Generation Deactivation Notification Update

Transmission Expansion Advisory Committee

November 8, 2018

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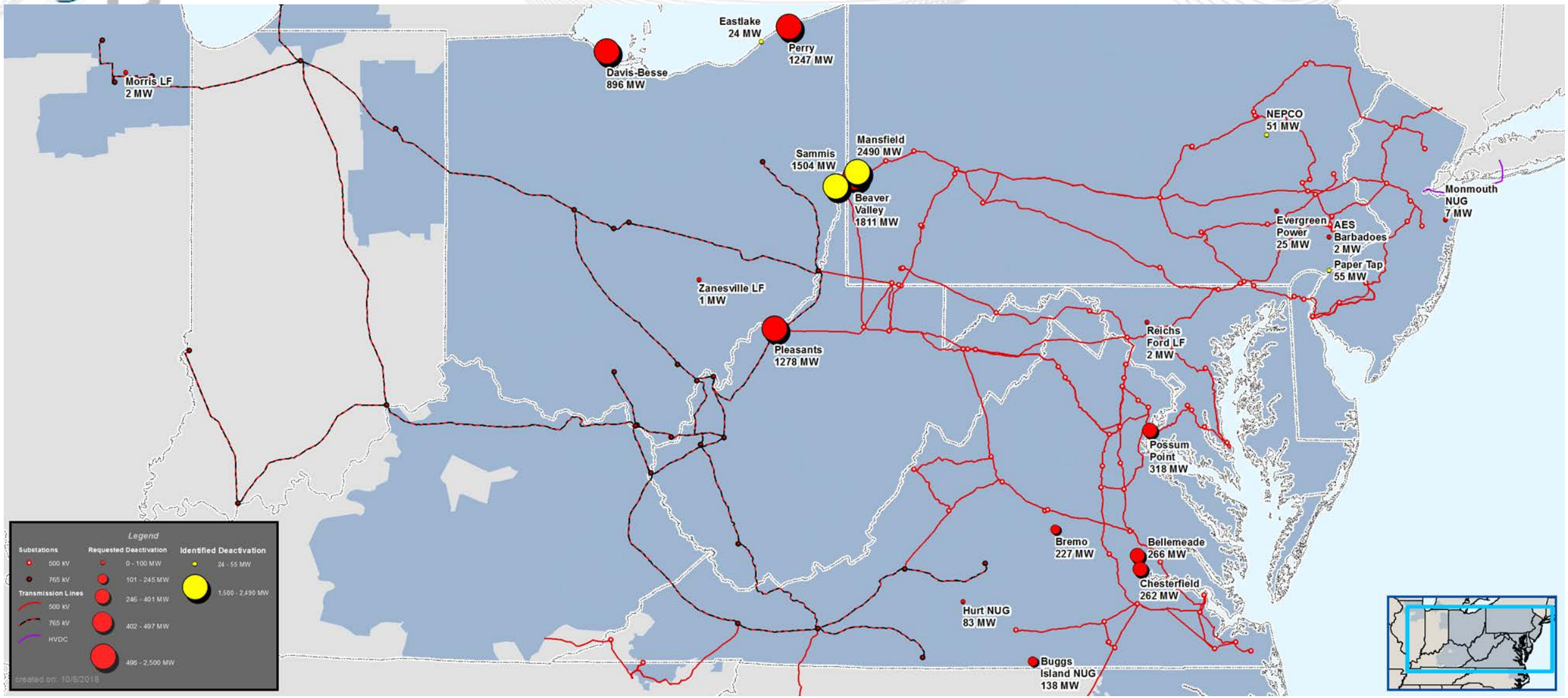
Generation Deactivations for 2018



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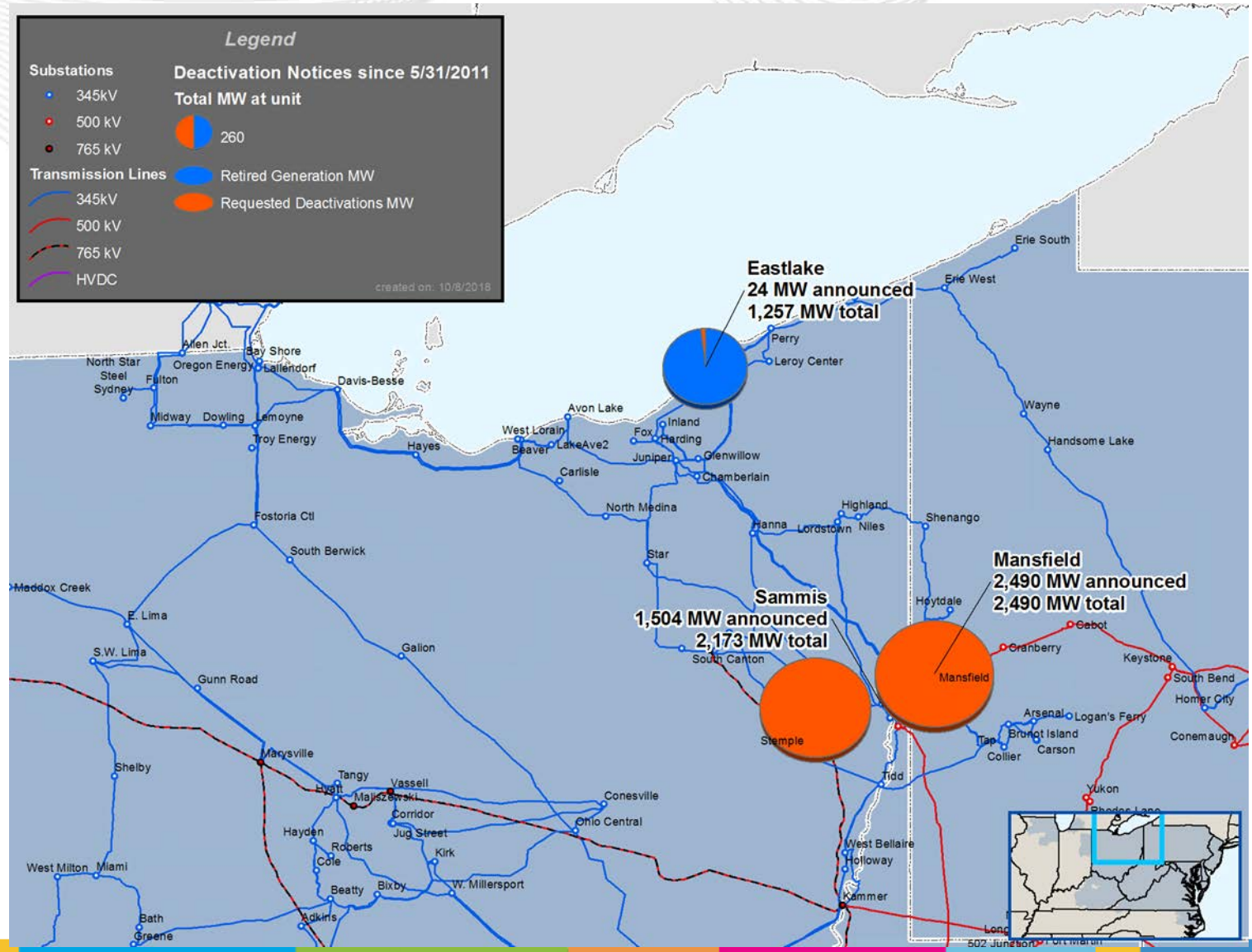
Generation Deactivation

ATSI Transmission Zones

- Bruce Mansfield 1, 2, and 3 (6/01/2021 – 2490 MW)
- Eastlake 6
  (6/01/2021 – 24 MW)
- Sammis Diesel
  (6/01/2021 – 13 MW)
- Sammis 5, 6, 7
  (06/01/2022 – 1491 MW)

- Previously announced Sammis 1, 2, 3, and 4 (06/01/2022 – 669 MW)



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Deactivation Status

Unit(s)	Transmission Zone	Requested Deactivation Date	PJM Reliability Status
Kimberly Clark (9.4 MW)	PECO	08/01/2019	Reliability analysis complete
Bruce Mansfield 1, 2 & 3 (2490 MW)	ATSI	6/01/2021	Reliability analysis complete. New and existing baselines resolve identified impacts. Units can retire as scheduled.
Eastlake 6 (24 MW)	ATSI	6/01/2021	
Sammis Diesel (13 MW)	ATSI	6/01/2021	
Sammis 5, 6 & 7 (1491 MW)	ATSI	6/01/2022	

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APS/ DLCO Transmission Zone

Problem Statement: Generation Deliverability

Mitchell - Elrama 138 kV and Route 51 – Charleroi 138 kV #1 and #2 lines are overloaded for multiple contingencies:

- Tower contingency for loss of Wycoff tap 138 kV bus and Elrama – Bethel Park 138 kV line.

- Tower contingency for Wycoff tap and Wycoff 138 kV buses and Route 51 – Elrama 138 kV #2 line.

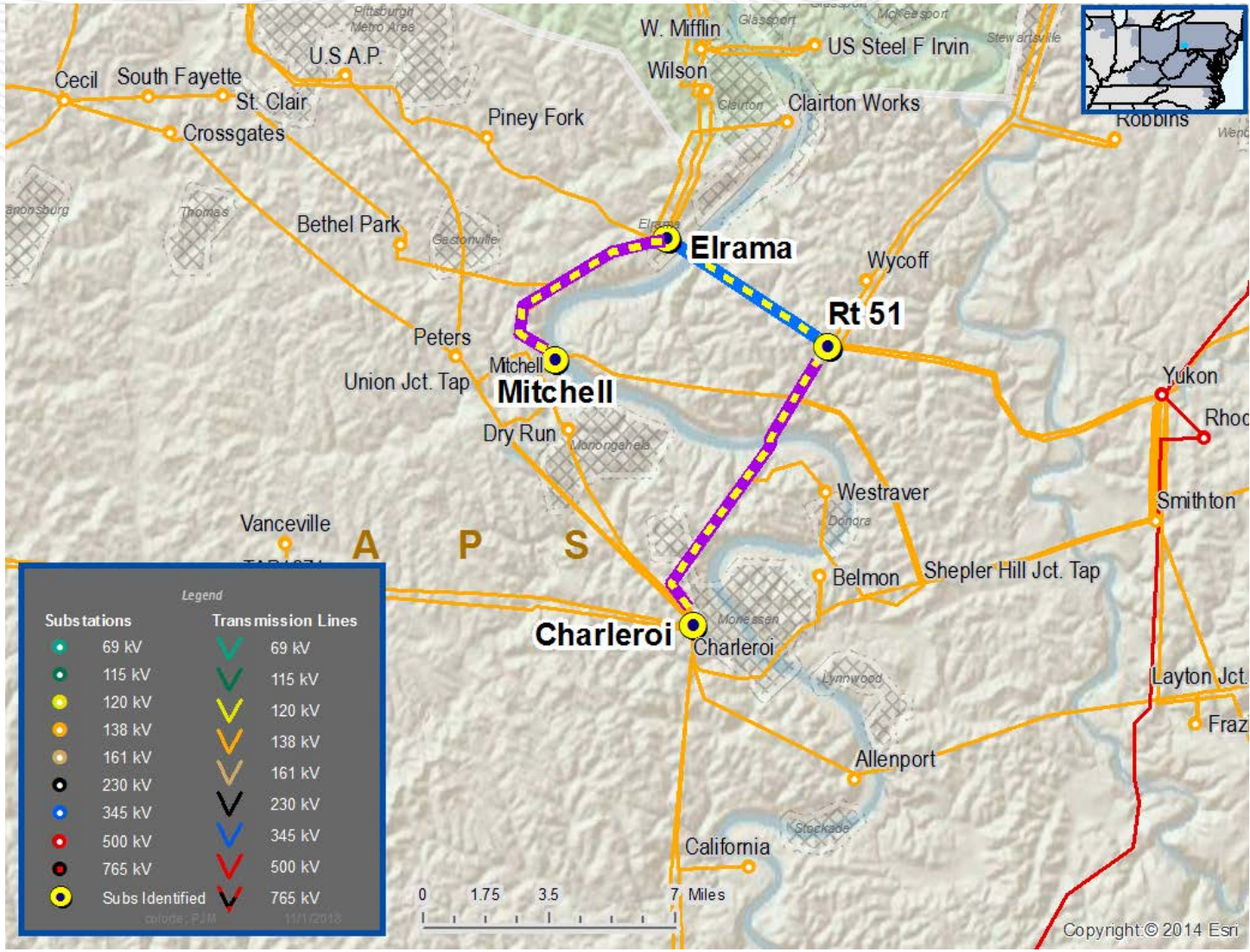
Recommended Solution:

- Modify the scope of baseline **b3012** – Build two tie lines by using two separate structures.

Required IS Date: 06/01/2021
Projected IS Date: 06/01/2021

Original Estimated Project Cost: $9.2M

Original Required IS Date: 06/01/2021
Original TEAC Date: 06/07/2018



ATSI Transmission Zone

Problem Statement: Generation Deliverability

Jackson - Cranberry 138 kV line is overloaded for multiple contingencies:

- Single contingency for loss of Wylie Ridge - Toronto 345 kV line.

- Breaker failure contingency for loss of Wylie Ridge – Cranberry 500kV line and Wylie Ridge 500/345 kV transformer #7 and #8.

