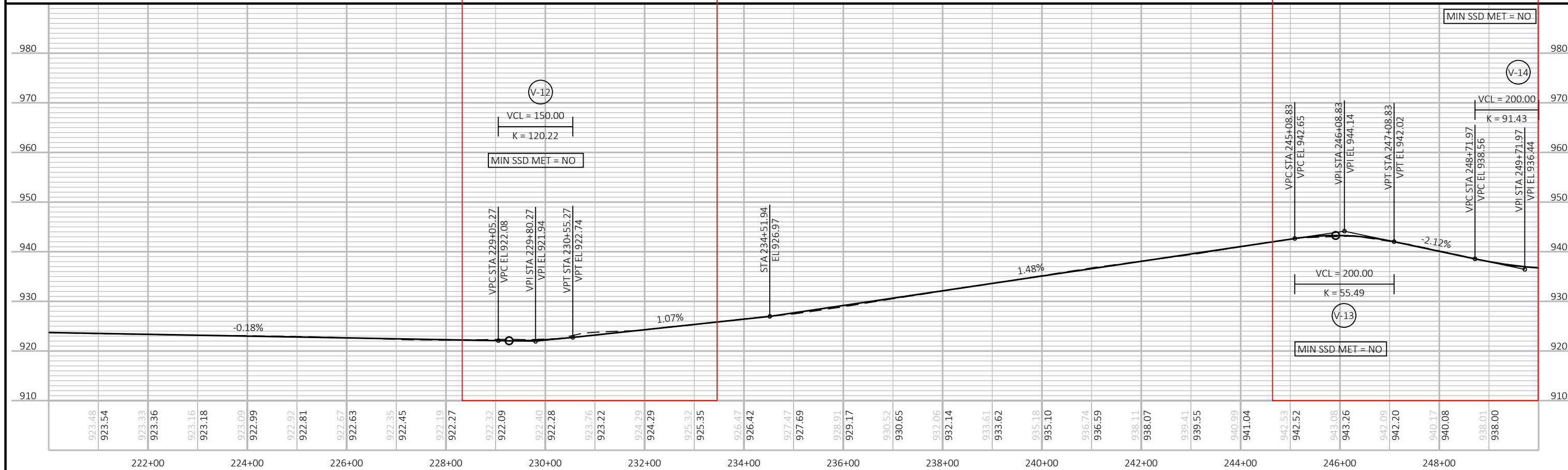
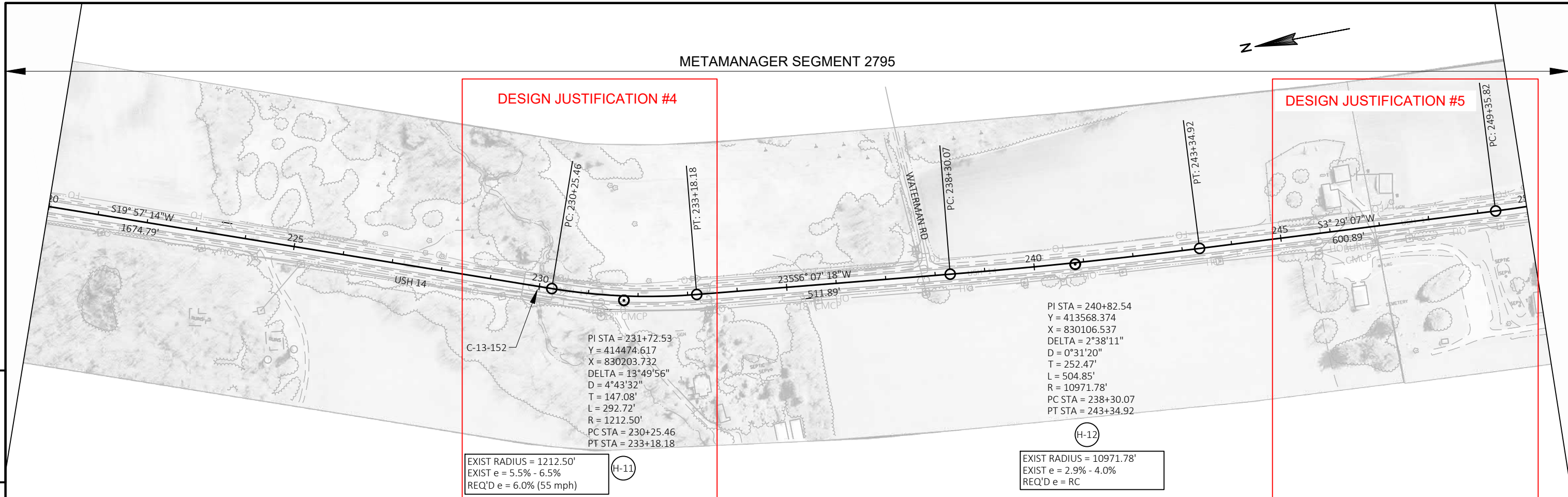


5

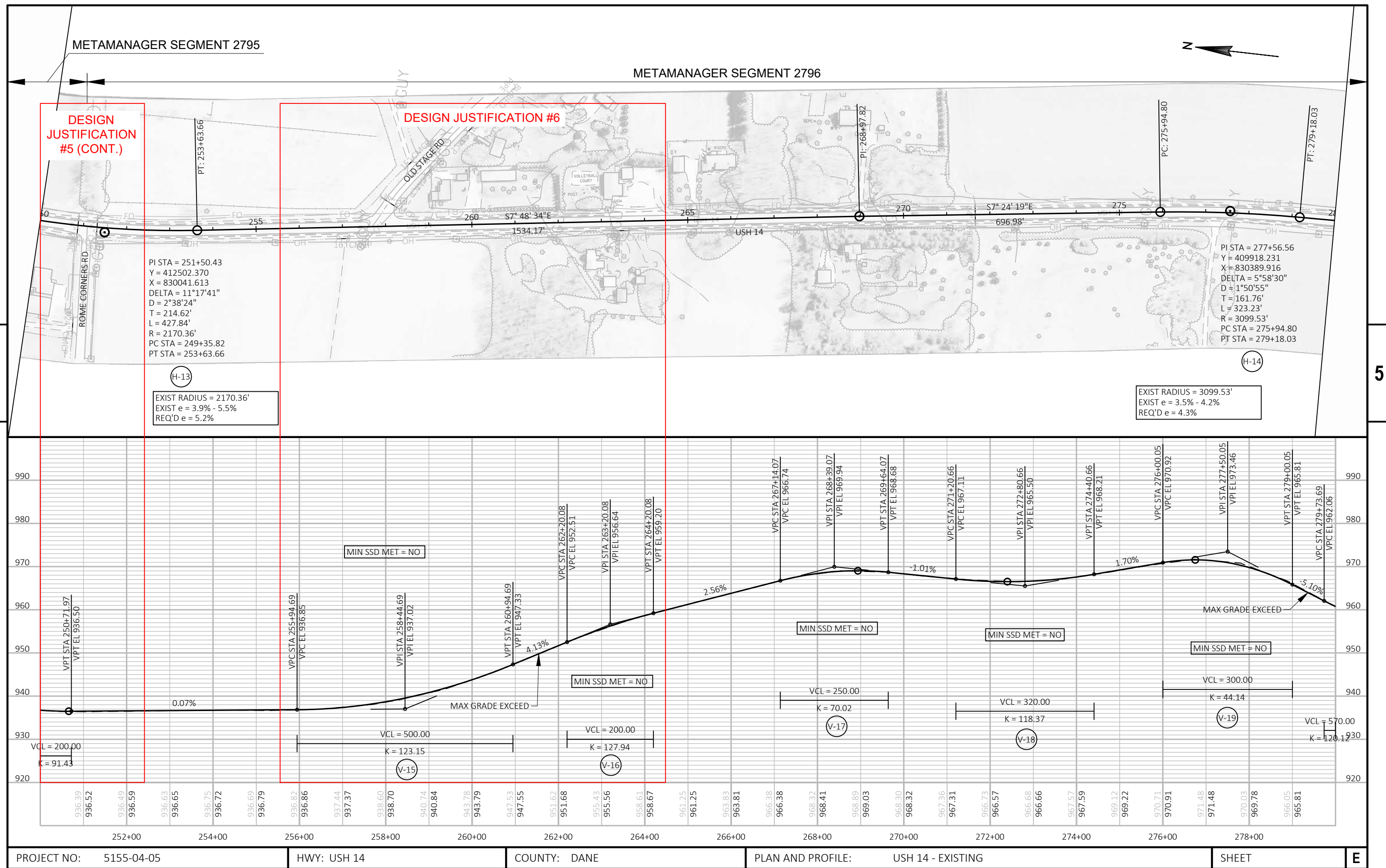
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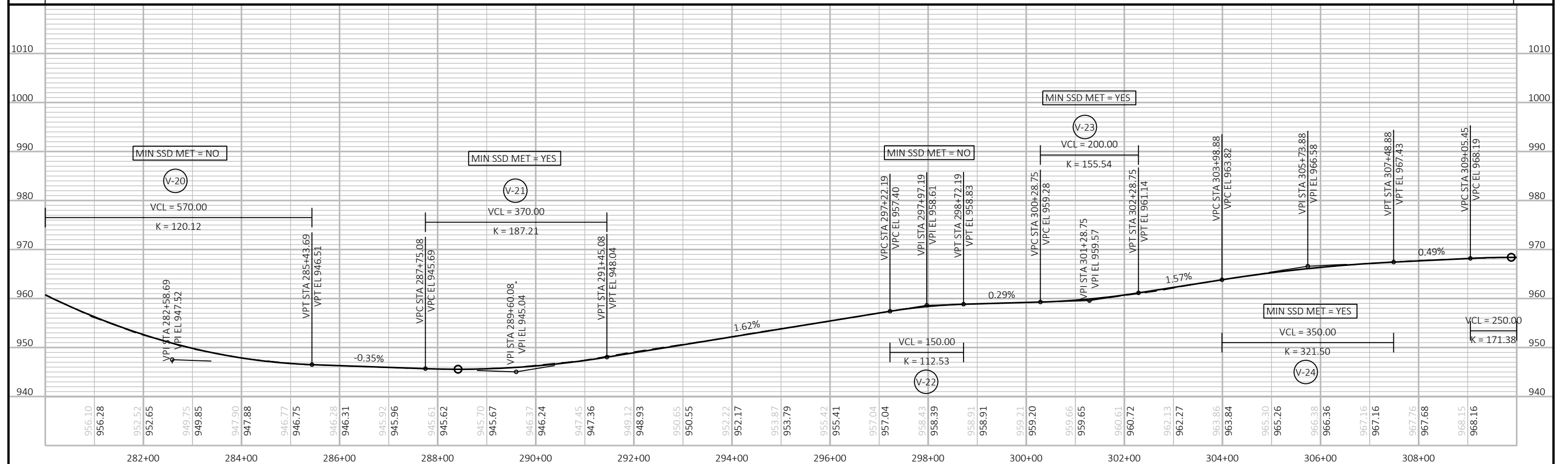
| | | | | |
|------------------------|-------------|--------------|-------------------------------------|---------|
| PROJECT NO: 5155-04-05 | HWY: USH 14 | COUNTY: DANE | PLAN AND PROFILE: USH 14 - EXISTING | SHEET E |
|------------------------|-------------|--------------|-------------------------------------|---------|