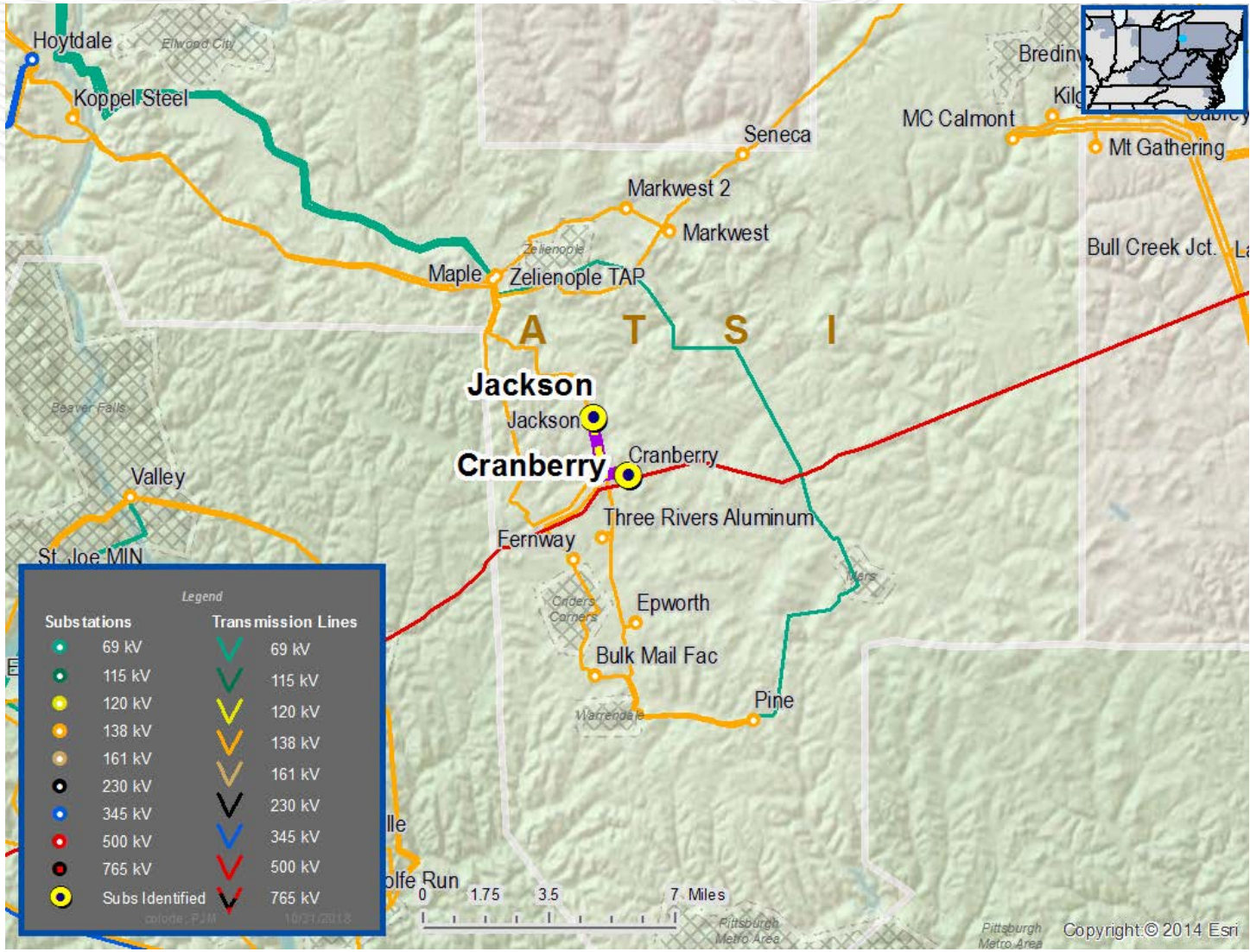
Recommended Solution:

- Reconductor line (~2.1 miles), replace bus conductor at Cranberry, and replace line switches at Jackson 138 kV bus (b3066).

- Current rating: SN 278 MVA / SE 339 MVA
- New rating: SN 435 MVA / SE 500 MVA

Estimated Project Cost: $3.44M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



ATSI Transmission Zone

Problem Statement: Generation Deliverability

Jackson – Maple 138 kV line is overloaded for multiple contingencies:

- Single contingency for loss of Wylie Ridge - Toronto 345 kV line.

- Breaker failure contingency for loss of Wylie Ridge – Cranberry 500kV line and Wylie Ridge 500/345 kV transformer #7 and #8.

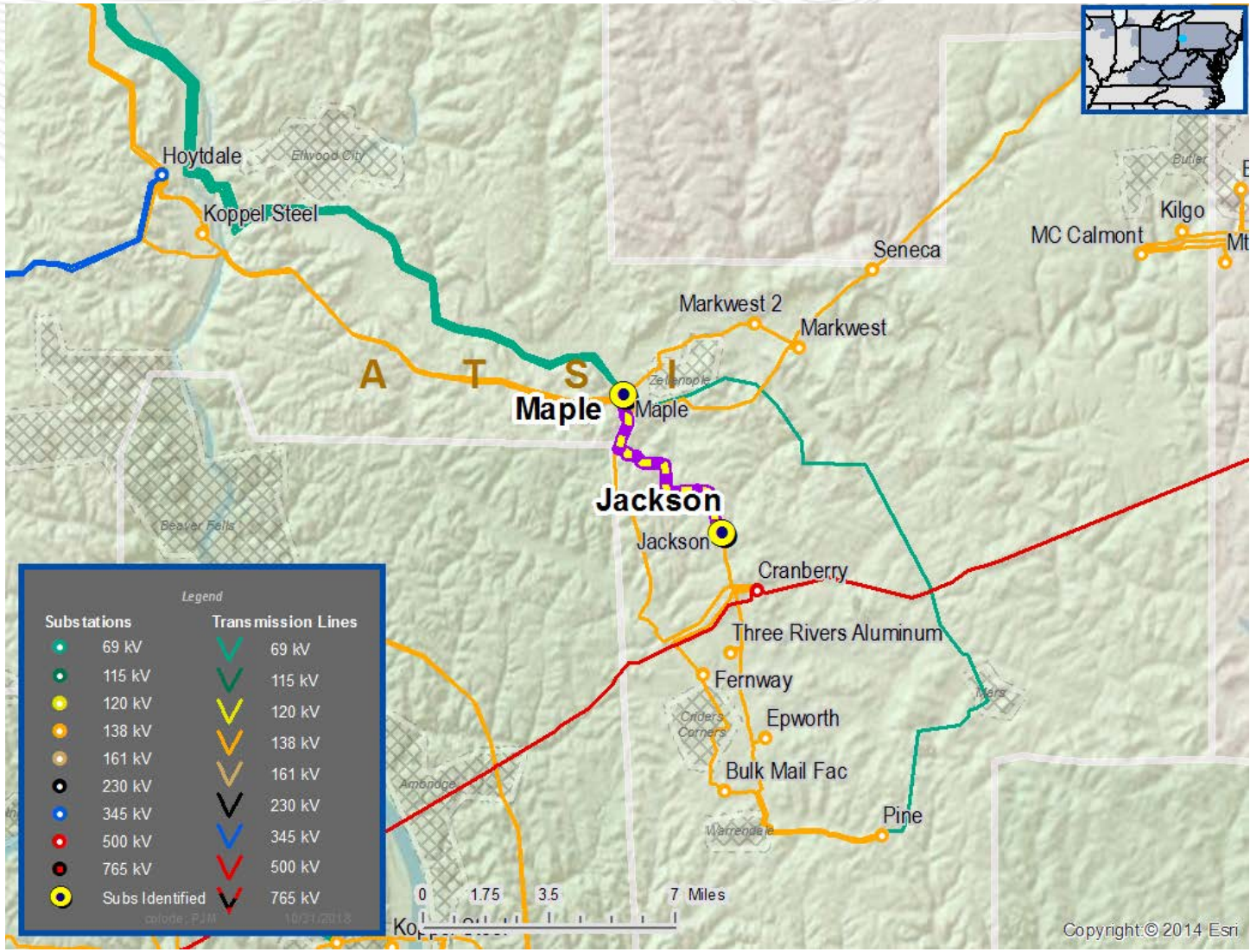
Recommended Solution:

- Reconductor line (~4.7 miles), replace line switches at Jackson, and replace the line traps and relays at Maple 138 kV bus (b3067).

- Current rating: SN 256 MVA /SE 316 MVA
- New rating: SN 435 MVA/SE 500 MVA

Estimated Project Cost: $7.86M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



ATSI Transmission Zone

Problem Statement: Generation Deliverability

Seneca - Markwest 138 kV line is overloaded for multiple contingencies:

- Breaker failure contingency for loss of Cranberry - Cabot 500kV line and Cranberry 500/138 kV transformer.

- Breaker failure contingency for loss of Cranberry - Cabot 500kV line and Cranberry #2 500/138 kV transformer.

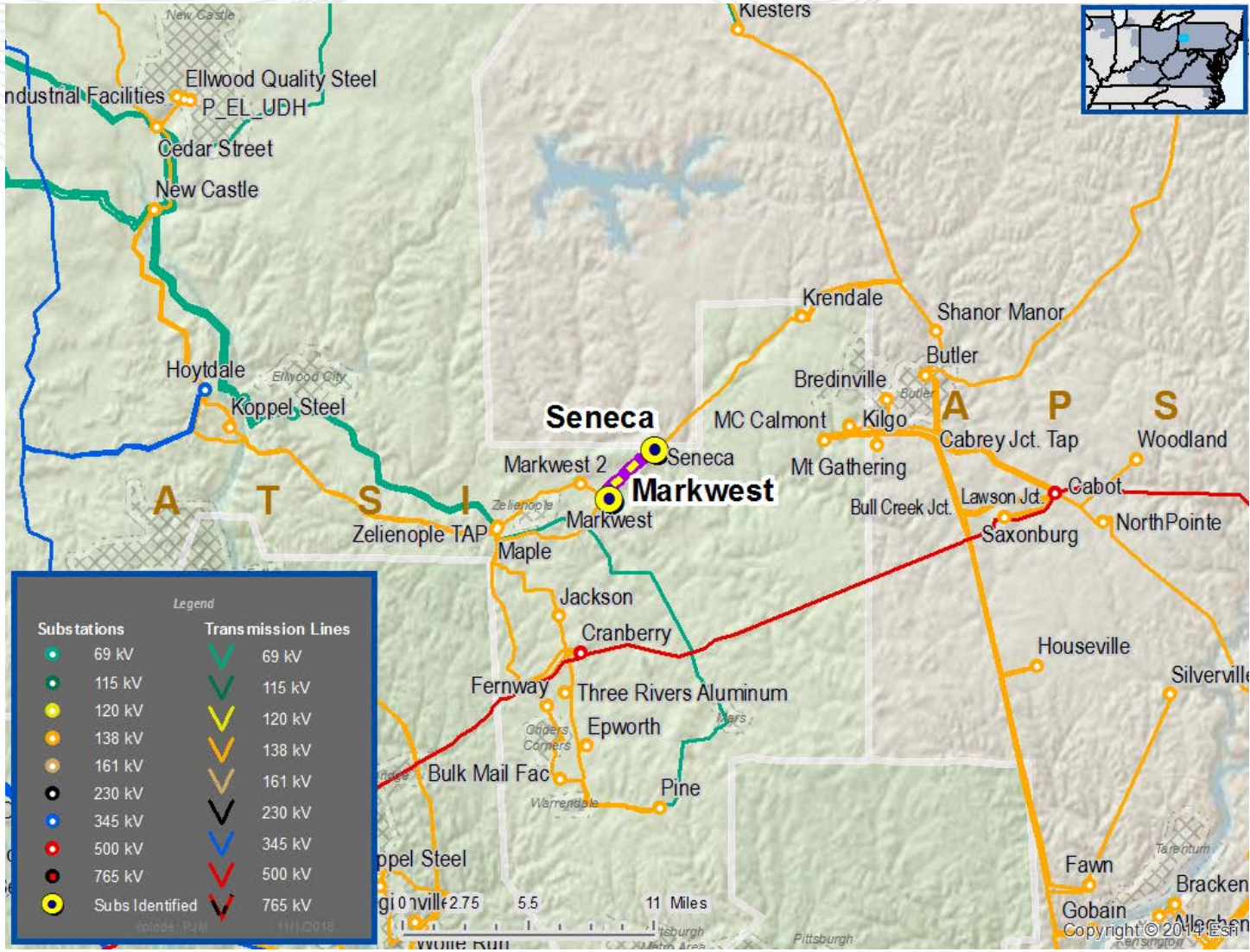
Recommended Solution:

- Replace bus conductor at Seneca 138 kV bus (b3080)

- Current rating: SN 294 MVA / SE 350 MVA
- New rating: SN 312 MVA / SE 380 MVA

Estimated Project Cost: $0.07M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



ATSI / APS Transmission Zone

Problem Statement: Generation Deliverability

Seneca - Krendale 138 kV line is overloaded for multiple contingencies:

- Breaker failure contingency for loss of Cranberry - Cabot 500kV line and Cranberry 500/138 kV transformer.

- Breaker failure contingency for loss of Cranberry - Cabot 500kV line and Cranberry #2 500/138 kV transformer.