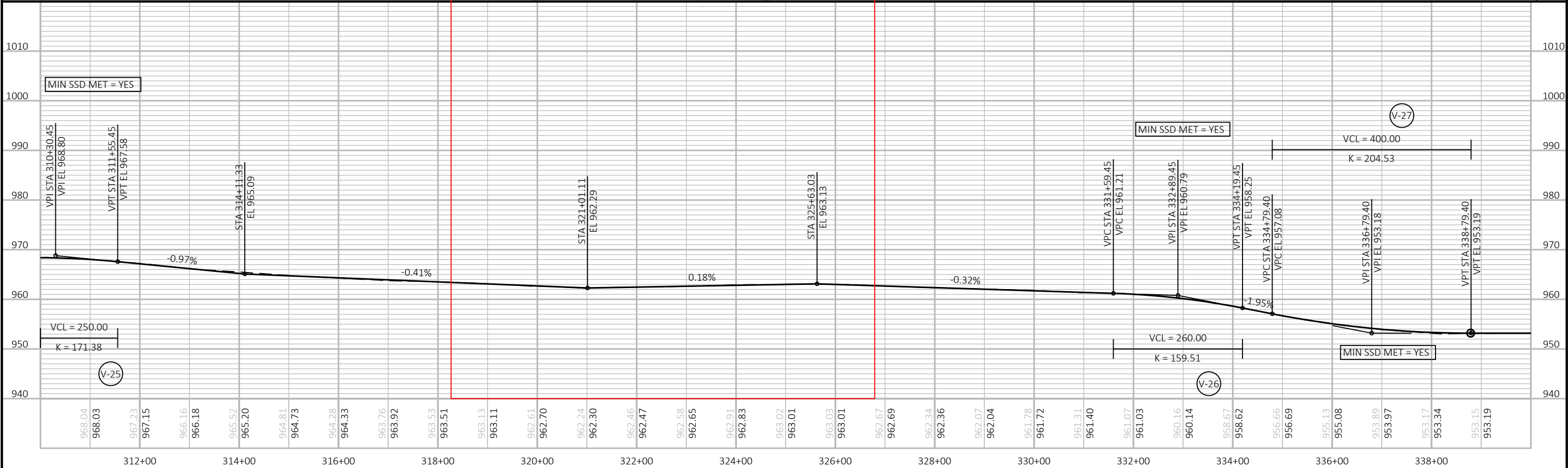
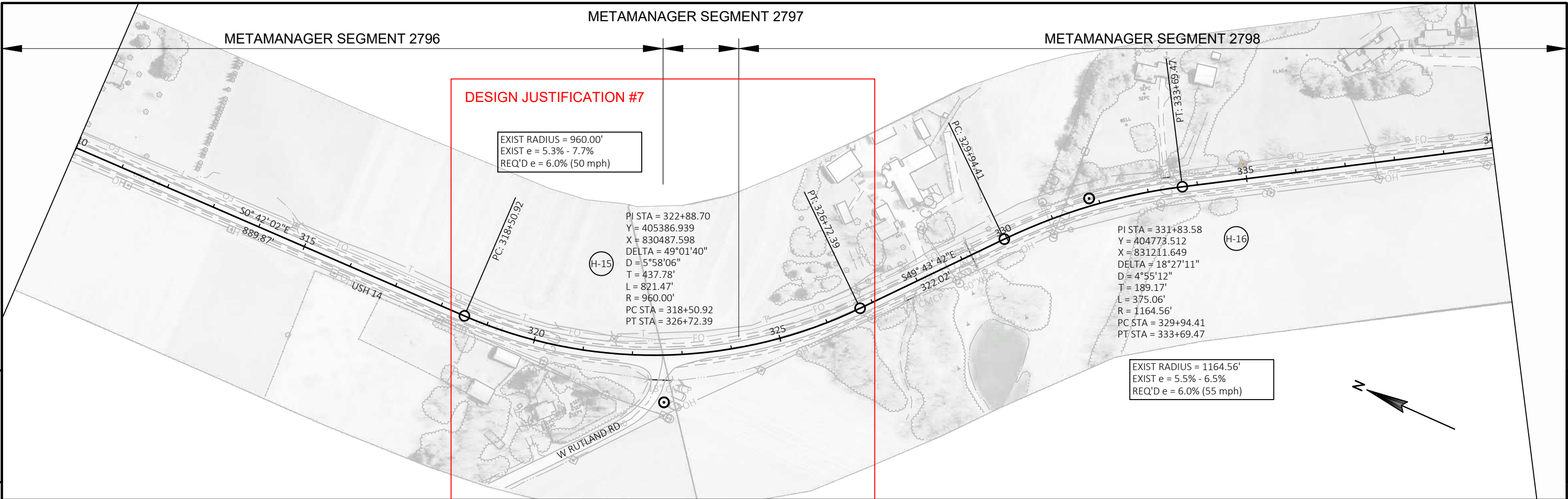
| | | | | | |
|------------------------|-------------|--------------|-------------------------------------|-------|---|
| PROJECT NO: 5155-04-05 | HWY: USH 14 | COUNTY: DANE | PLAN AND PROFILE: USH 14 - EXISTING | SHEET | E |
|------------------------|-------------|--------------|-------------------------------------|-------|---|



z



5



| | | | | |
|------------------------|-------------|--------------|-------------------------------------|---------|
| PROJECT NO: 5155-04-05 | HWY: USH 14 | COUNTY: DANE | PLAN AND PROFILE: USH 14 - EXISTING | SHEET E |
|------------------------|-------------|--------------|-------------------------------------|---------|

METAMANAGER SEGMENT 2798

PI STA = 351+19.43
Y = 403116.167
X = 832218.351
DELTA = 13°04'29"
D = 4°19'59"
T = 151.52'
L = 301.73'
R = 1322.26'
PC STA = 349+67.91
PT STA = 352+69.64

EXIST RADIUS = 1322.26'
EXIST e = 3.9% - 4.6%
REQ'D e = 6.0%

(H-17)

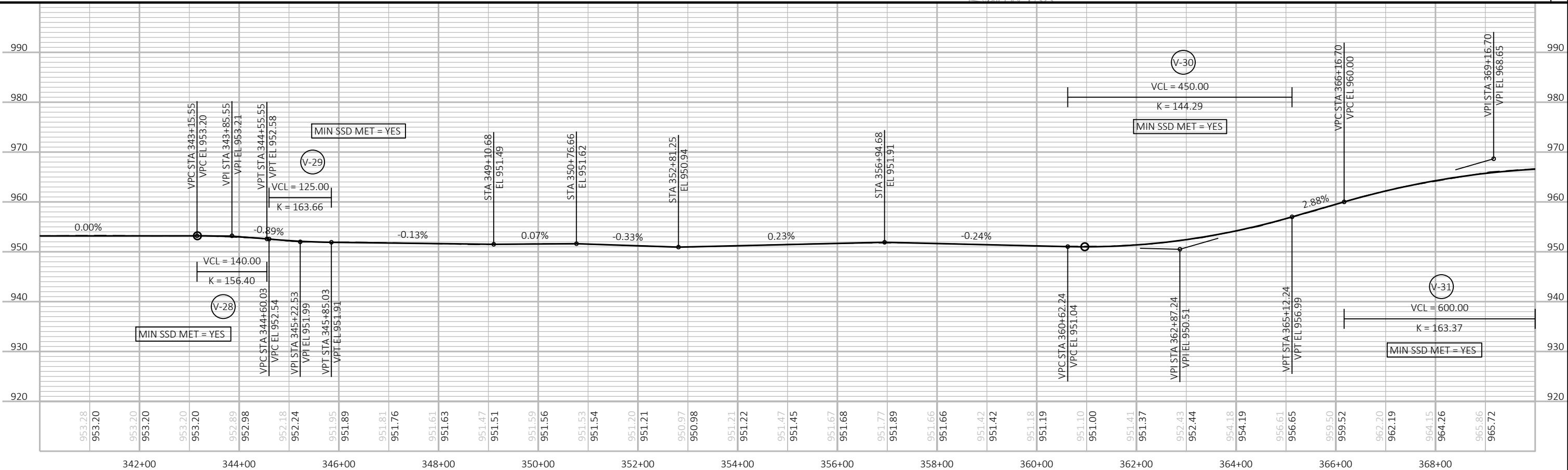
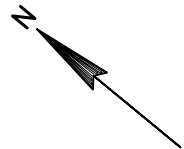
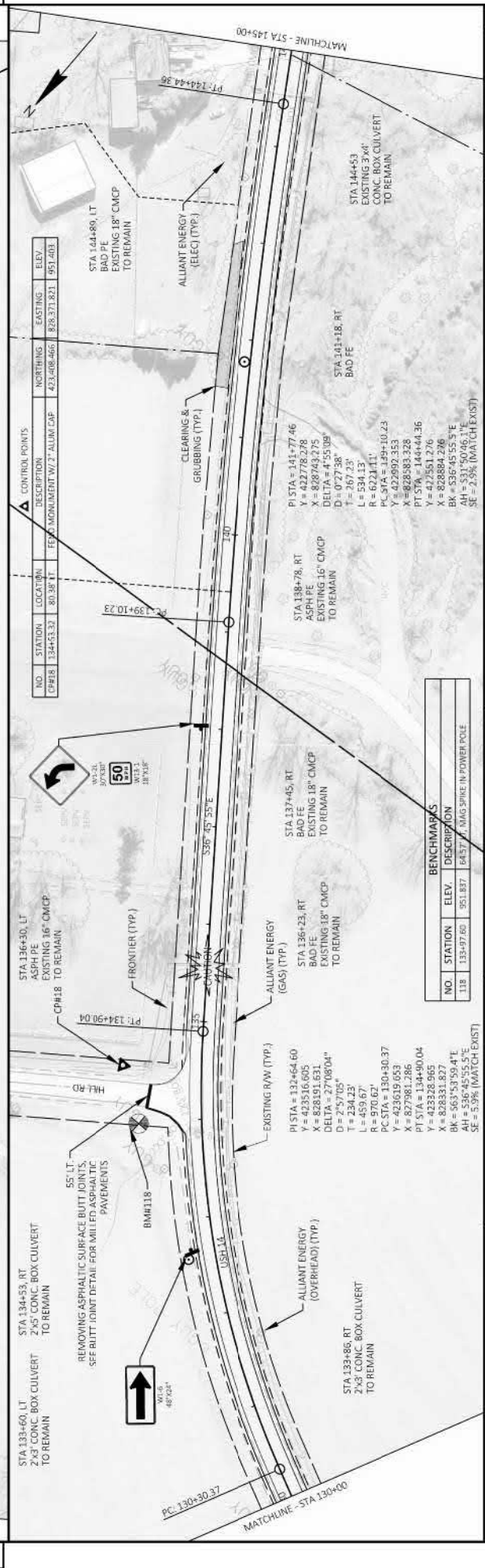
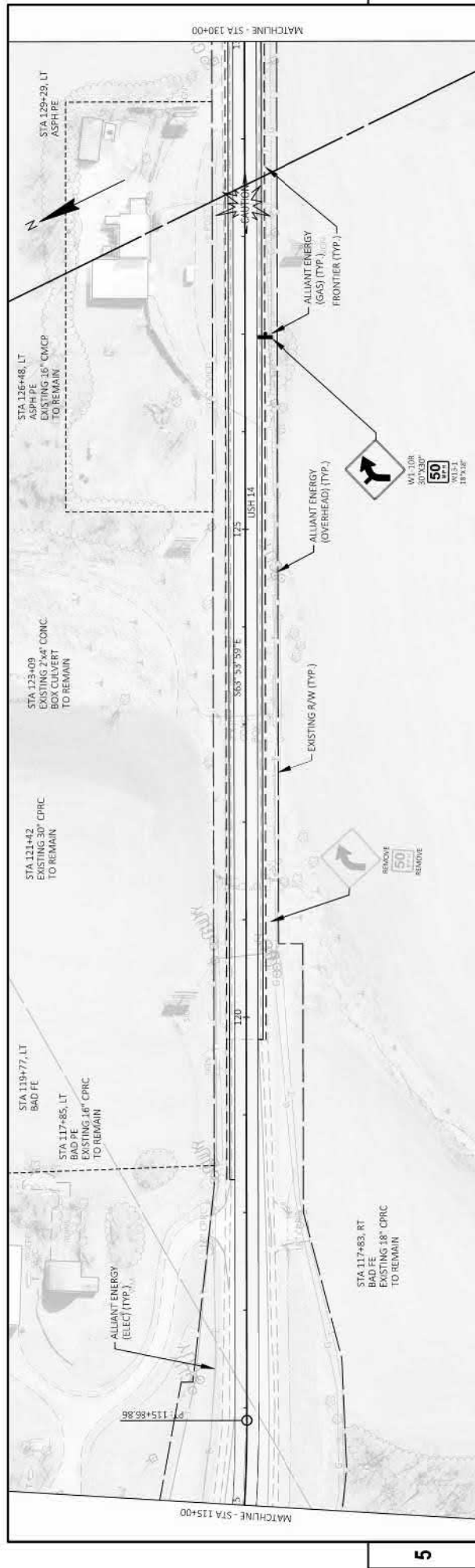
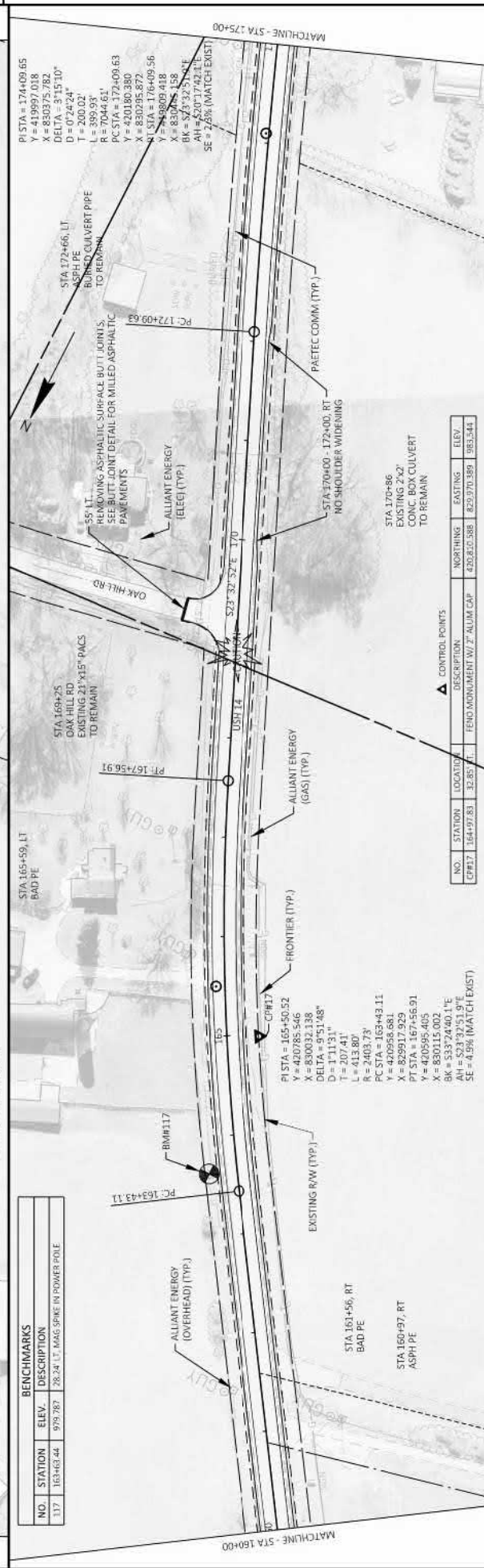
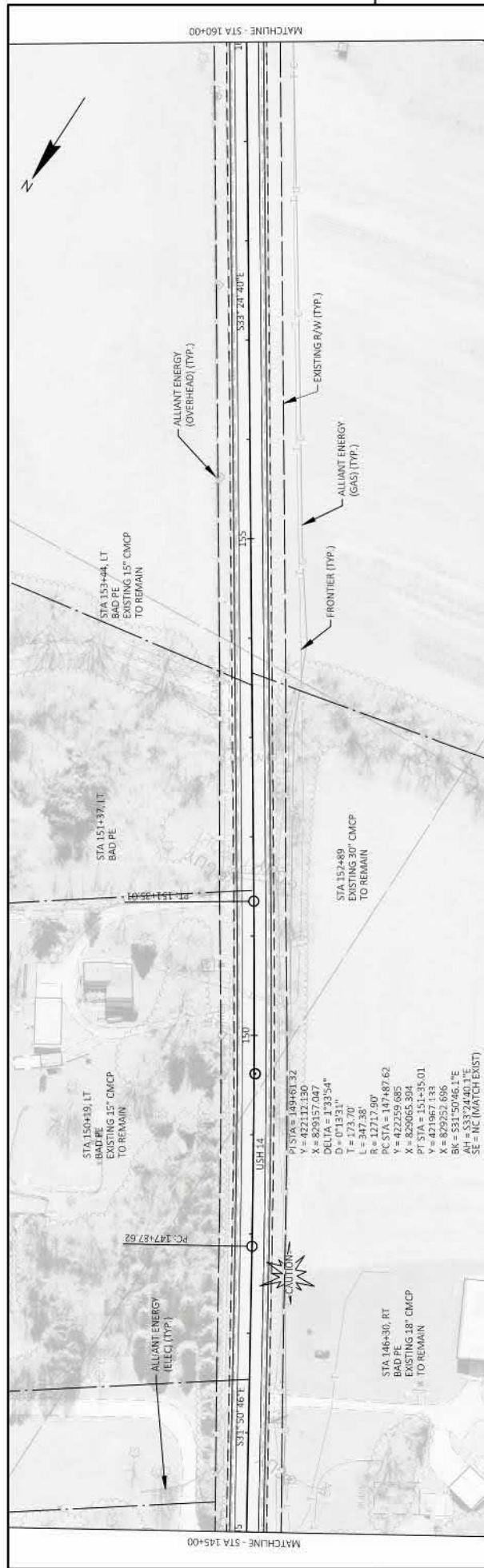


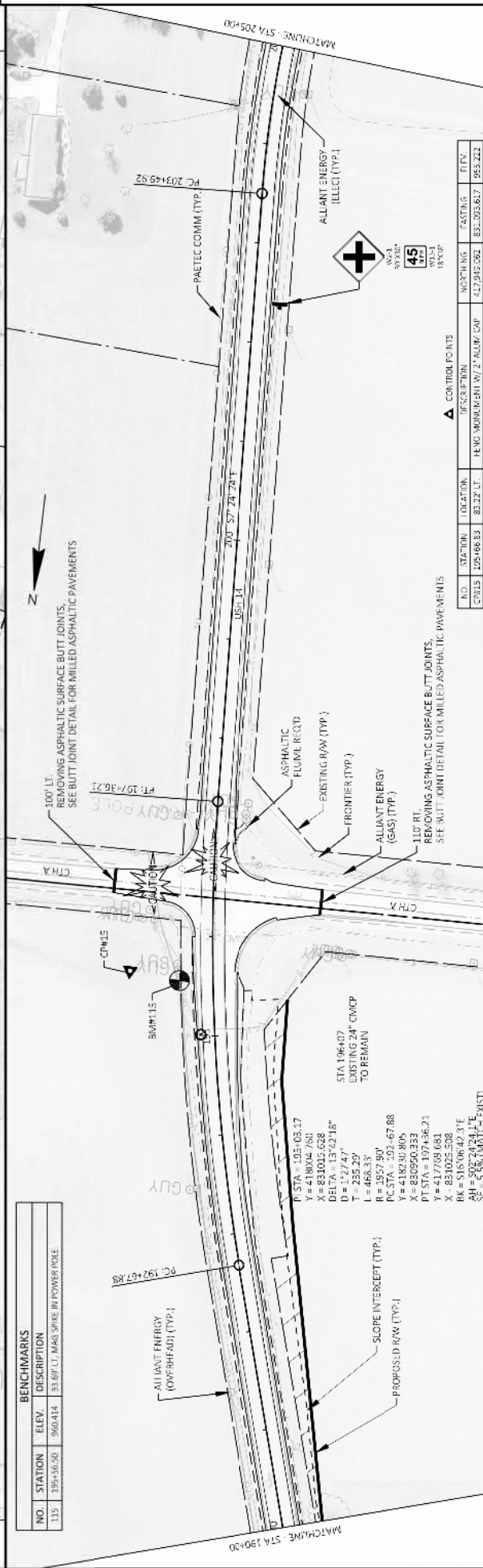
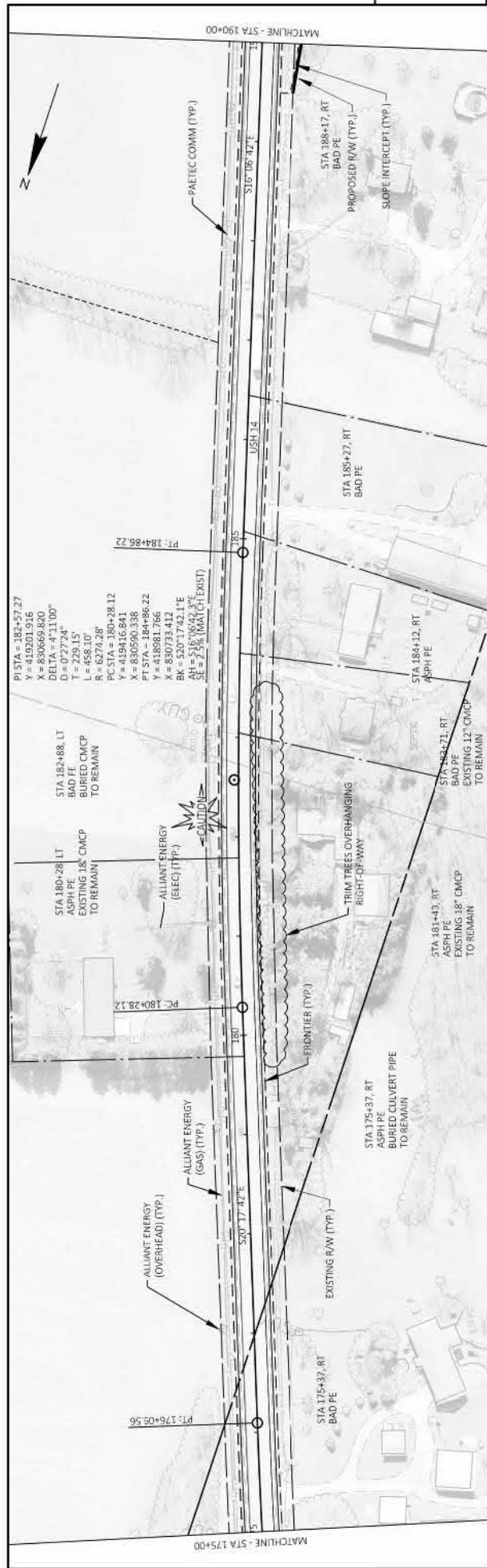
Exhibit 6

Preliminary Plan Sheets

| NO. | STATION | LOCATION | DESCRIPTION | NORTHING | EASTING | ELEV. |
|-------|----------|------------|------------------------------|-------------|-------------|---------|
| CPI#9 | 11197.75 | 97.24' FT. | FEND MONUMENT W/ 2" ALUM CAP | 424,398.397 | 825,298.320 | 966.368 |