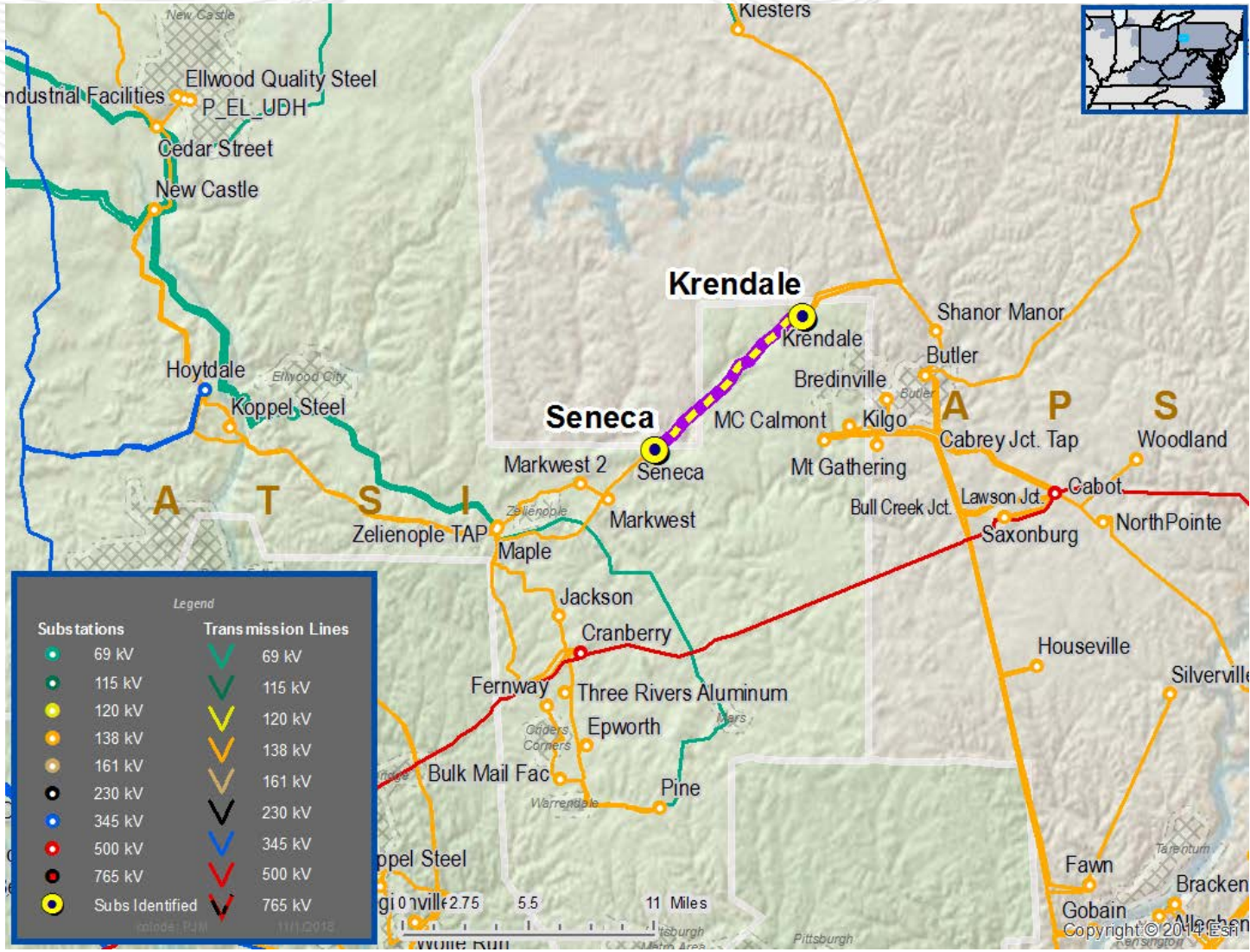
Recommended Solution:

- Replace breaker and bus conductor at Krendale 138 kV bus (b3081).

- Current rating: SN 267 MVA / SE 352 MVA
- New rating: SN 312 MVA / SE 380 MVA

Estimated Project Cost: $1M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Yukon – Westraver 138 kV line is overloaded for multiple contingencies:

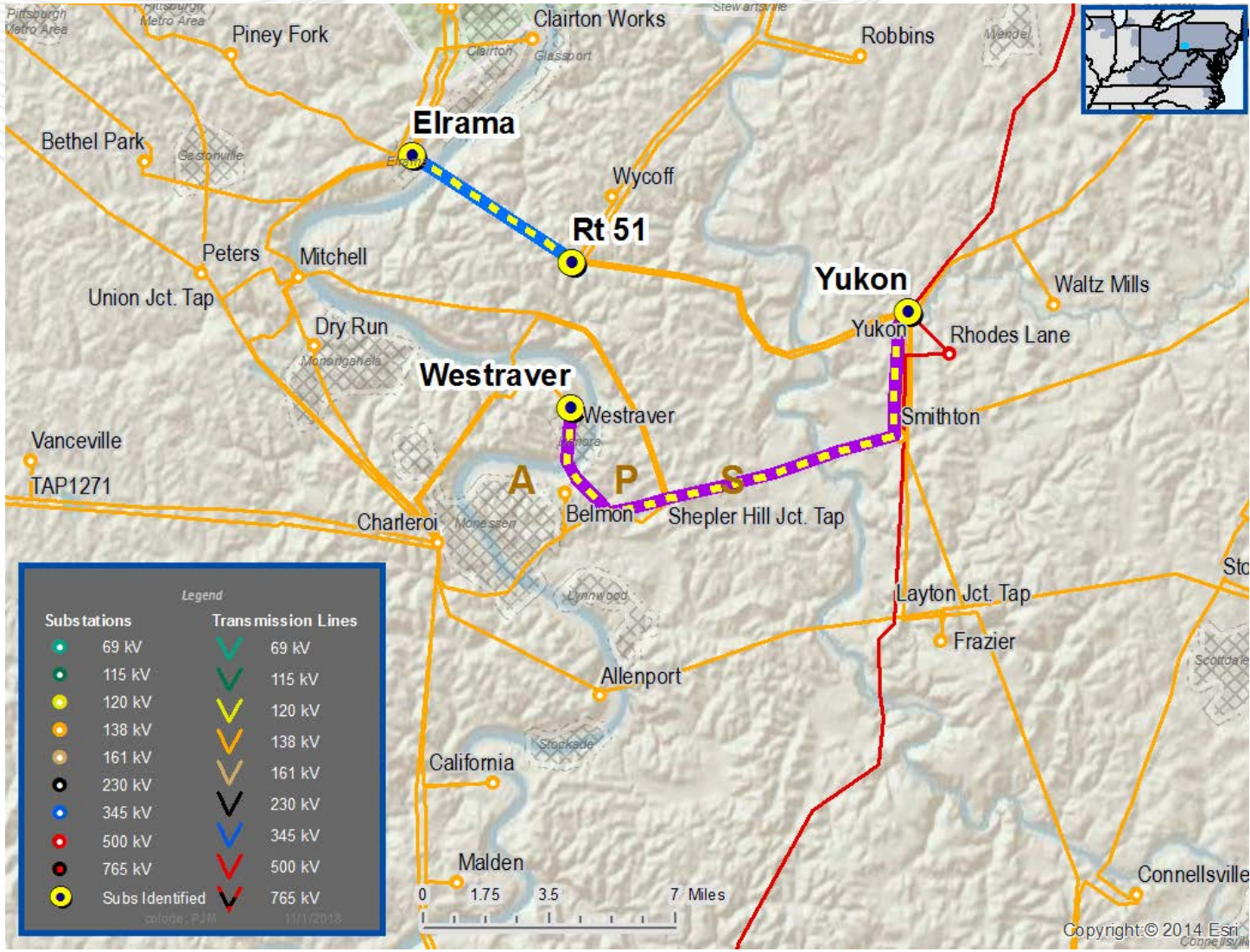
- Tower contingency for loss of Yukon - Route 51 #1 and #2 138 kV lines.
- Breaker failure contingency for loss of Yukon - Route 51 #2 and #3 138 kV line.

Recommended Solution:

- Reconductor line (~2.8 miles), replace the line drops and relays at Yukon, and replace switches at Westraver 138 kV bus (b3068).
- Current rating: SN 308 MVA / SE 376 MVA
- New rating: SN 491 MVA / SE 556 MVA

Estimated Project Cost: $2.5M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Westraver – Route 51 138 kV line is overloaded for multiple contingencies:

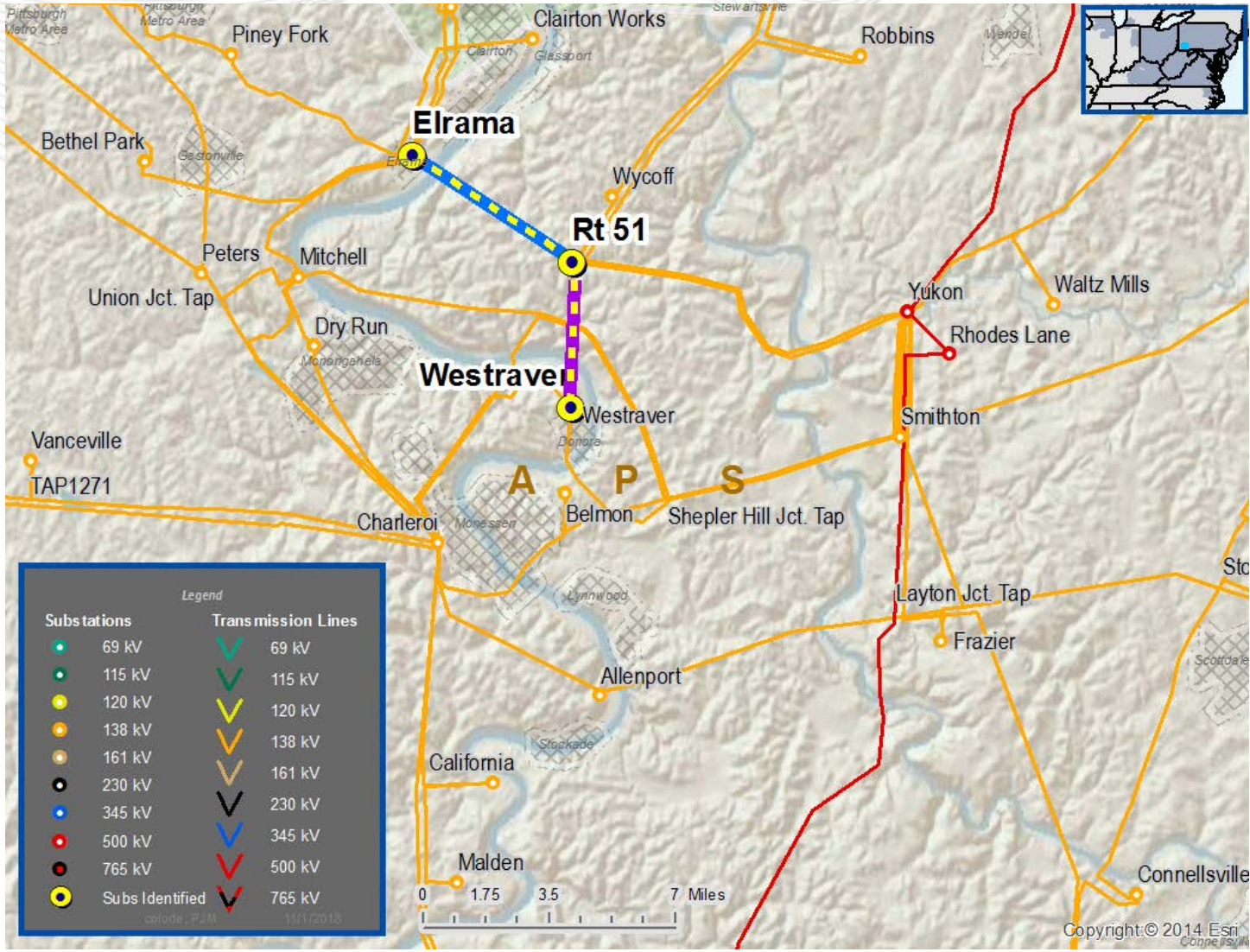
- Tower contingency for loss of Yukon - Route 51 #1 and #2 138 kV lines.
- Breaker failure contingency for loss of Yukon - Route 51 #2 and #3 138 kV line.

Recommended Solution:

- Reconductor line (~5.63 miles), replace line switches at Westraver 138 kV bus (b3069).
- Current rating: SN 308 MVA / SE 376 MVA
- New rating: SN 491 MVA / SE 556 MVA

Estimated Project Cost: $7.5M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Yukon – Route 51 #1 138 kV line is overloaded for multiple contingencies:

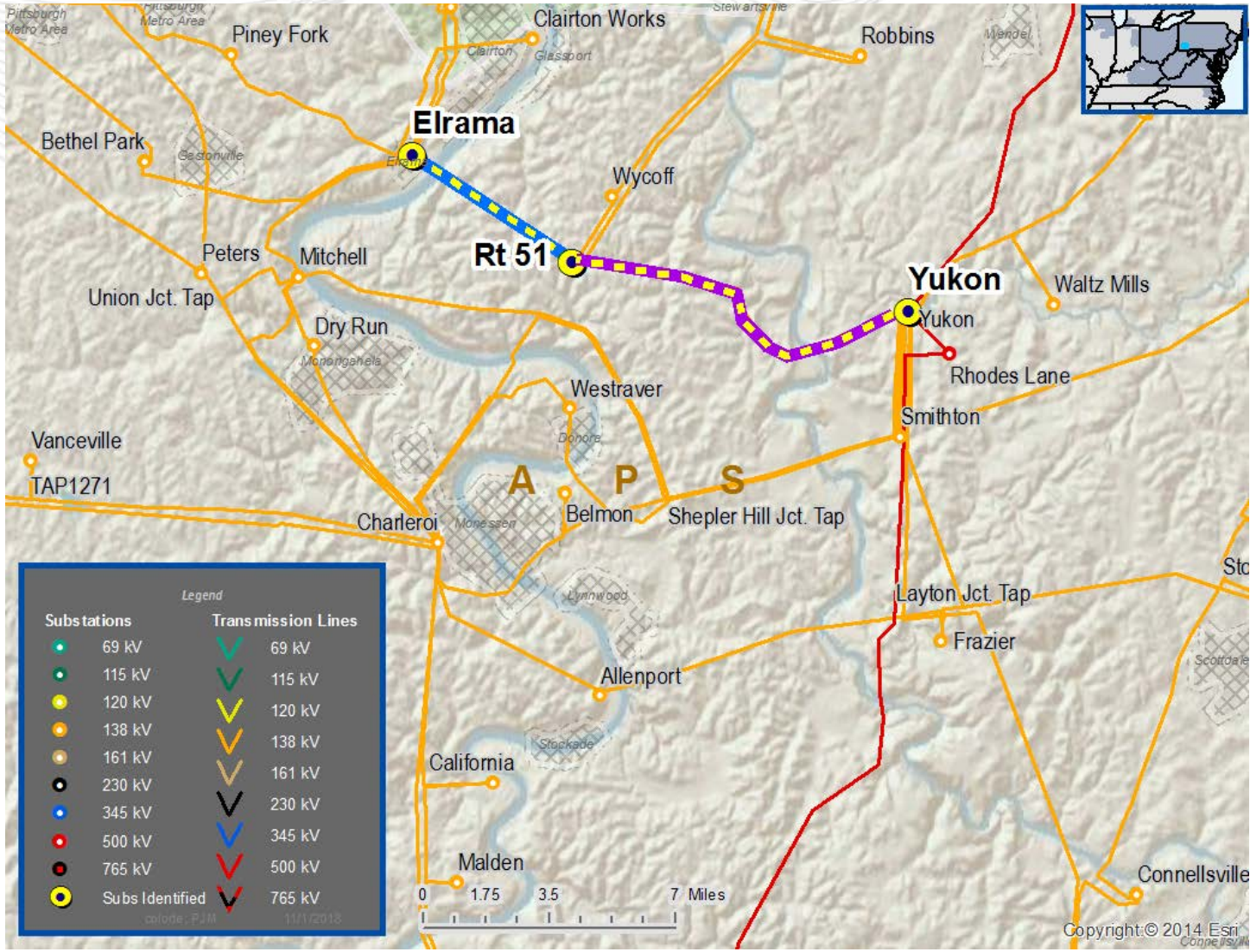
- Breaker failure contingency for loss of Yukon - Route 51 #2 and #3 138 kV line.
- Tower contingency for loss of Route 51 - Yukon #3 138 kV line and Westraver 138 kV bus.