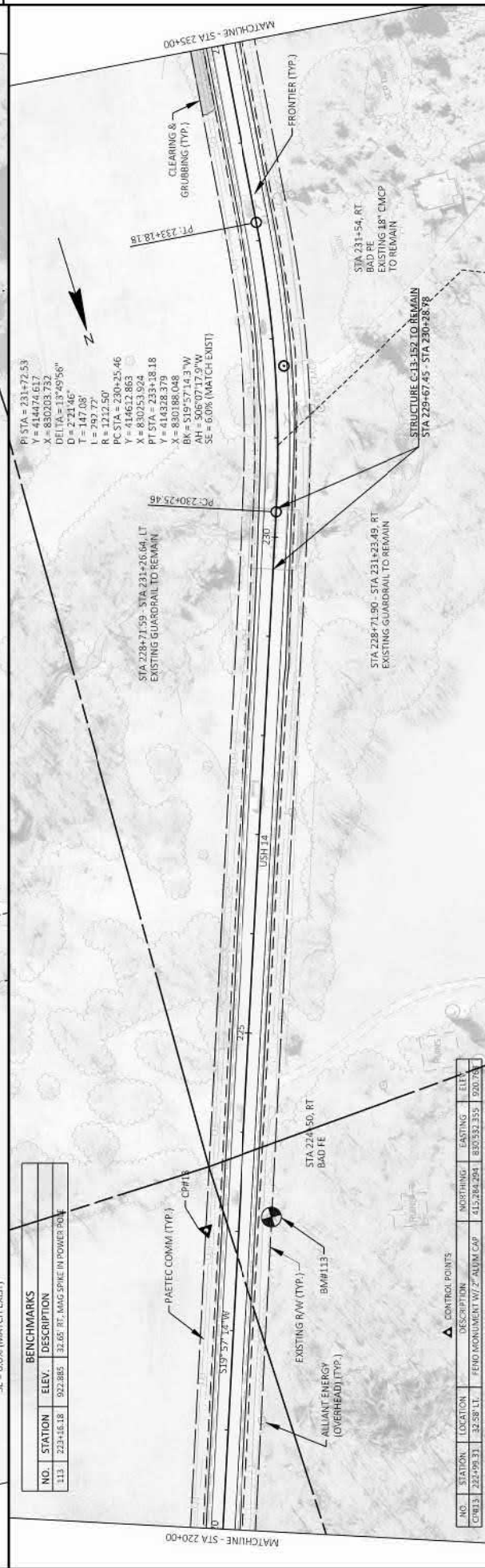
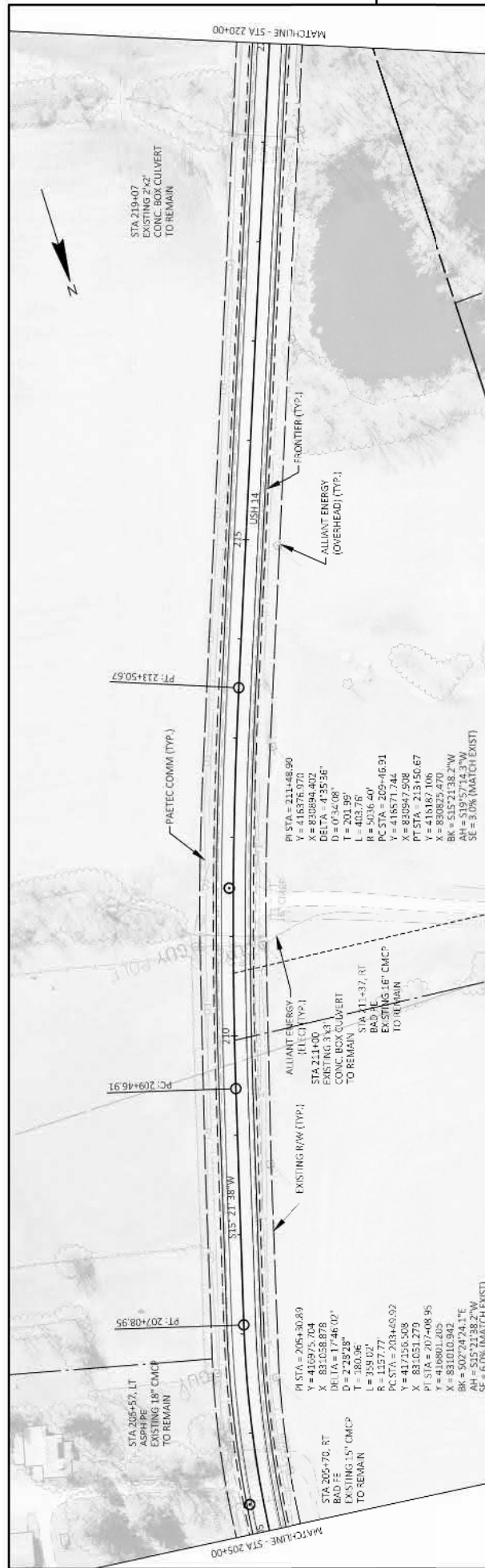


| Δ CONTROL POINTS | | | | | |
|------------------|-----------|------------|-------------------------------|--------------|---------|
| NO. | STATION | LOCATION | DESCRIPTION | WEIGHTING | FLYV. |
| CP115 | 195+66.83 | 83.22' LT. | PLUG MONUMENT W/ 2' ALUM' CAP | 417,943.6617 | 955.222 |

1

X = 831025.508
BK = S16°06'42.3"E
AH = S02°24'24.1"E
SE = S58°16'41.7"E (ST)

[illegible]



| CONTROL POINTS | | | | | | |
|----------------|-----------|------------|------------------------------|-------------|-------------|---------|
| NO. | STATION | LOCATION | DESCRIPTION | NORTHING | EASTING | ELEV. |
| CP#13 | 222+99.31 | 32.58' LT. | FENO MONUMENT W/ 2" ALUM CAP | 415,284.294 | 830,532.355 | 920.763 |

PROJECT NO: 5155-04-81

FILE NAME : P:\905\93\00033386\CADD\C3D\51550405\SHEETS\PLAN\50201-PN-81.DWG
ABOUT NAME : 05/02/05-PN

COUNTY: DANE

PLOT DATE : 7/19/2019 8:32 AM

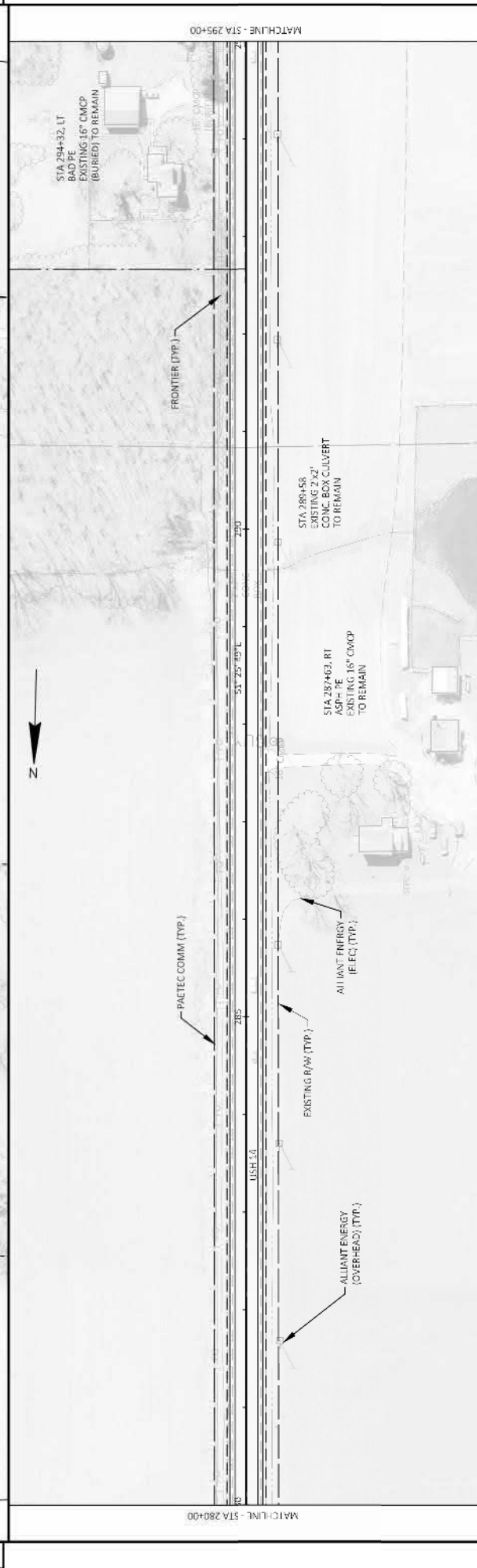
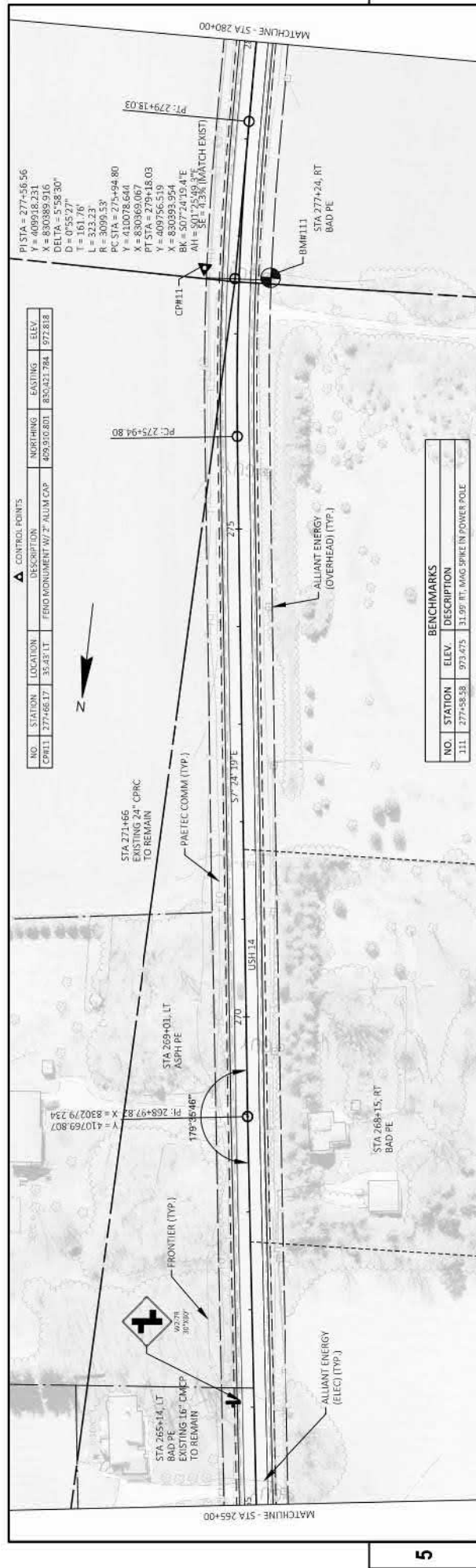
PLAN - U5H 14

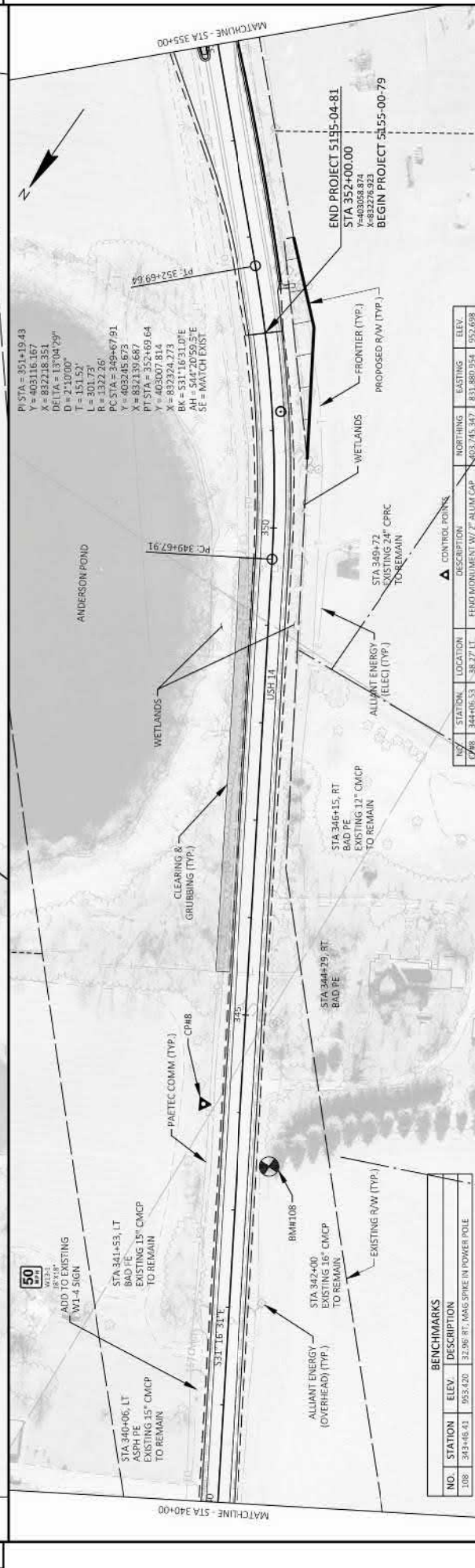
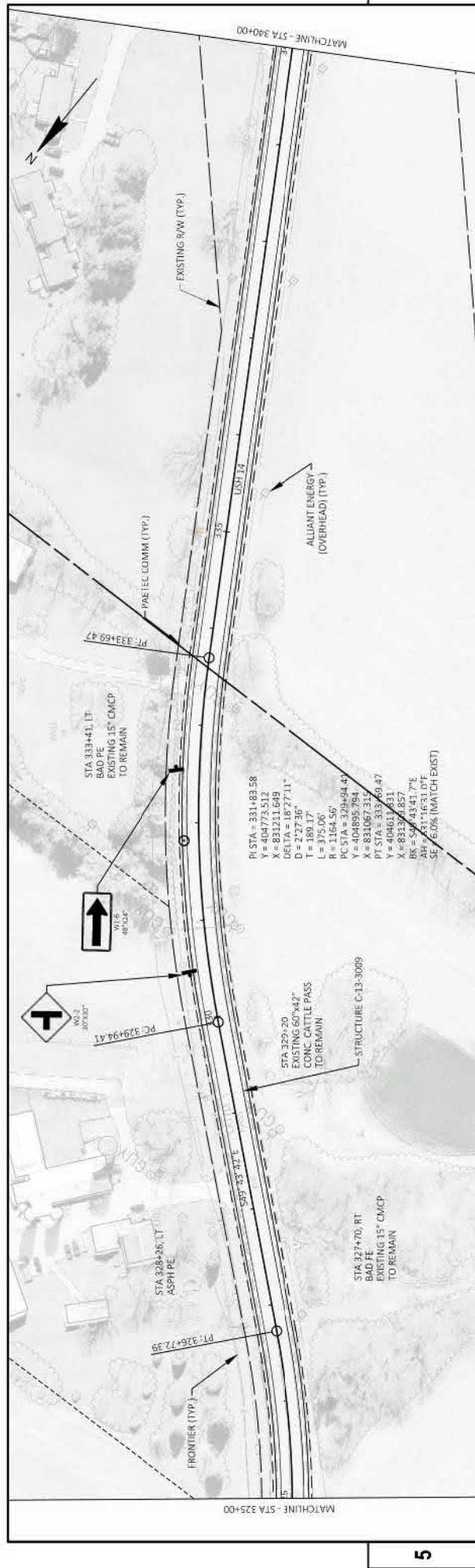
PLOT NAME:

SHEET

PLOT SCALE: 1 IN=100 FT

WISCONSIN SHEET 44



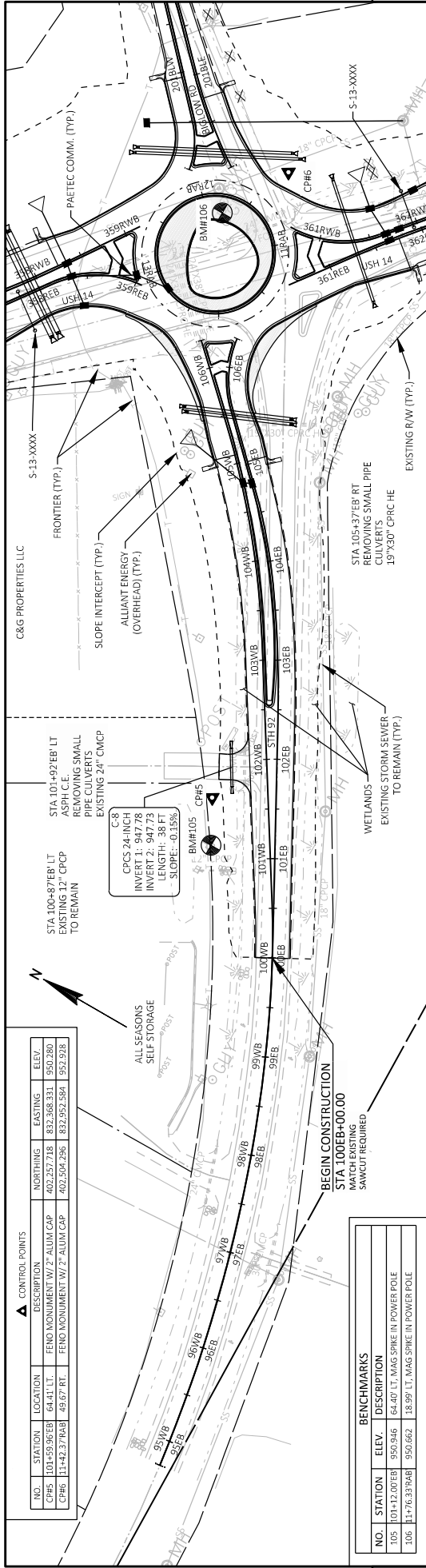


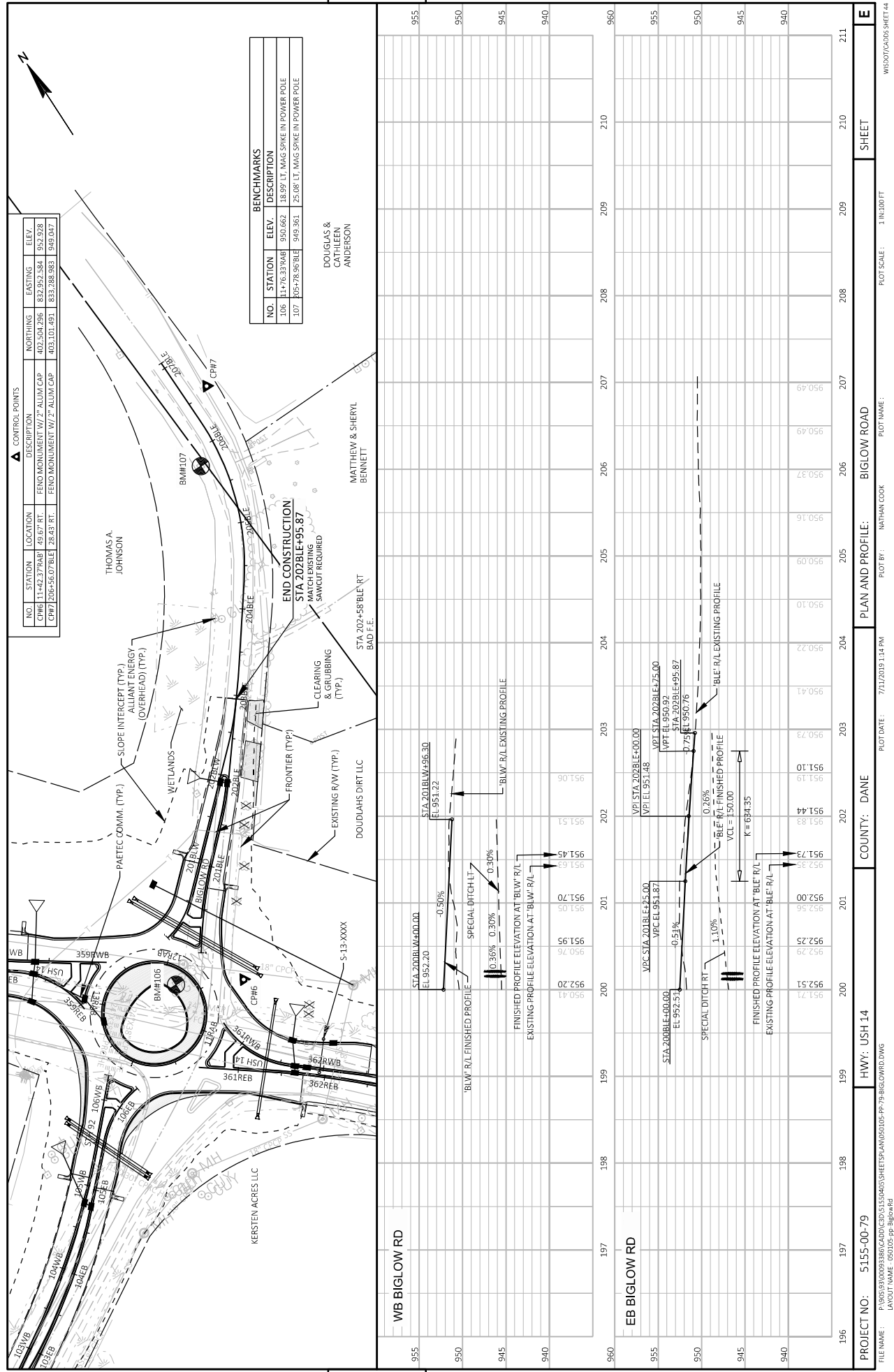
| BENCHMARKS | | | |
|------------|-----------|---------|------------------------------------|
| NO. | STATION | ELEV. | DESCRIPTION |
| 108 | 343+46.41 | 953.420 | 32.96' RT. MAG SPIKE IN POWER POLE |

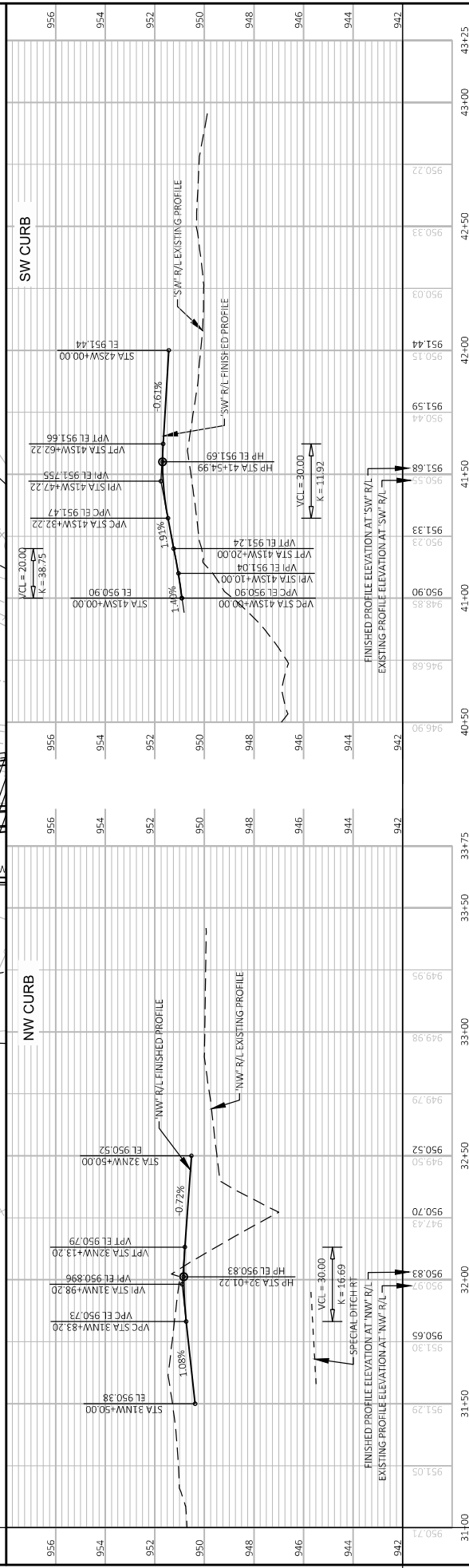
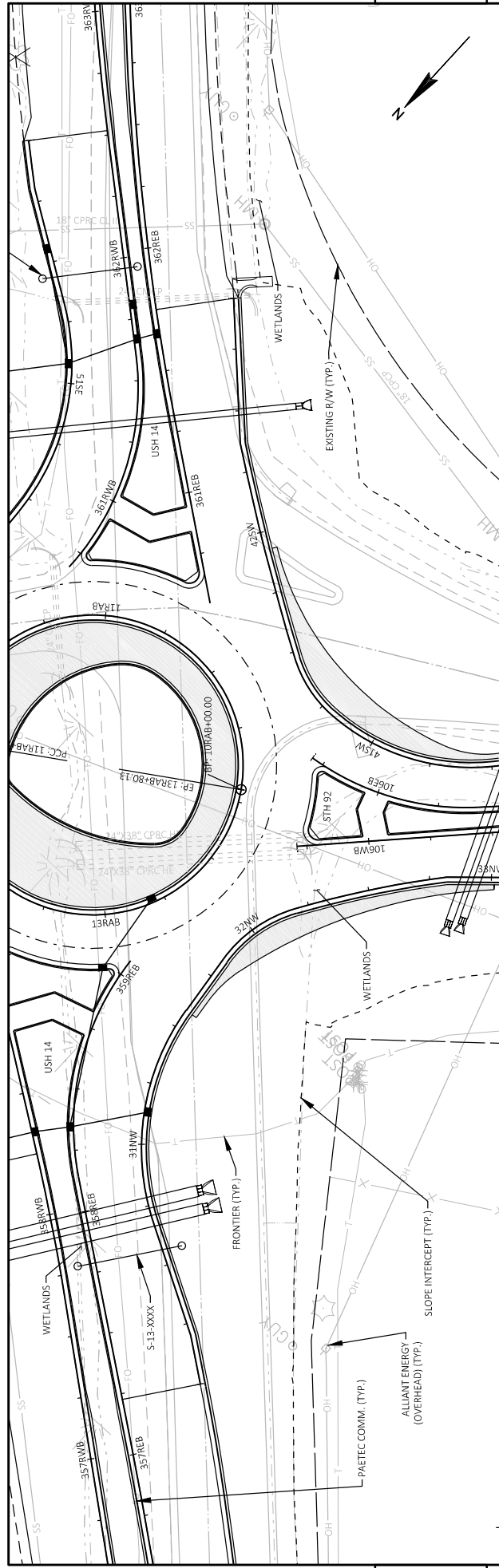
| NO. | STATION | LOCATION | DESCRIPTION | NORTHING | EASTING | ELEV. |
|-----|-----------|-----------|------------------------------|------------|-----------|---------|
| 048 | 344+06.53 | 3R 37' LT | FEND MONUMENT W/ 7" ALUM CAP | 403.745347 | 83.880954 | 952.698 |

| | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|---------------|-------|---|
| PROJECT NO: 5155-04-81 | HWY: USH 14 | COUNTY: DANE | PLAN - USH 14 | SHEET | E |
| THE NAME: P:\PROJECTS\0000\BSC2\CD\5155\0481\SH14\PLAN\BSC21.PN-B1.DWG AUTHOR: JAPF 16/02/04 PLOT DATE: 27/09/2008 8:34 AM PLOT BY: NATHAN CODE PLOT NAME: 3 IN 120 PT WSCDOT\CAOS\SHEET 44 | | | | | |

MISCELLANEOUS SHEET 44







| | | | | | | |
|-------------|------------|-------------|--------------|-------------------|-------------------------------|----------|
| PROJECT NO: | 5155-00-79 | HWY: USH 14 | COUNTY: DANE | PLAN AND PROFILE: | USH 14 - STH 92 CURB PROFILES | SHEET |
| | | | | | | E |

Exhibit 7

Critical Design Parameters Chart

5155-00-09
Madison - Evansville
STH 92 Intersection
USH 14
Dane County

ROUNDAABOUT CRITICAL DESIGN PARAMETERS

USH 14 at STH 92/Biglow Road

| DESIGN PARAMETERS | LEG 1 SB USH 14 | LEG 2 EB STH 92 | LEG 3 NB USH 14 | LEG 4 WB Biglow Rd |
|-------------------------------------------------|--------------------|--------------------|--------------------|-----------------------|
| Approach Width, FT | 12 | 12 | 12 | 11 |
| Entry Width, FT | 30 | 18 | 30 | 18 |
| Entry Angle, PHI ϕ , DEG | 21.6 | 18.3 | 16.1 | 23.0 |
| Inscribed Circle Diameter, FT | 165 | 181 | 165 | 181 |
| Exit Width, FT | 26.4 | 22.3 | 25.9 | 21.2 |
| Circulating Roadway Width Upstream of Entry, FT | 20 | 28 | 20 | 28 |

FASTEST SPEED PATH

| | | | | | | | | |
|-------------------------------------|-----|----|-----|----|-----|----|-----|----|
| R_1 , Radius/Speed, FT/MPH | 205 | 27 | 150 | 24 | 203 | 27 | 168 | 25 |
| R_2 , Radius/Speed, FT/MPH | 207 | 27 | 105 | 21 | 166 | 25 | 108 | 22 |
| R_3 , Radius/Speed, FT/MPH | NA | NA | NA | NA | NA | NA | NA | NA |
| R_4 , Radius/Speed, FT/MPH | 63 | 18 | 63 | 18 | 63 | 18 | 63 | 18 |
| R_5 , Radius/Speed, FT/MPH | 98 | 21 | 102 | 21 | 119 | 22 | 100 | 21 |
| Bypass R_5 , Radius/Speed, FT/MPH | NA | NA | NA | NA | NA | NA | NA | NA |

MINIMUM SIGHT PARAMETERS

| | | | | |
|-------------------------------------------------|-----|-----|-----|-----|
| Approach Design Speed, MPH | 60 | 60 | 60 | 50 |
| Horizontal Stopping Sight Distance, FT | 570 | 570 | 570 | 425 |
| Circulating Intersection Sight Distance, FT/MPH | 132 | 18 | 132 | 18 |
| Entering Intersection Sight Distance, FT/MPH | 176 | 24 | 198 | 27 |

| | |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Design Vehicle: | WB-65 |
| Truck Apron Width: | Varies, 13-ft to 30.6-ft (measured back of curb to face of curb) |
| OSOW Accommodations: | <p>USH 14 is not on an OSOW Route or a High Clearance Route, but is a designated Long Truck Route which requires accommodating multi-trip permitted vehicles. STH 92 is designated as a 65-ft Restricted Truck Route but is still used by multi-trip permitted vehicles, which will be accommodated. Both routes also have a history of use by single-trip OSOW vehicles. Those that have used it in the past are also being accommodated.</p> <p>Accommodation of multi-trip and single-trip permitted vehicles on USH 14 and STH 92 will be accomplished through the use of outside truck aprons in the NW and SW corners of the intersection and a wider inside truck apron.</p> |
| Circulating Roadway Cross-Slope: | The circulatory roadway will be crowned at 13.5-ft from the truck apron. Cross slopes will be 1.5% towards the truck apron and 1.5% towards the outside of the circulating roadway. |
| Access Control: | The nearest driveway access is 350-ft from the roundabout on Biglow Road and 420-ft from the roundabout on STH 92. |
| Parking Control: | No parking will be allowed near the roundabout. |
| Bicycle & Pedestrian Accommodations: | Grading will be provided for a 10-ft multiuse path around the roundabout; however the path will not be constructed. Splitter island cut-throughs will be constructed for future path connections. Bicycles will be accommodated on USH 14 and STH 92 with 5-ft to 6-ft paved shoulders. Bicyclists will navigate the roundabout through the driving lanes. |

Designer: MSA Professional Services, Inc.
Reviewer: MSA Professional Services, Inc.

SIGNATURE: Ben Wilkinson

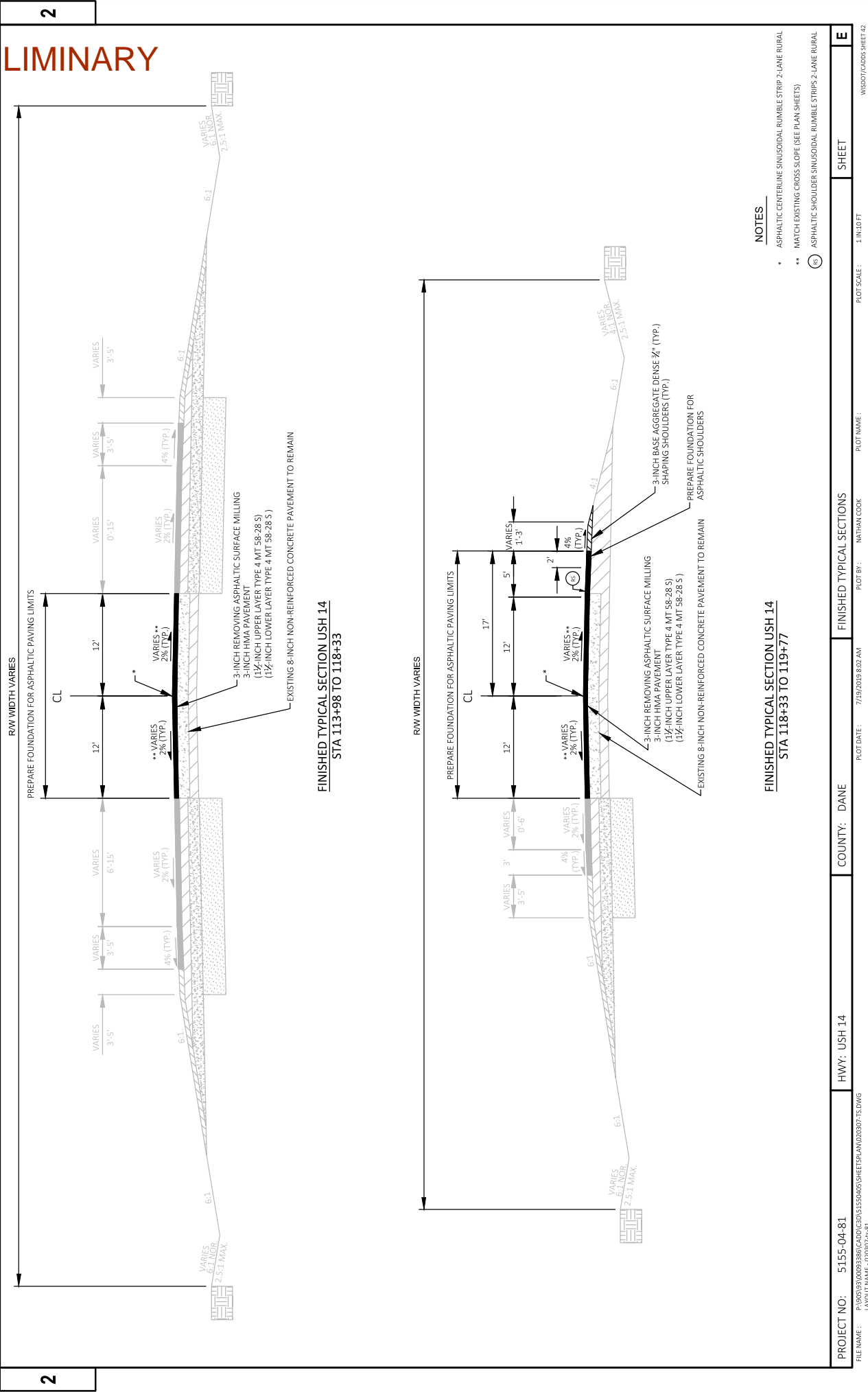
DATE: 7/12/2019

NAME: Ben Wilkinson, PE

The reviewer's signature on this document indicates that the design has been reviewed and is in general compliance with good roundabout principals. The critical design elements have been addressed. The project design engineer in responsible charge of final plan development will stamp the plans when applicable.