Recommended Solution:

- Reconductor line (~8 miles), replace line drops, relays, and line disconnect switch at Yukon 138 kV bus (b3070).
- Current rating: SN 297 MVA / SE 365 MVA
- New rating: SN 491 MVA / SE 566 MVA

Estimated Project Cost: $10M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Yukon – Route 51 #2 138 kV line is overloaded for multiple contingencies:

- Tower contingency for loss of Route 51 - Yukon #3 138 kV line and Westraver 138 kV bus.
- Single contingency for loss of Keystone - Cabot 500 kV line.
- Breaker failure contingency for loss of Keystone - Cabot 500kV, Keystone #4 500/230 kV transformer, and capacitor bank at Keystone 500 kV bus.

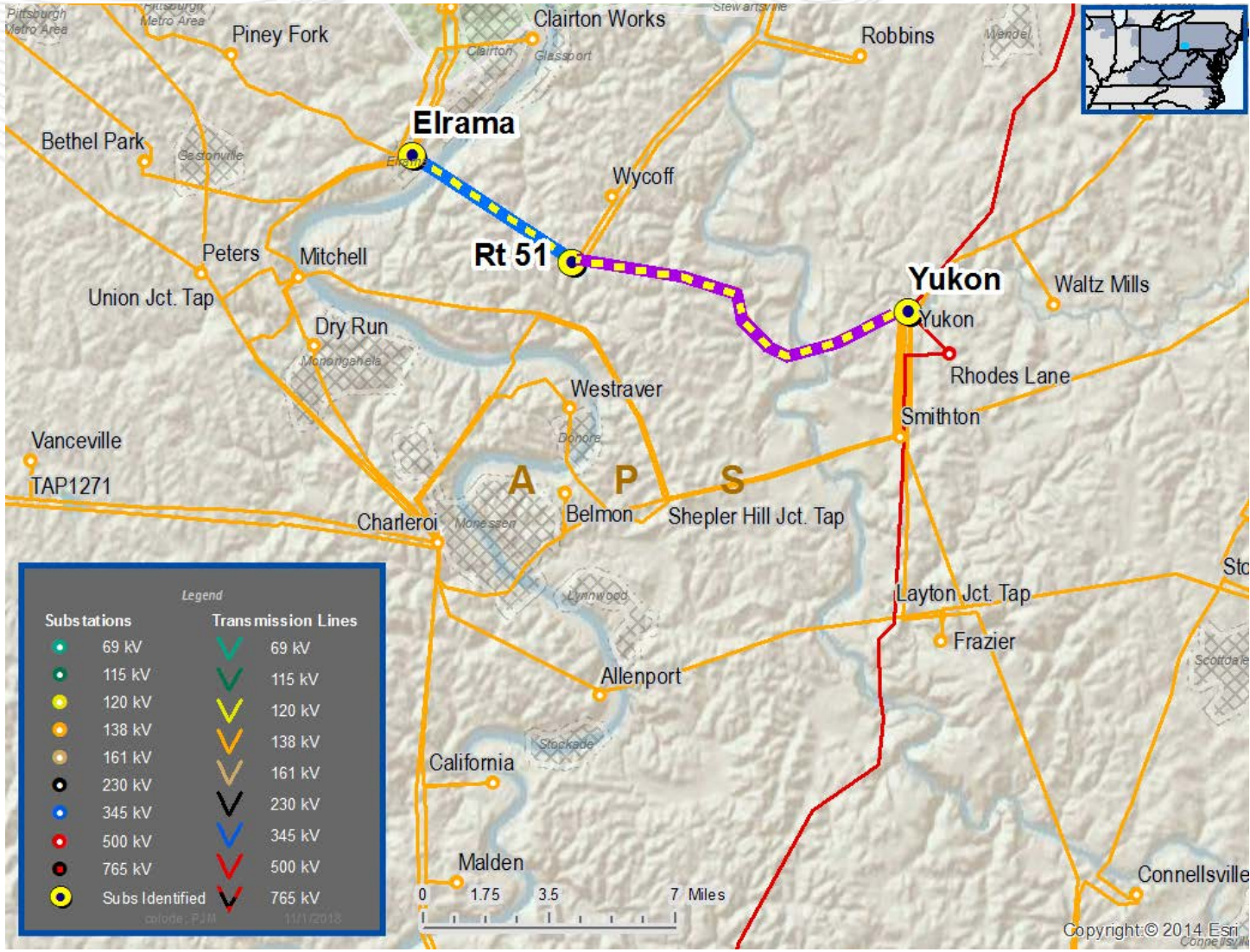
Recommended Solution:

- Reconductor line (~8 miles) and replace relays at Yukon 138 kV bus (b3071).
- Current rating: SN 297 MVA / SE 365 MVA
- New rating: SN 491 MVA / SE 566 MVA

Estimated Project Cost: $10M

Required IS Date: 06/01/2022

Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Yukon – Route 51 #3 138 kV line is overloaded for tower contingency for loss of Yukon - Route 51 #1 and #2 138 kV lines.

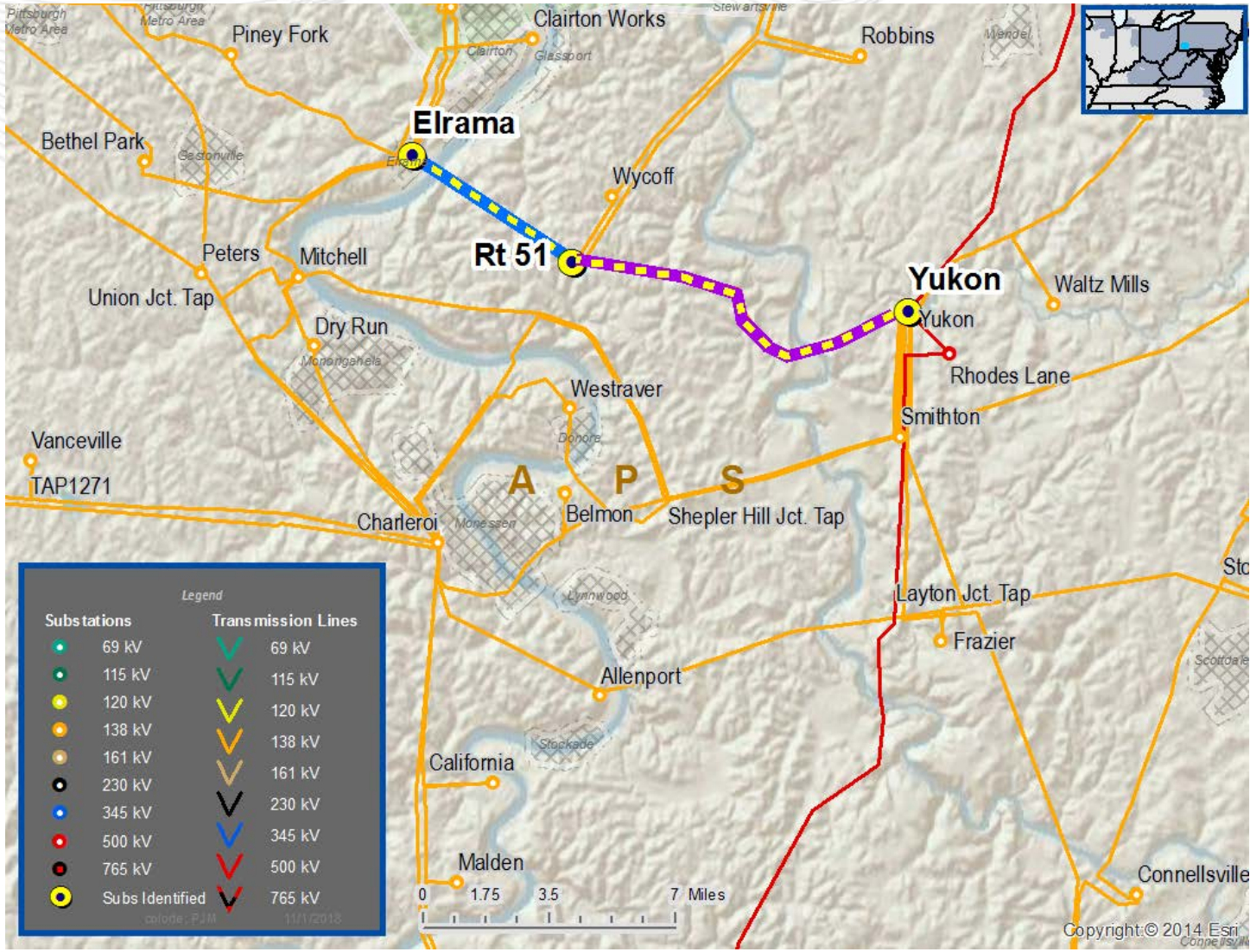
Recommended Solution:

- Reconductor line (~8 miles) and replace relays at Yukon 138 kV bus (b3072).

- Current rating: SN 308 MVA / SE 376 MVA
- New rating: SN 491 MVA / SE 566 MVA

Estimated Project Cost: $10M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Armstrong #3 345/138 kV transformer is overloaded for single contingency loss of Handsome Lake – Wayne 345 kV line.

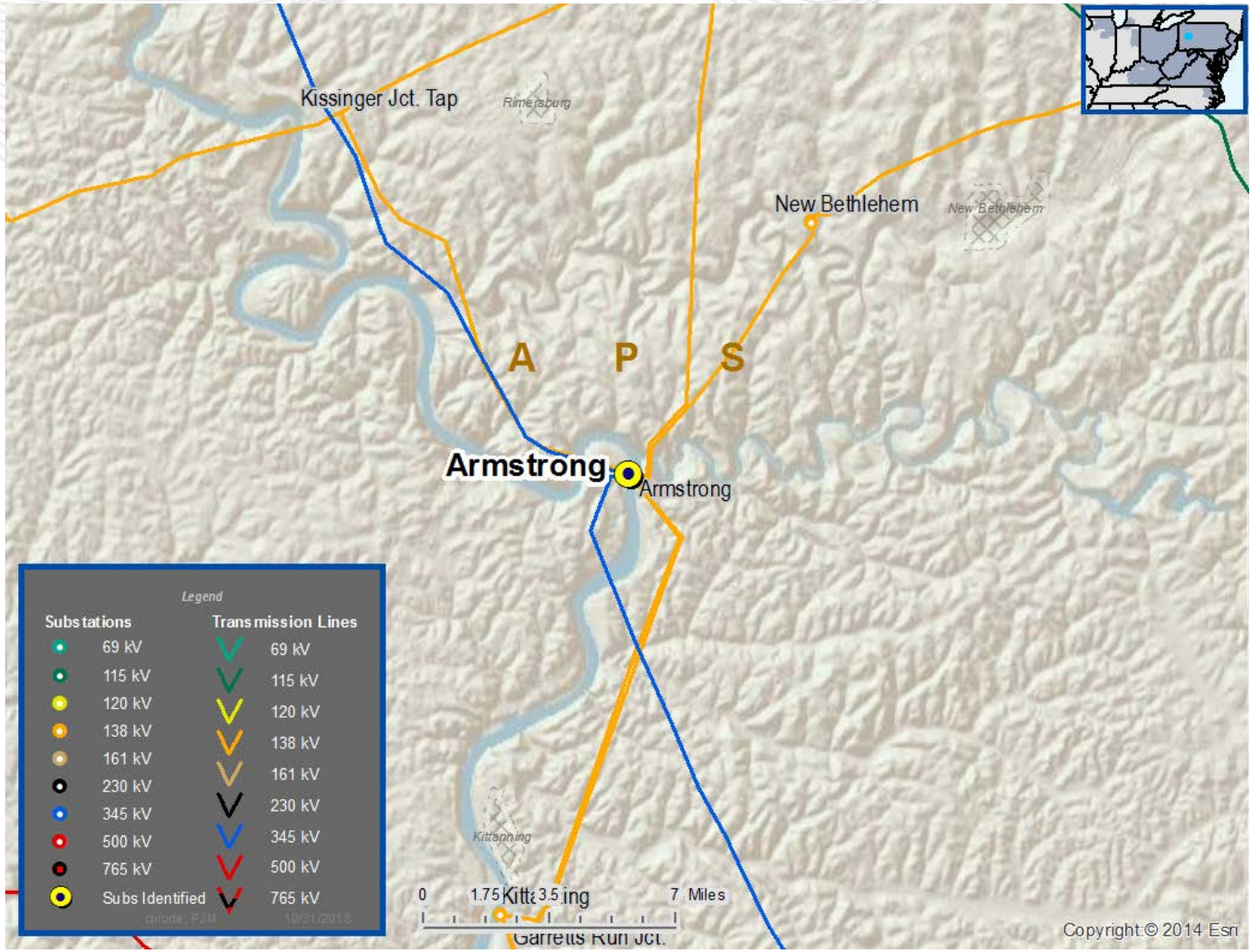
Recommended Solution:

- Replace bus conductor at 138 kV side of Armstrong substation (b3074).