Exhibit 8

Finished Typical Sections



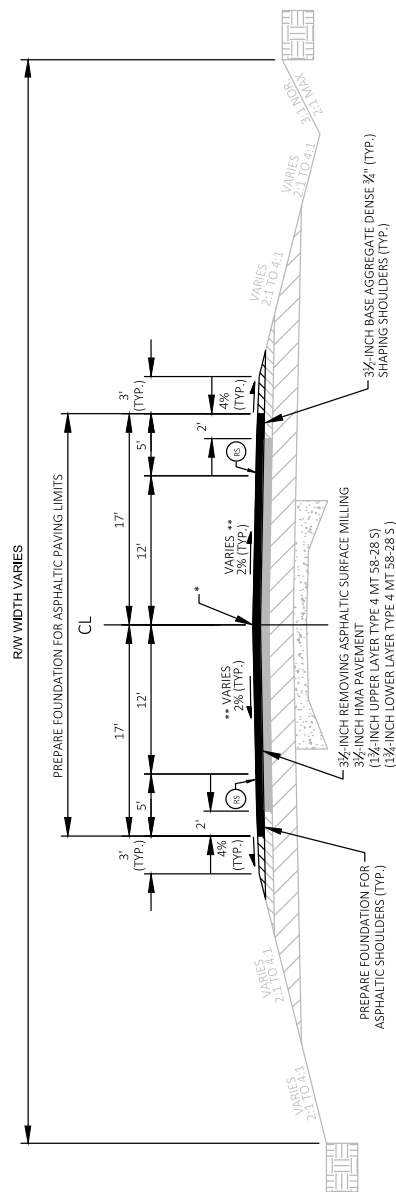




- * ASPHALTIC CENTERLINE SINUSOIDAL RUMBLE STRIP 2-LANE RURAL
- ** MATCH EXISTING CROSS SLOPE (SEE ALIGNMENT DETAILS)

| | | | | | | | |
|----------------------------------------------------------------------------------------------------------|------------|------|--------|----------------------|------|---------------------------|---|
| PROJECT NO: | 5155-04-81 | HWY: | USH 14 | COUNTY: | DANE | FINISHED TYPICAL SECTIONS | E |
| FILE NAME: P:\905\93\10009\3886\CAD\CS\5155\04\05\SHEETS\PLAN\020307-TS.DWG LAYOUT NAME: 020309-TS-81 | | | | | | | |
| PLOT DATE: 7/19/2019 8:02 AM | | | | PLOT BY: NATHAN COOK | | PLOT SCALE: 1 IN.=10 FT | |
| WISDOT/CADDIS SHEET 42 | | | | | | | |

PRELIMINARY



FINISHED TYPICAL SECTION USH 14
STA 345+00 TO 352+00

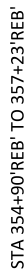
NOTES

- * ASPHALTIC CENTERLINE SINUSOIDAL RUMBLE STRIP 2-LANE RURAL
- ** MATCH EXISTING CROSS SLOPE (SEE ALIGNMENT DETAILS)
- *** ASPHALTIC SHOULDER SINUSOIDAL RUMBLE STRIPS 2-LANE RURAL

| | |
|---------------------------|------------------------------------------------------------|
| FILE NAME: | P:\000\00093286\CADD\CDR\51550405\SHEETTPA-AN\20207.2T.RWG |
| PROJECT NO: | 5155-04-81 |
| HWY: | USH 14 |
| COUNTY: | DANE |
| FINISHED TYPICAL SECTIONS | |
| PLOT DATE: | 7/19/2019 9:02 AM |
| PLOT BY: | NATHAN COOK |
| PLOT SCALE: | 1 IN=10 FT |
| E | SHEET |



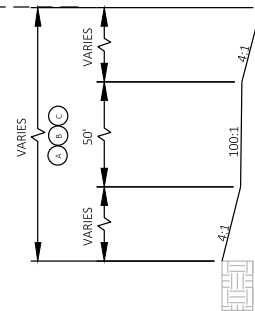
2



TYPICAL FINISHED SECTION USH 14

SEE STORM SEWER PLANS FOR PIPE UNDERDRAIN LOCATIONS
FRENCH DRAINS REQUIRED ON RURAL SECTIONS. SEE CONSTRUCTION DETAIL

| | | | | | | |
|-------------|-------------------------------------------------------------------------------------------|-------------|--------------|------------------------------------------------------|--------------------------------------|----------------------|
| PROJECT NO: | 5155-00-79 | HWY: USH 14 | COUNTY: DANE | FINISHED TYPICAL SECTIONS | | E |
| FILE NAME: | P:\9509\3009\3860\CADD\CD\5155\550405\SHEETPLAN\20307-TS.PWG DRAWING NAME: 020312-6-79 | | | | | |
| | | | | PLOT DATE: 7/19/2019 8:02 AM PLOT BY: NATHAN COOK | PLOT NAME: PLOT SCALE: 1 IN=10 FT | WISDOT/CADD/SHEET 42 |



TYPICAL FINISHED SECTION USH 14
STA 357+23'REB' TO 359+07'REB'
STA 358+25'RWB' TO 359+16'RWB'
STA 360+55'RWB' TO 361+75'RWB'
STA 360+68'REB' TO 362+52'REB'

A. SEED MIXTURE #20 WITH TEMPORARY SEEDING & FERTILIZER TYPE B FOR CENTRAL ISLAND & FERTILIZER TYPE B FOR CENTRAL ISLAND

SEE STORM SEWER PLANS FOR PIPE UNDERDRAIN LOCATIONS



| | | | | | | |
|-------------------------------------------------------------------------------------------------------|-------------|--------------|------------------------------------------------------|--------------------------------------|-----------------------|---|
| PROJECT NO: 5155-00-79 | HWY: USH 14 | COUNTY: DANE | FINISHED TYPICAL SECTIONS | | SHEET | E |
| FILE NAME: P:\9503\931000933861\CA010\315050405\8HEETS\9A\IAND0307-TS.DWG LAYOUT NAME: -00314-5-79 | | | PLOT DATE: 7/19/2019 8:03 AM PLOT BY: NATHAN COOK | PLOT NAME: PLOT SCALE: 1 IN=10 FT | WISDOT/CADDS SHEET 42 | |



SEED MIXTURE #20 WITH TEMPORARY SEEDING & FERTILIZER TYPE B, SEED MIXTURE #40 & FERTILIZER TYPE B FOR CENTRAL ISLAND

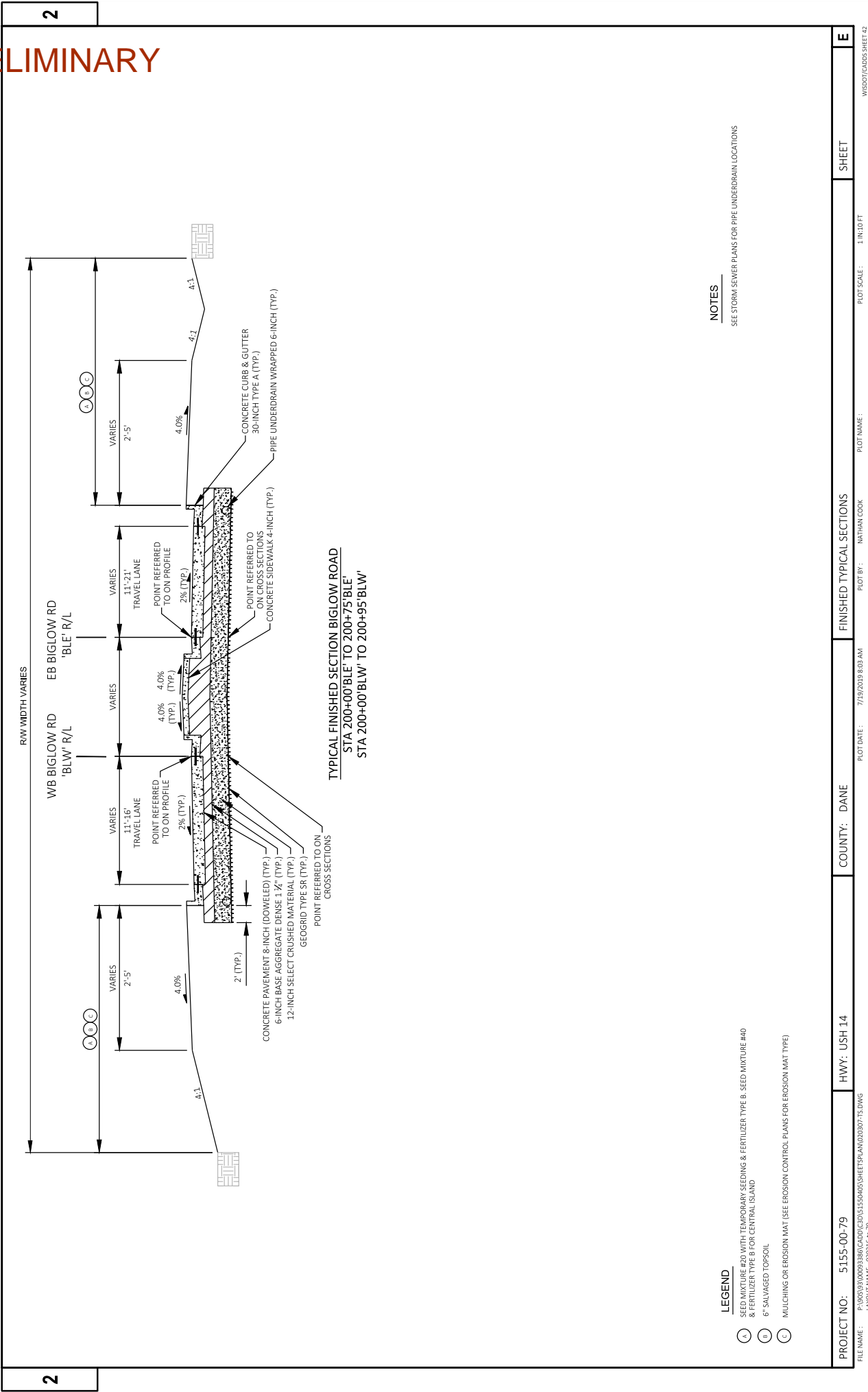
6" SALVAGED TOPSOIL

MULCHING OR EROSION MAT (SEE EROSION CONTROL PLANS FOR EROSION MAT TYPE)