- Current rating: SN 552 MVA / SE 659 MVA
- New rating: SN 627 MVA / SE 710 MVA

Estimated Project Cost: $0.5M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Cabot 500/138 kV transformer is overloaded for breaker failure contingency for loss of Cabot - Cranberry 500kV line and Cabot #2 and #4 500/138 kV

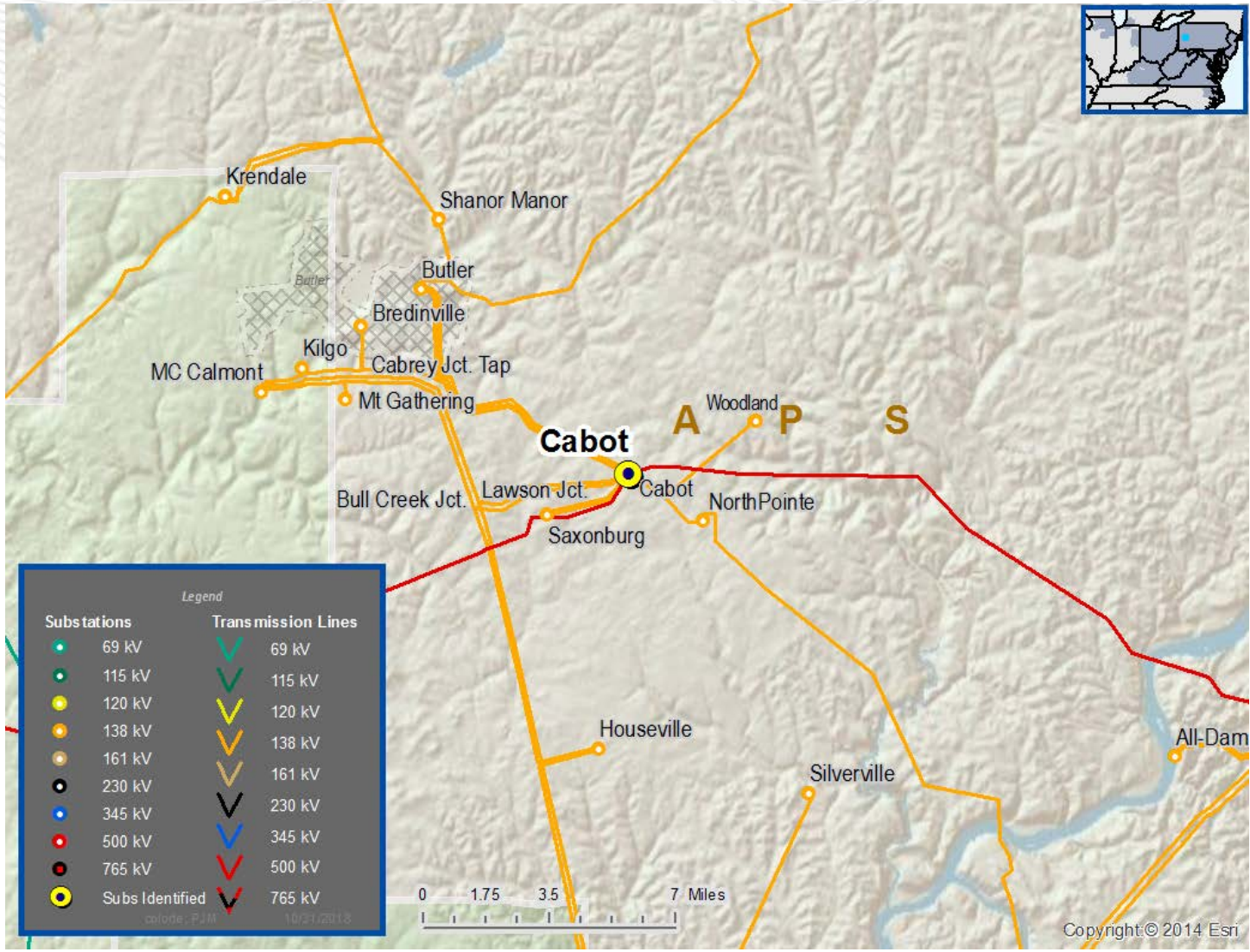
Recommended Solution:

- Replace transformer breaker and bus conductor at 138 kV side of Cabot substation (b3075).

- Current rating: SN 390 MVA / SE 525 MVA
- New rating: SN 481 MVA / SE 609 MVA

Estimated Project Cost: $0.5M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Edgewater - Loyalhanna 138 kV line is overloaded for single contingency loss of South Bend – Yukon 500 kV line

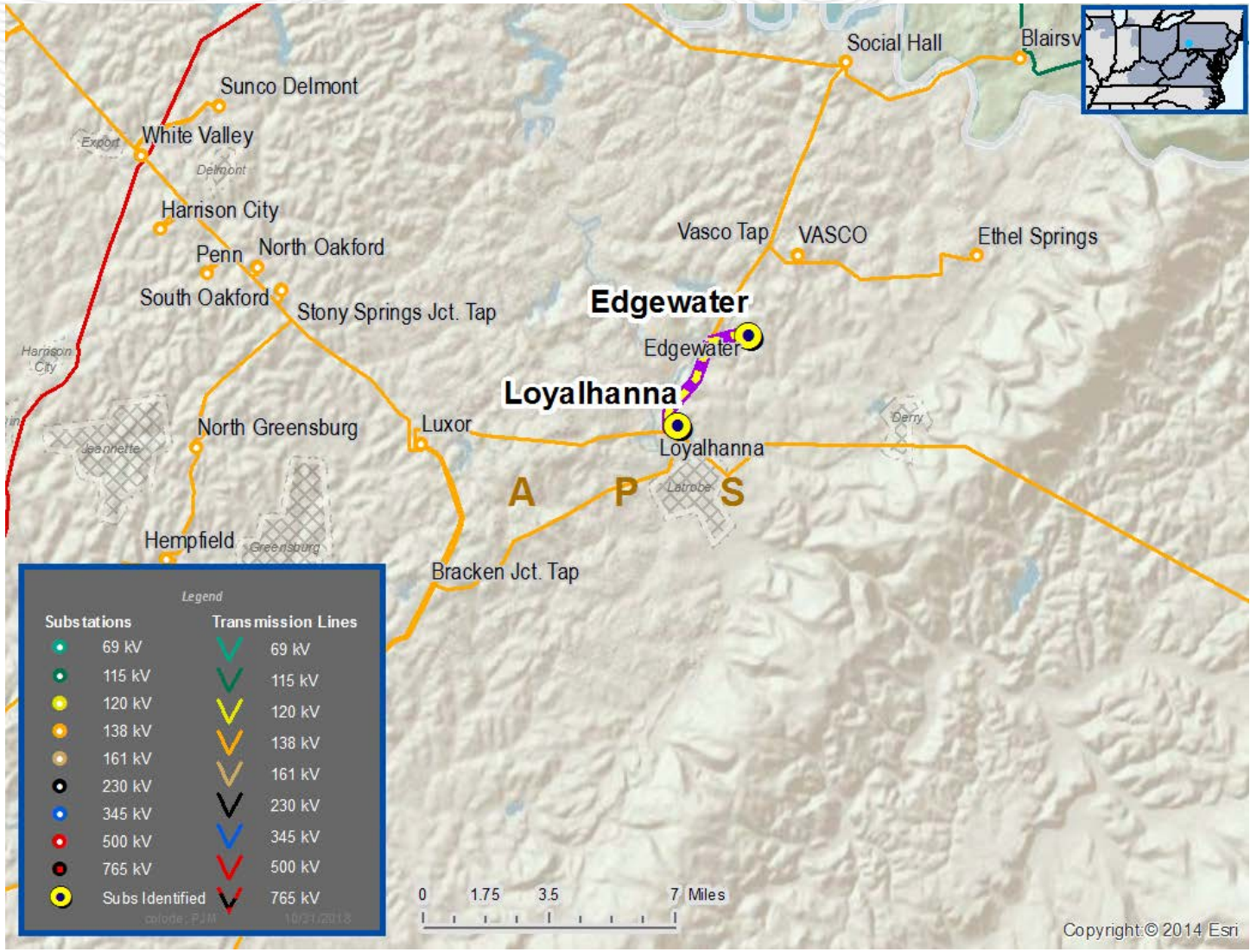
Recommended Solution:

- Reconductor the Edgewater – Loyalhanna 138 kV line (~0.67 miles) (b3076).

- Current rating: SN 160 MVA /SE 192 MVA
- New rating: SN 256 MVA / SE 294 MVA

Estimated Project Cost: $2M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



APS Transmission Zone

Problem Statement: Generation Deliverability

Wylie Ridge #7 500/345 kV transformer is overloaded for breaker failure contingency for loss of Wylie Ridge – AA2-121 Tap 345 kV, and Wylie Ridge #7 & #8 transformers.

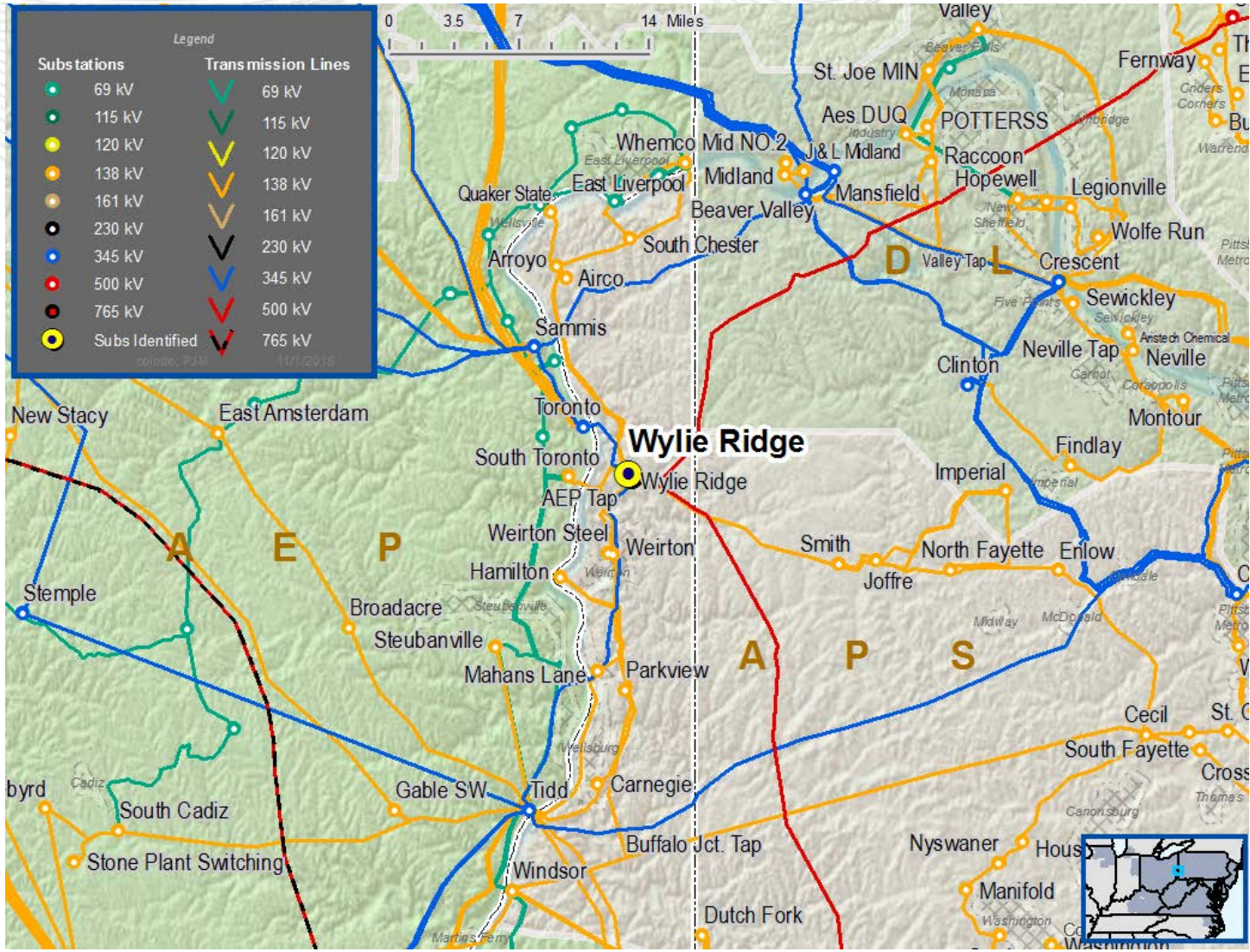
Recommended Solution:

- Replace Wylie Ridge #7 500/345 kV transformer (b3079).

- Current rating: SN 866 MVA / SE 883 MVA
- New rating: SN 1157 MVA / SE 1444 MVA

Estimated Project Cost: $6.37M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



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APS Transmission Zone

Problem Statement: Generation Deliverability

Karns City – Butler 138 kV line is overloaded for single contingency loss of Erie West – Wayne 345 kV line.

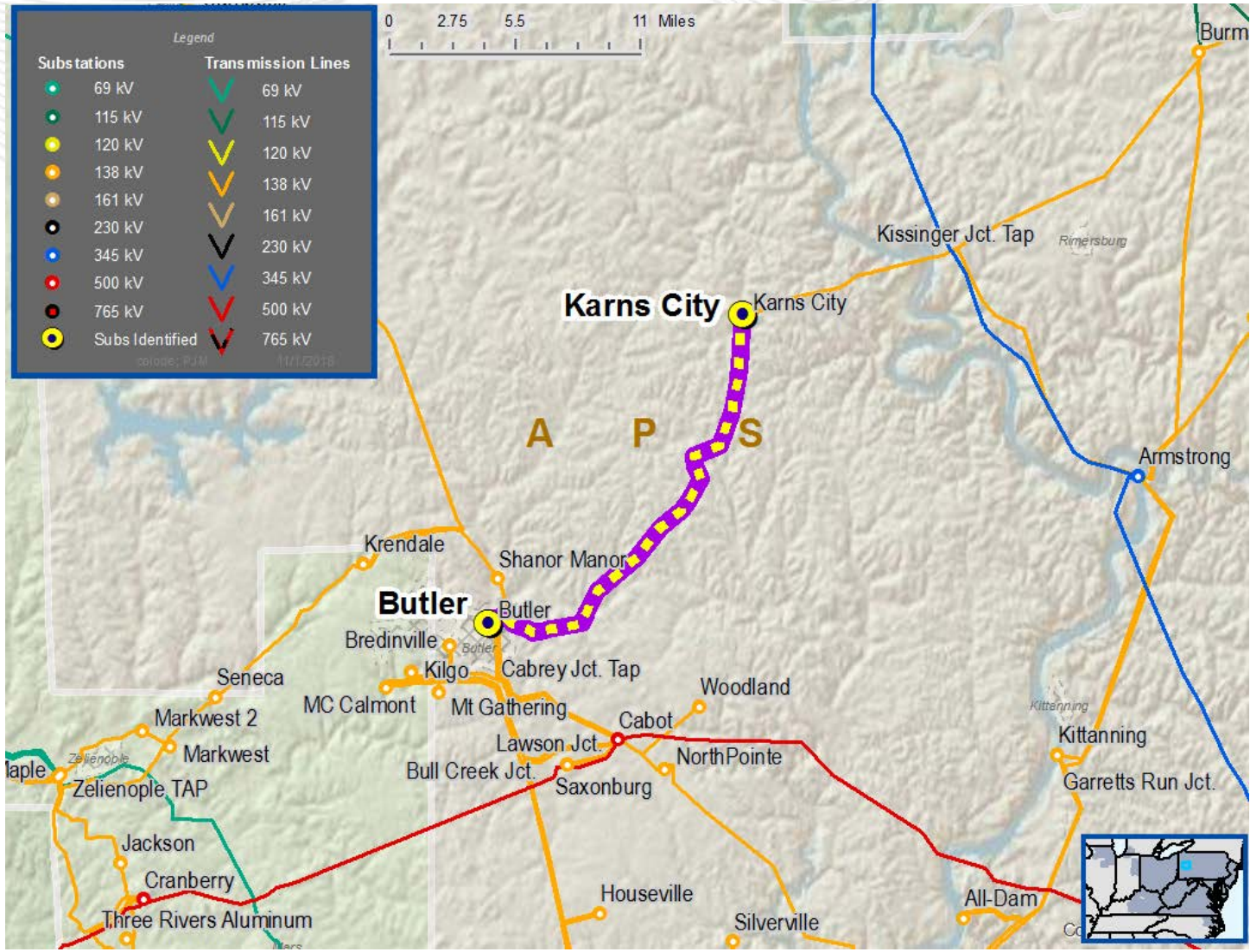
Recommended Solution:

- Replace bus conductor at Butler 138 kV bus, and replace bus conductor and line trap at Karns City 138 kV bus (b3083).

- Current rating: SN 160 MVA / SE 192 MVA
- New rating: SN 256 MVA / SE 294 MVA

Estimated Project Cost: $2M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



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PENELEC Transmission Zone

Problem Statement: Generation Deliverability

Geneva - Franklin Pike 115 kV line is overloaded for single contingency loss of Erie West – Wayne 345 kV line.

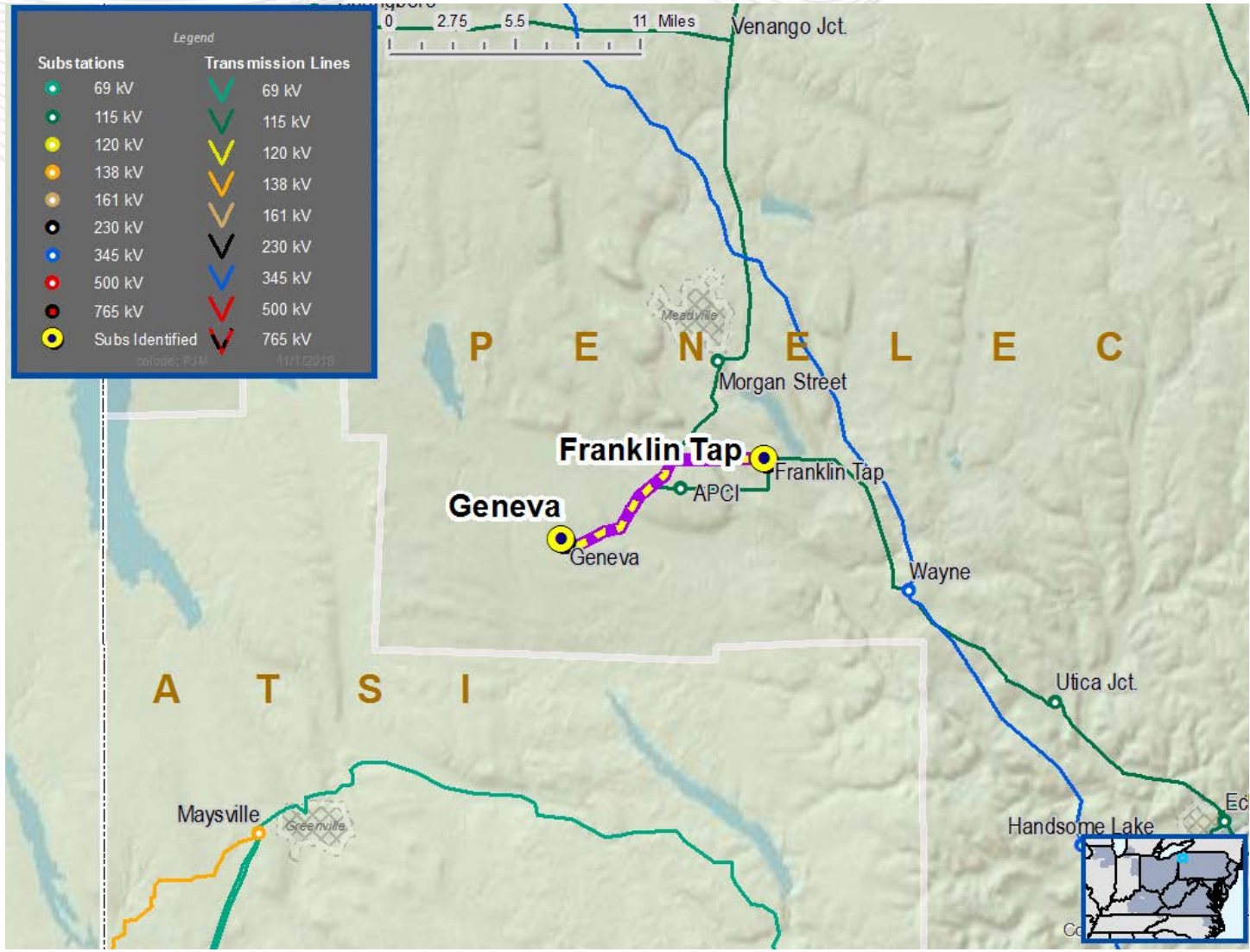
Recommended Solution:

- Construct 4-breaker ring bus at Franklin Tap 115 kV to loop in Morgan Street - Geneva 115 kV, Wayne – Geneva 115 kV (b3082).

Estimated Project Cost: $7M

Required IS Date: 06/01/2022

Projected IS Date: 06/01/2022



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PENELEC Transmission Zone

Problem Statement: Generation Deliverability

Franklin Tap - Wayne 115 kV is overloaded for single contingency loss of Erie West – Wayne 345 kV line.

Recommended Solution:

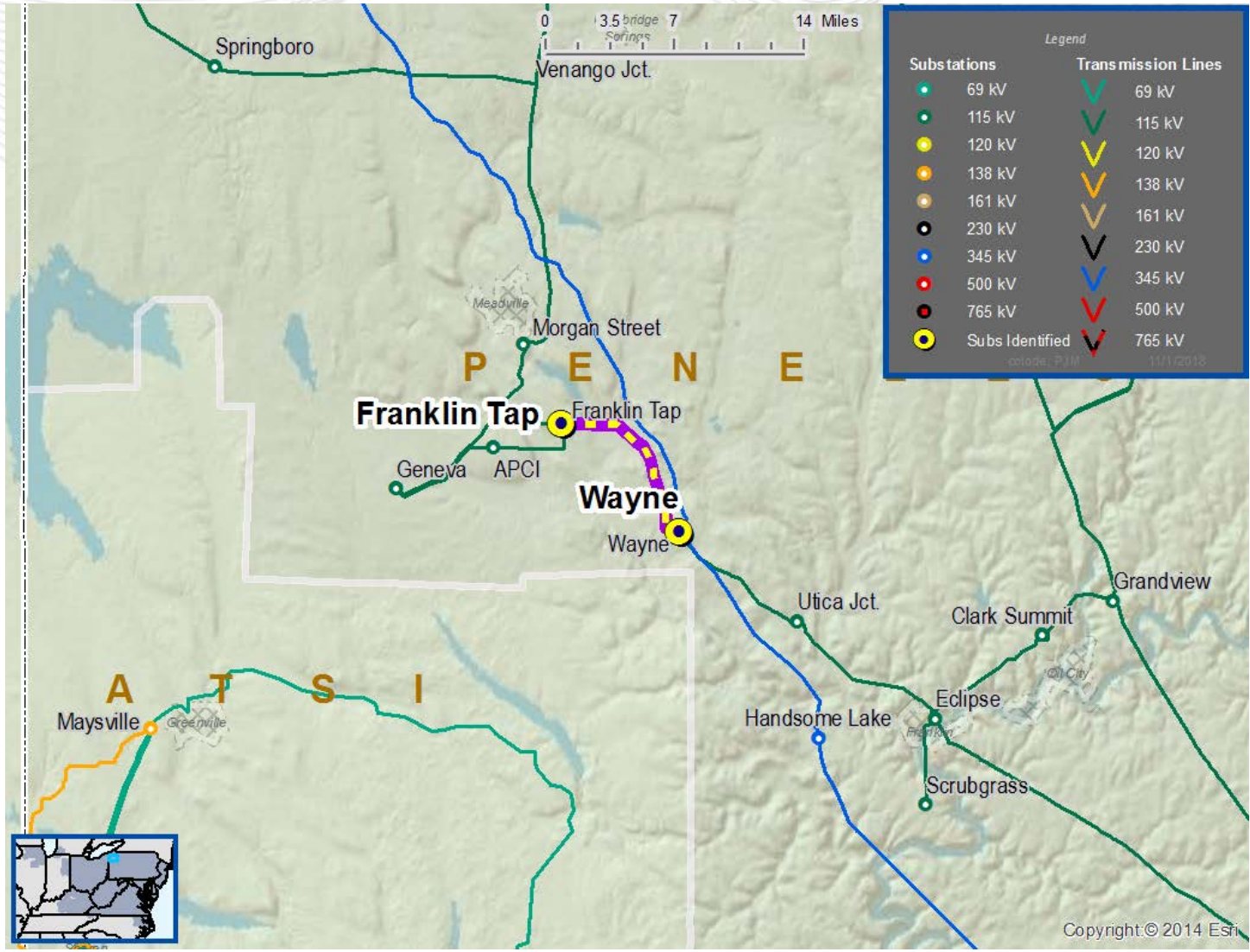
- Reconductor Franklin Tap - Wayne 115 kV line (~6.78 miles) (b3077).

- Current rating: SN 232 MVA / SE 282 MVA
- New rating: SN 373 MVA / SE 430 MVA.

Estimated Project Cost: $15M

Required IS Date: 06/01/2022

Projected IS Date: 06/01/2022



PENELEC Transmission Zone

Problem Statement: Generation Deliverability

Morgan Street - Venango Jct. 115 kV is overloaded for single contingency loss of Erie West – Wayne 345 kV line.

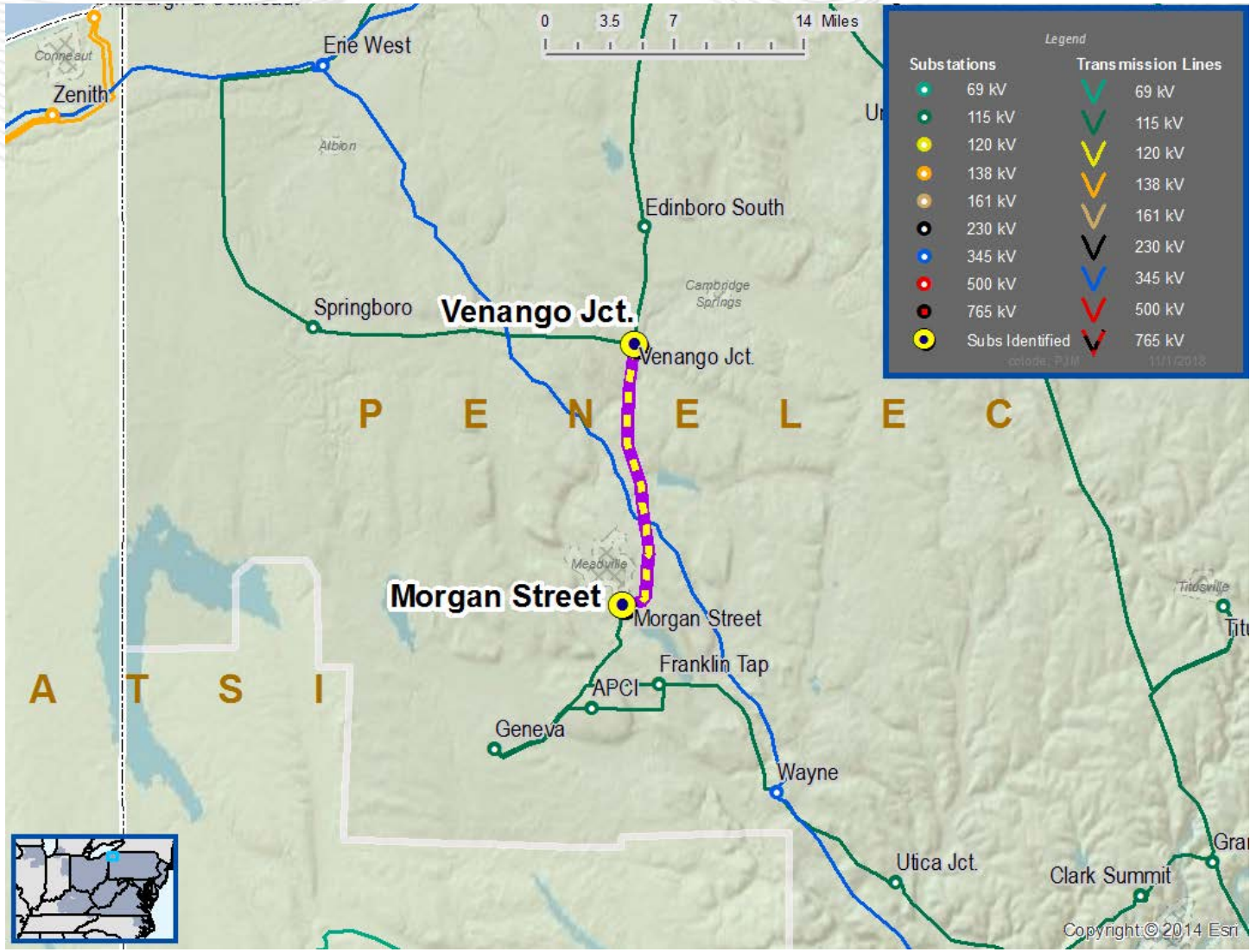
Recommended Solution:

- Replace the line trap, relays, and bus conductor at Morgan Street 115 kV bus. Also replace bus conductor at Venango Jct. 115 kV bus (b3078).