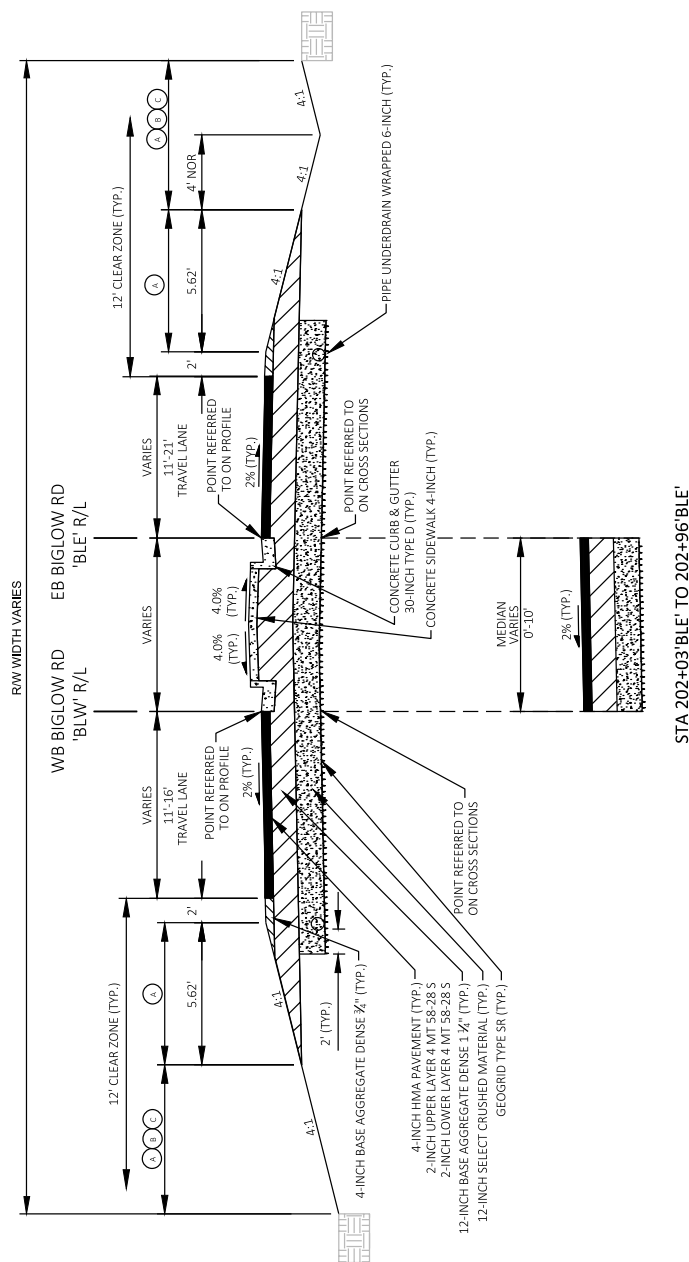
SEE PLAN DETAILS AND ALIGNMENT DETAILS FOR OVERTRACKING PAD LOCATIONS

SEE STORM SEWER PLANS FOR PIPE UNDERDRAIN LOCATIONS

| | | | | | | |
|--------------|------------------------------------------------------|-------------|--------------|---------------------------|-------------------|---------------------|
| PROJECT NO: | 5155-00-79 | HWY: USH 14 | COUNTY: DANE | FINISHED TYPICAL SECTIONS | | E |
| FILE NAME: | P:\P05\1000933601\CADD\1300\51550005\SHEETP05.TB.DWG | | | | | |
| LAYOUT NAME: | 020315-6-79 | | | | | |
| | | | | PLOT DATE: | 7/19/2019 8:03 AM | |
| | | | | PLOT BY: | NATHAN COOK | |
| | | | | PLOT NAME: | | |
| | | | | | | 1 IN=10 FT |
| | | | | | | WSDOT/CADD SHEET 42 |



PRELIMINARY



STA 202+03'BLE' TO 202+96'BLE'

NOTES

SEE STORM SEWER PLANS FOR PIPE UNDERDRAIN LOCATIONS
FRENCH DRAINS REQUIRED ON RURAL SECTIONS. SEE CONSTRUCTION DETAIL

| | | | | | |
|---------------------------------------------------------------------------------------------------------|----------------------|------------------------|-------------|----------------------------------|----------|
| PROJECT NO: | HWY: | COUNTY: | DANE | FINISHED TYPICAL SECTIONS | E |
| FILE NAME: P:\000\00099\286\CADD\CD0151550005\SHEETSPR AND 20207.TS.DWG LAYOUT NAME - 00031716-79 | 5155-00-79 | USH 14 | | | |
| PLOT DATE: 7/29/2019 6:09 AM | PLOT BY: NATHAN COOK | PLOT SCALE: 1 IN 10 FT | | | |
| WSDOT/CADD SHEET 42 | | | | | |



WISDOT/CADD SHEET 42

Exhibit 9

Environmental Commitments

Section Five: Environmental Commitments

List any environmental mitigation measures or commitments that will be incorporated into the project. Any items listed below must be incorporated into the project plans and contract documents. Attach a copy of this page to the design study report (DSR) and the plans, specifications, and estimate (PS&E) submittal package.

| Environmental Factor | Commitment (If none, include 'No special or supplemental commitments required.') |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General Economics | Commitments Made - Access for businesses will be maintained within the project limits at all times during construction. The Construction Supervisor shall assure fulfillment. The commitment will be recorded in the special provisions. |
| Business | Commitments Made - Access for businesses will be maintained within the project limits at all times during construction. The Construction Supervisor shall assure fulfillment. The commitment will be recorded in the special provisions. |
| Agriculture | No special or supplemental commitments required. |
| Community or Residential | Commitments Made - Access for residents and emergency vehicles will be maintained within the project limits at all times during construction. The Construction Supervisor shall assure fulfillment. The commitment will be recorded in the special provisions. |
| Indirect Effects | No special or supplemental commitments required. |
| Cumulative Effects | No special or supplemental commitments required. |
| Environmental Justice | No special or supplemental commitments required. |
| Historic Resources | No special or supplemental commitments required. |
| Archaeological/Burial Sites | Commitments Made – Two catalogued burial sites under Wis. Stat. 157.70 abut the project area: Tuttle Cemetery and Rutland Center Cemetery. The Region will notify the Wisconsin Department of Transportation's Cultural Resources Team for coordination with the Wisconsin Historical Society when the project is within one year of construction. The sites shall not be used for borrow or waste disposal, or for the staging of personnel, equipment, and/or supplies. The Construction Supervisor shall assure fulfillment of this commitment. The commitment will be recorded in the special provisions. |
| Tribal Coordination/Consultation | No special or supplemental commitments required. |
| Section 4(f) and 6(f) or Other Unique Areas | No special or supplemental commitments required. |
| Aesthetics | No special or supplemental commitments required. |
| Wetlands | Commitments Made - The project wetland impacts of 0.75 acres will be mitigated in accordance with the cooperative agreement between Wisconsin DNR and WisDOT. The project will minimize wetland impacts by optimizing the roadway vertical alignments and utilizing maximum ditch backslopes in the wetland areas. Mitigation will occur at a Wetland Mitigation Bank. The Regional Environmental Coordinator will assure fulfillment. Delineated wetlands will be shown on plans. |
| Rivers, Streams and Floodplains | No special or supplemental commitments required. |
| Lakes or other Open Water | No special or supplemental commitments required. |
| Groundwater, Wells and Springs | No special or supplemental commitments required. |
| Upland Wildlife and Habitat | No special or supplemental commitments required. |
| Coastal Zones | No special or supplemental commitments required. |

| | |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Threatened and Endangered Species | No special or supplemental commitments required. |
| Air Quality | No special or supplemental commitments required. |
| Construction Stage Sound Quality | WisDOT Standard Specifications 107.8(6) and 108.7.1 will apply. |
| Traffic Noise | No special or supplemental commitments required. |
| Hazardous Substances or Contamination | No special or supplemental commitments required. |
| Storm Water | <p>Commitments Made - Must implement storm water quality "Best Management Practices" and fulfill requirements of WisDOT/DNR Memorandum of Understanding. The Construction Supervisor will assure fulfillment of this commitment.</p> <p>A 401 WQC will be coordinated with the WDNR. This will include the completion of a Transportation Construction General Permit. The Designer will assure the fulfillment of this commitment.</p> |
| Erosion Control | Commitments Made - Commitment to implement proper erosion control measures "Best Management Practices" consistent with Trans 401 and the WisDOT/DNR Memorandum of Understanding will be included in the project construction plans and contract documents. The Construction Supervisor will assure fulfillment of this commitment. |
| Other | |

Exhibit 10

Roadside Hazard Analysis

Roadside Hazard Analysis

Project I.D. 5155-04-05 & 5155-00-09

Entered by: AMD

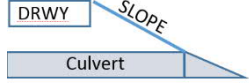
Checked by: BCW

Speed (MPH) = 55

AADT = 13,200

Alignment = USH 14

The existing clear zone width for USH 14 is 18-ft from the edge of traveled way.

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 1 | Project | Varies | L/R | - | Driveway Side Slope to Culvert steeper than 4:1  | None | Correcting slopes would require both grading and lengthening of culvert pipes. Due to the limited scope of the project and because the hazard has not been flagged as a safety concern based off crash data, assume the slopes can remain. | To be determined |
| 2 | Project | Varies | L/R | - | Slopes range from 3:1 to 1.5:1 | None | Correcting slopes would require both grading and lengthening of culvert pipes. Due to the limited scope of the project and because the hazard has not been flagged as a safety concern based off crash data, assume the slopes can remain. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|---------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 3 | Project | Varies | L/R | - | Backslopes range from 3:1 to 1.5:1 | None | Correcting slopes would require both grading and lengthening of culvert pipes. Due to the limited scope of the project and because the hazard has not been flagged as a safety concern based off crash data, assume the slopes can remain. | To be determined |
| 4 | Project | Varies | L | - | 47 Utility poles, some with guy wires | None | Identified utility poles are within the clear zone (most are near the right-of-way limits). The poles and guy wires were not flagged as a safety concern based on crash data, assume the poles and guy wires can remain. | To be determined |
| 5 | Project | Varies | R | - | 95 Utility poles, some with guy wires | None | Identified utility poles are within the clear zone (most are near the right-of-way limits). The poles and guy wires were not flagged as a safety concern based on crash data, assume the poles and guy wires can remain. | To be determined |
| 6 | Project | Varies | L/R | - | 27 Utility pedestals | None | Identified pedestals are within the clear zone (most are near the right-of-way limits). The pedestals were not flagged as a safety concern based on crash data, assume the pedestals can remain. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|----------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 7 | Project | Varies | L/R | - | Trees | None | Potentially hazardous trees exist outside of the right-of-way, but within the clear zone throughout the project. Trees within the right-of-way will be cleared. The trees outside of the right-of-way were not flagged as a safety concern based on crash data, assume the trees outside the right-of-way can remain. | To be determined |
| 8 | Project | Varies | L/R | - | Private fences | None | Potentially hazardous private fences exist outside of the right-of-way, but within the clear zone throughout the project. The fences were not flagged as a safety concern based on crash data, assume the fences can remain. | To be determined |
| 9 | 121+42 | 25' | L/R | - | 30" CPRC culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|--------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 10 | 123+09 | 25' | L/R | - | 2'x4' concrete box culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 11 | 133+86 | 22' | R | - | 2'x4' concrete box culvert end without transversable grates | None | The culvert end is close to the road and within the clear zone. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 12 | 134+53 | 26' | L | - | 2'x5' concrete box culvert end without transversable grates | None | The culvert end is close to the road and within the clear zone. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 13 | 144+53 | 25' | L/R | - | 3'x4' concrete box culvert ends without transversable grates | None | The culvert ends are close to the road and within the clear zone. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 14 | 152+88 | 25' | L/R | - | 30" CMCP culvert end | | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|-----------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 15 | 170+86 | 25' | L/R | - | 2'x2' concrete box culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 16 | 181+33 | 29' | R | - | Stone wall around driveway culvert | None | The stone wall is within the clear zone and is considered a hazard. The wall will not be removed as part of this project. | To be determined |
| 17 | 196+09 | 28' | L | - | 24" CMCP culvert end | None | The culvert end is close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 18 | 211+00 | 26' | L/R | - | 3'x3' box culvert ends without transversable grates | None | The culvert ends are close to the road and within the clear zone. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|----------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 19 | 219+07 | 24' | L/R | - | 2'x2' concrete box culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 20 | 250+87 | 25' | L/R | - | 24" CPRC culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 21 | 251+31 | 25' | L/R | - | 24" CPRC culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 22 | 262+13 to 262+94 | 27' | L | 81' | Concrete posts along front of property | None | The concrete posts are within the clear zone and are considered a hazard. The concrete posts will not be removed as part of this project. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|--------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 23 | 271+66 | 25' | L/R | - | 24" CPRC culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 24 | 289+60 | 24' | L/R | - | 2'x2' concrete box culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |
| 25 | 329+21 | 28' | L/R | - | 60"x42" cattle pass end | None | The cattle pass ends are close to the road and within the clear zone. Shielding of the hazard is not present. The cattle pass was not flagged as a safety concern based on crash data, assume the cattle pass can remain as-is. | To be determined |
| 26 | 342+00 | 23' | L/R | - | 16" CMCP culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |

| Hazard ID | Station or Stations | Offset (ft) | L/R | Total length of hazard FT | Description | Proposed Action | Discussion: MSA's Recommendation | Discussion: WisDOT's Recommendation |
|-----------|---------------------|-------------|-----|---------------------------|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 27 | 349+72 | 29' | L/R | - | 24" CPRC culvert end | None | The culvert ends are close to the road and within the clear zone. The undercarriage of a vehicle could snag on the culvert end. The culvert was not flagged as a safety concern based on crash data, assume the culvert can remain as-is. | To be determined |