- Current rating: SN 149 MVA / SE 149 MVA
- New rating: SN 232 MVA / SE 282 MVA

Estimated Project Cost: $1M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



PENELEC Transmission Zone

Problem Statement: Generation Deliverability

Blairsville East 138/115 kV transformer is overloaded for single contingency loss of Keystone – Cabot 500 kV line

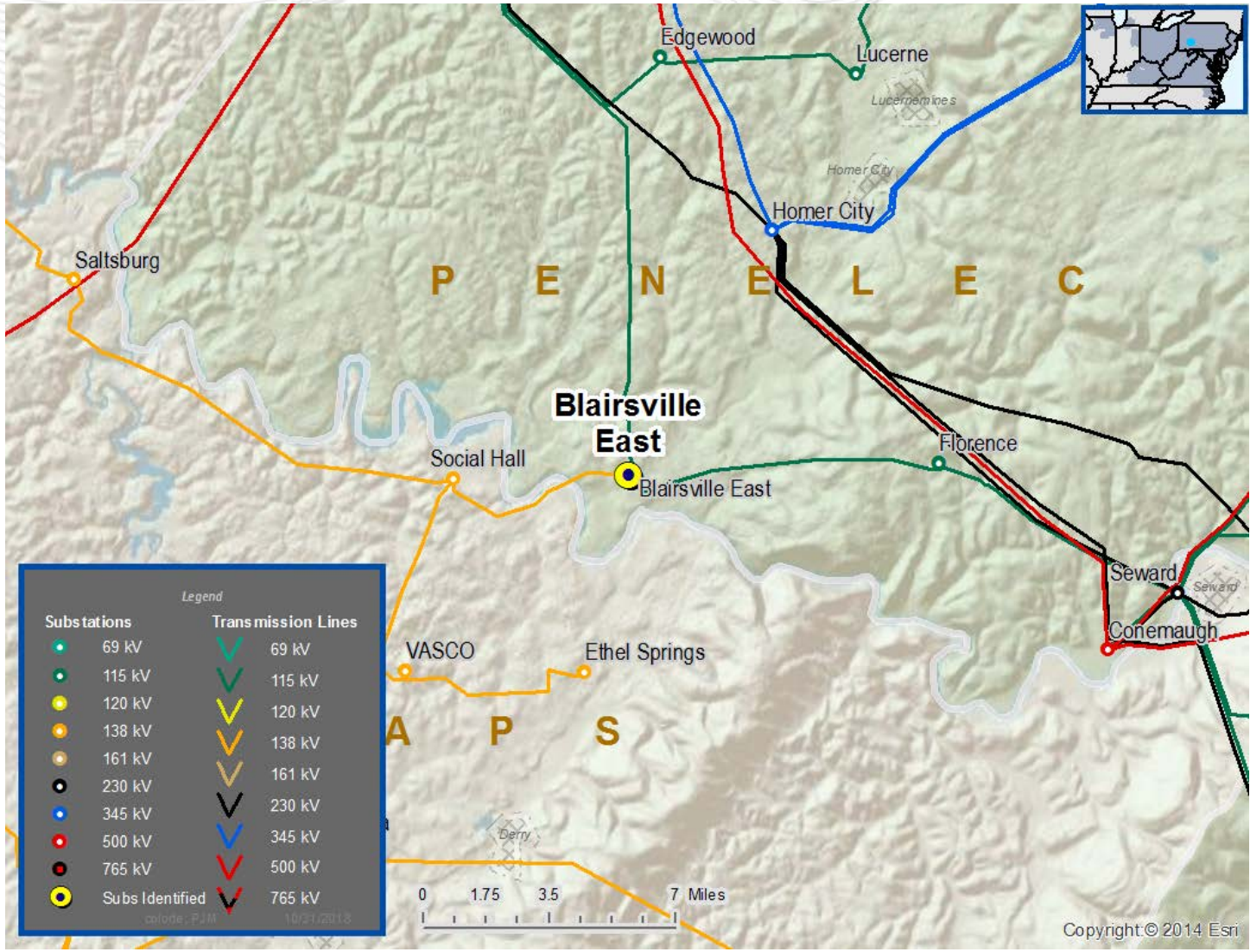
Recommended Solution:

- Replace 138/115 kV transformer and associated equipment such as breaker disconnects and bus conductor (b3073).

- Current rating: SN 291 MVA / SE 364 MVA
- New rating: SN 406 MVA / SE 456 MVA

Estimated Project Cost: $5M

Required IS Date: 06/01/2022
Projected IS Date: 06/01/2022



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DLCO Transmission Zone

Problem Statement: Generation Deliverability

West Mifflin - Dravosburg 138 kV line is overloaded for multiple contingencies:

- Breaker failure contingency for loss of Wilson - West Mifflin #2 138 kV line and Wilson - Dravosburg 138 kV line.
- Bus contingency for loss of Dravosburg - Bettis 138 kV line, Dravosburg - West Mifflin 138 kV line, and Dravosburg - Wilson 138 kV line.
- Single contingency for loss of Dravosburg - Wilson 138 kV line.

Recommended Solution:

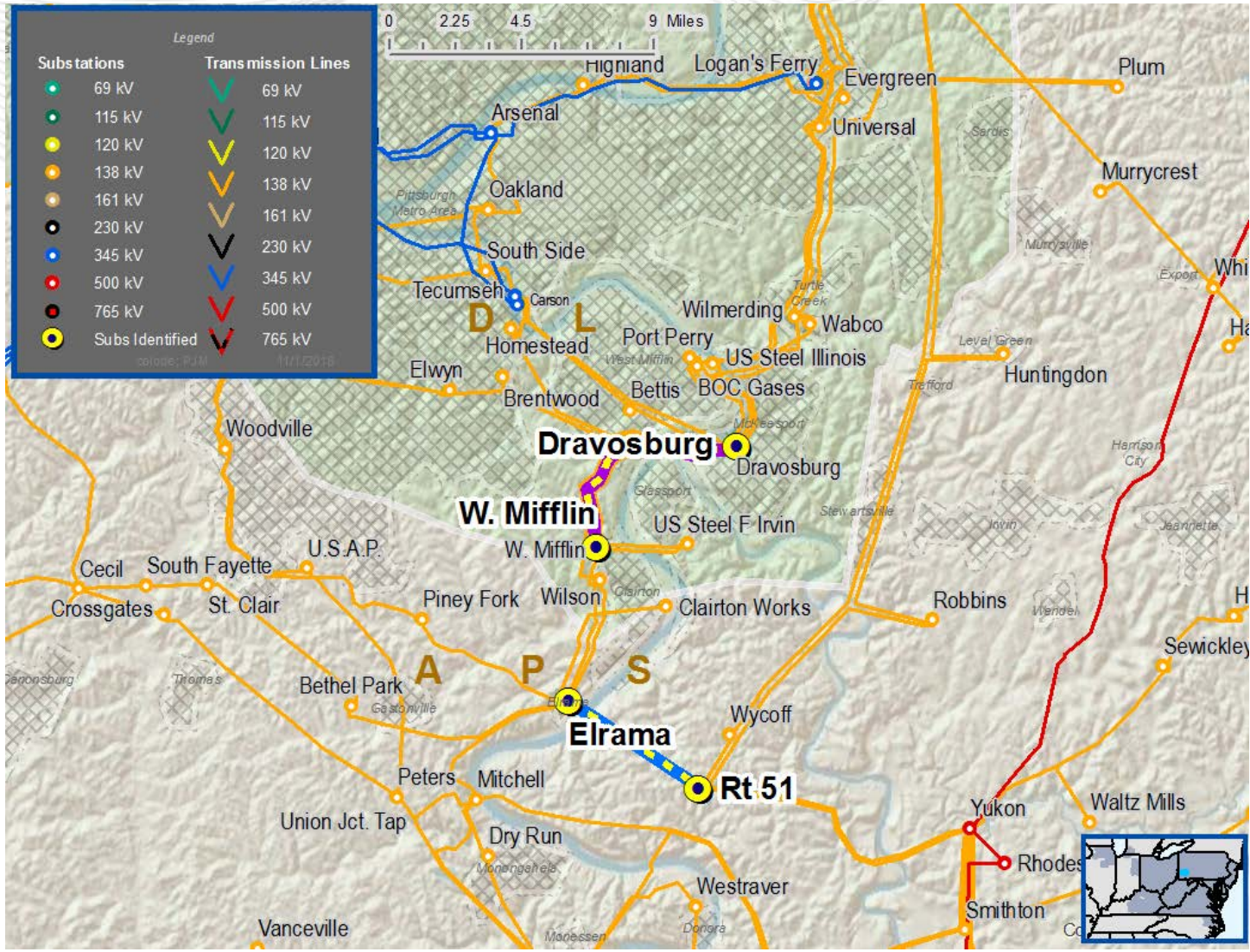
- Reconductor West Mifflin – Dravosburg 138 kV and Dravosburg - Elrama 138 kV lines (~3 miles). (b3061)
- Add West Mifflin 138 kV tie breakers. (b3062)

- Current rating: SN 382 MVA / SE 382 MVA
- New rating: SN 439 MVA / SE 490 MVA

Estimated Project Cost: $5.7M –b3061, $4M –b3062

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



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DLCO Transmission Zone

Problem Statement: Generation Deliverability

West Mifflin - Wilson 138 kV line is overloaded for multiple contingencies:

- Breaker failure contingency for loss of Wilson - West Mifflin #2 138 kV line and Wilson - Dravosburg 138 kV line.

- Bus contingency for loss of Dravosburg - Bettis 138 kV line, Dravosburg - West Mifflin 138 kV line, and Dravosburg - Wilson 138 kV line.

- Single contingency for loss of Dravosburg - Wilson 138 kV line.

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DLCO Transmission Zone

Problem Statement: Generation Deliverability (continued from previous slide)

Elrama - Wilson 138 kV line is overloaded for tower contingency for loss of Elrama – Wilson 138 kV line and Elrama – Dravosburg 138 kV line.

Recommended Solution:

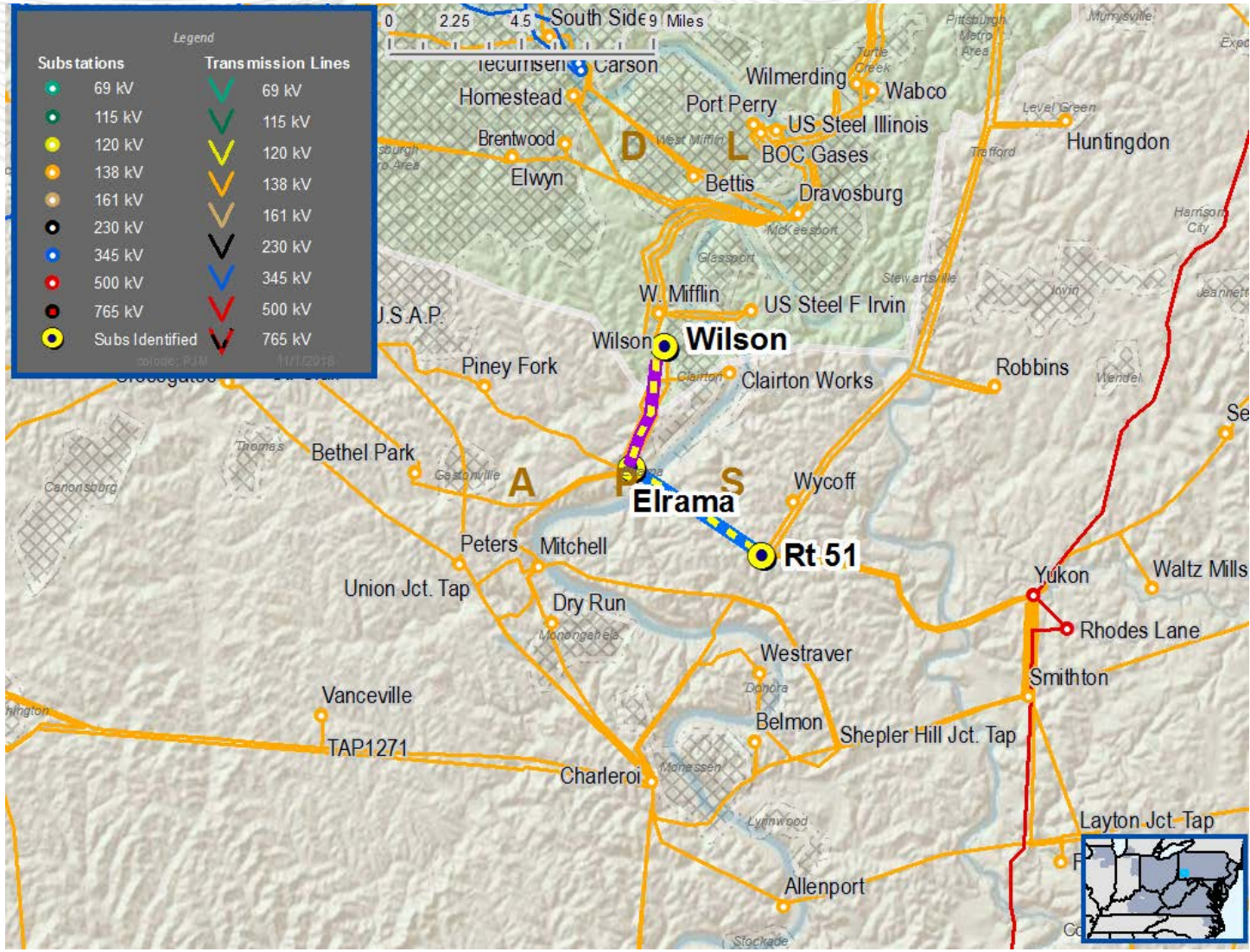
- Expand Elrama 138 kV substation to loop in US Steel Clairton - Piney Fork 138 kV. (b3064)

- Add Wilson tie breaker (b3065)

Estimated Project Cost: $8.75M – b3064, $4M – b3065

Required IS Date: 06/01/2021

Projected IS Date: 06/01/2021



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DLCO Transmission Zone

Problem Statement: Generation Deliverability

Wilson - Dravosburg 138 kV line is overloaded for multiple contingencies:

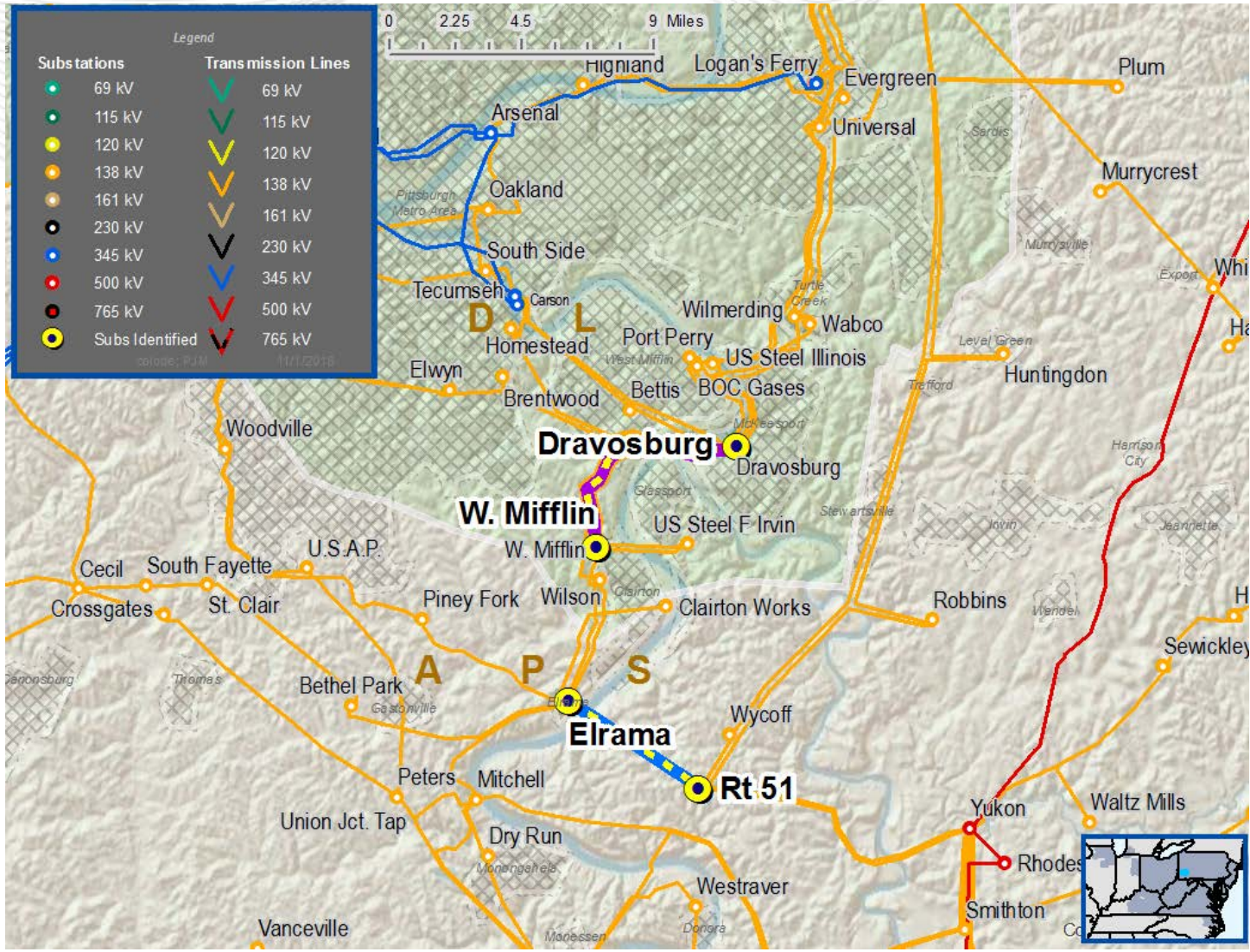
- Tower contingency for loss of West Mifflin - Wilson 138 kV line and Dravosburg - Elrama 138 kV line.
- Bus contingency for loss of Dravosburg - USS Illinois 138 kV line, Dravosburg - Carson 138 kV line, Dravosburg - West Mifflin 138 kV line , Dravosburg - Wilmerding 138 kV line, Dravosburg - US Steel Clairton, and Dravosburg - Elrama 138 kV line.
- Single contingency loss of Wilson - West Mifflin 138 kV line.

Recommended Solution:

- Reconductor Wilson - Dravosburg 138 kV line (~5 miles) (b3063).
- Current rating: SN 439 MVA / SE 497 MVA
- New rating: SN 790 MVA / SE 838 MVA

Estimated Project Cost: $ 4.8M

Required IS Date: 06/01/2021
Projected IS Date: 06/01/2021



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DLCO Transmission Zone

Problem Statement: N-1-1 thermal

Oakland – Panther Hollow 138 kV line is overloaded for following scenarios:

- Single contingency loss of Cheswick #1 unit followed by single contingency loss of Arsenal 345/138 kV transformer.

- Single contingency loss of Arsenal 345/138 kV transformer followed by single contingency loss of Cheswick #1 unit.

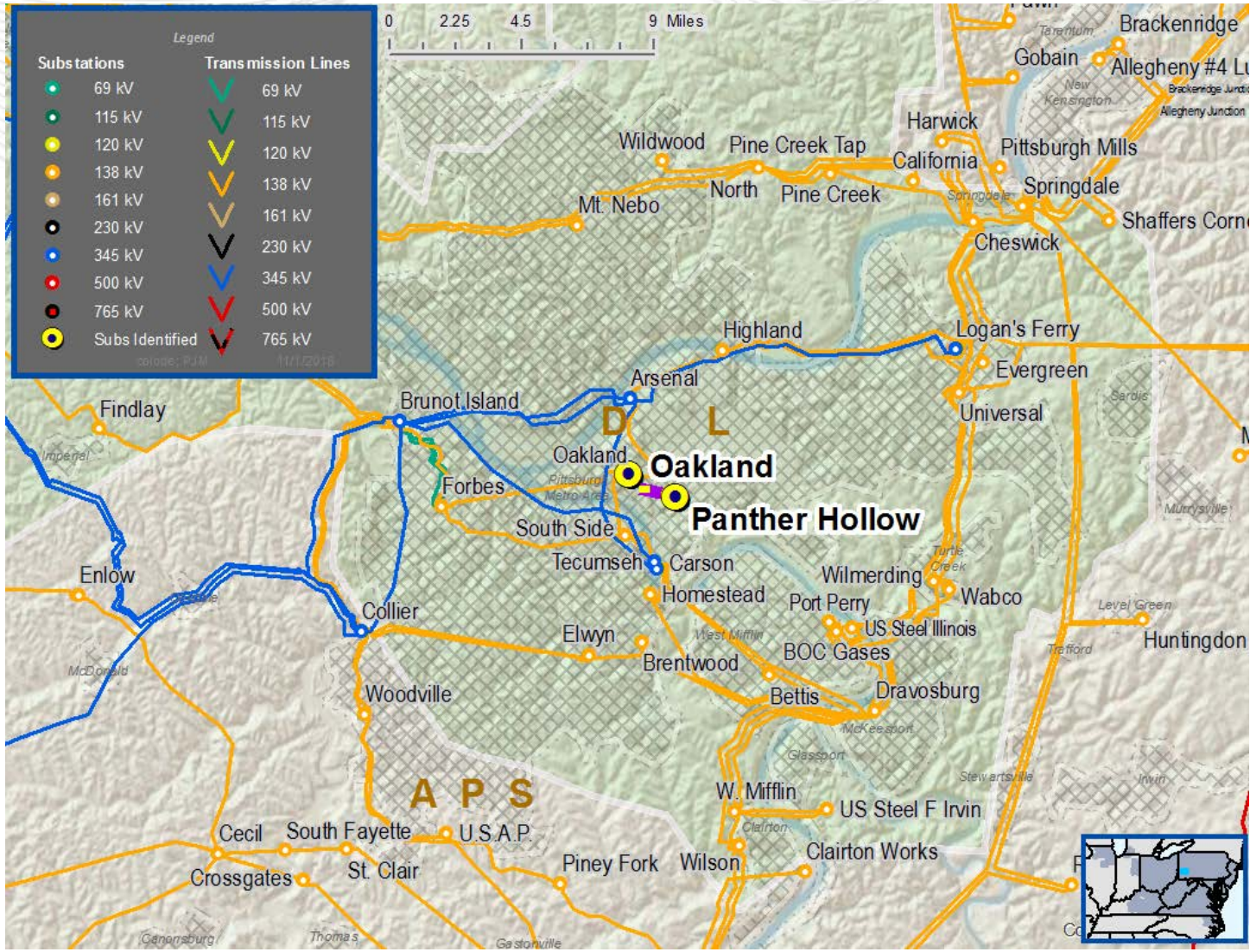
Recommended Solution:

- Reconductor Oakland - Panther Hollow 138 kV line (~1 mile) (b3084).

- Current rating: SN 185 MVA / SE 247 MVA
- New rating: SN 217 MVA / SE 306 MVA

Estimated Project Cost: $ 2.75M

Required IS Date: 06/01/2021
Projected IS Date: 06/01/2021



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AEP Transmission Zone

Problem Statement: Generation Deliverability

Kammer - George Washington 138 kV line is overloaded for tower contingency for loss of Beverly - Hollow 345 kV line and Kammer - Lamping 345 kV line.

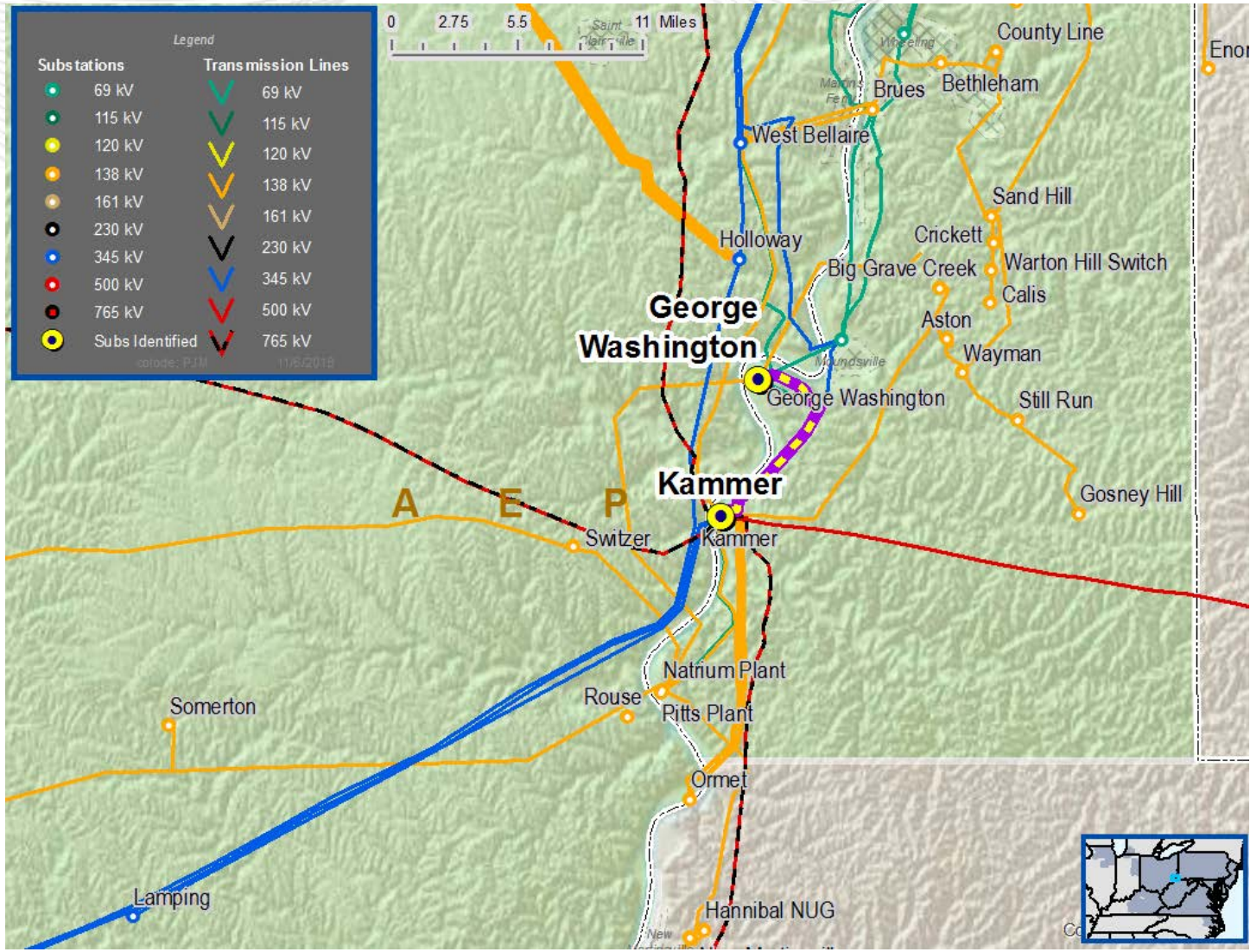
Recommended Solution:

- Conductor Kammer – George Washington 138 kV line (~0.08 mile) and replace wavetrap at Kammer 138 kV bus (b3085).
- Current rating: SN 296 MVA / SE 398 MVA
- New rating: SN 389 MVA / SE 550 MVA

Estimated Project Cost: $0.5M

Required IS Date: 06/01/2022

Projected IS Date: 06/01/2022



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Revision History

- V2 – 11/06/2018 – Formatting corrections and minor description clarifications. ISD and ratings corrections.
- V1 – 11/05/2018 – Original Slides Posted.

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