Attachments

Attachment A

Excerpts from *Transportation Needs Analysis*

EASTERN CORRIDOR SEGMENTS II and III (PID 86462)

TRANSPORTATION NEEDS ANALYSIS



Prepared for:
Ohio Department of Transportation
District 8
505 South State Route 741
Lebanon, OH 45036-9518

Prepared by:
Stantec Consulting Services, Inc.

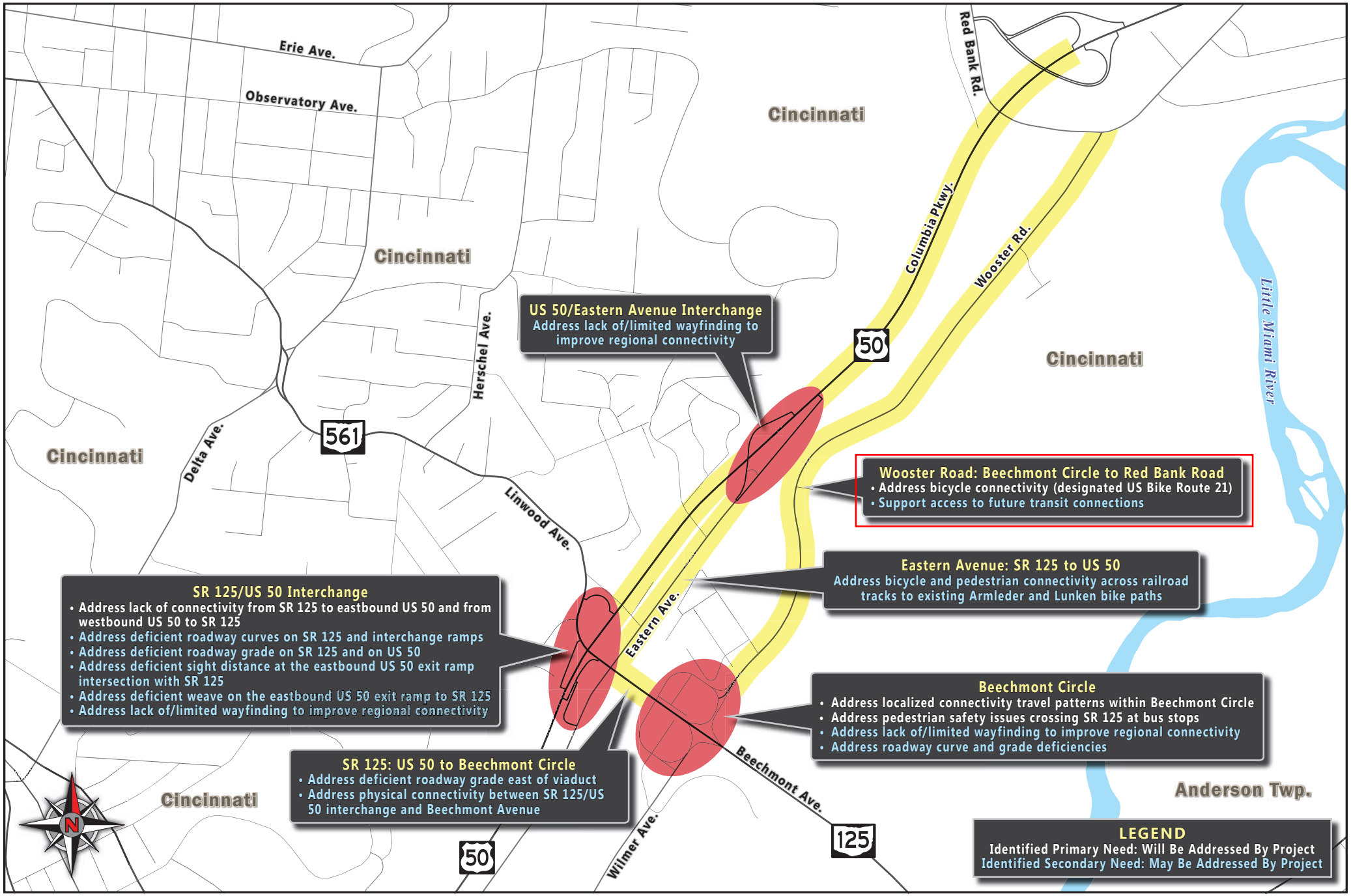
July 31, 2017

The Eastern Corridor

Figure ES-4

Eastern Corridor Segments II and III

Linwood/Eastern Interchange Focus Area



- Street calming is needed; Eastern Avenue between Linwood Avenue and US 50 is treated mostly as an on and off ramp and motorists go too fast. A solar radar sign would be beneficial in this location. (2 comments)

Three comments address bike issues:

- A pedestrian bridge is needed to get bikes over the railroad tracks (2 comments)
- Marked bike lanes are needed (1 comment).

One public transit comment identifies the need for a transit stop in this location.

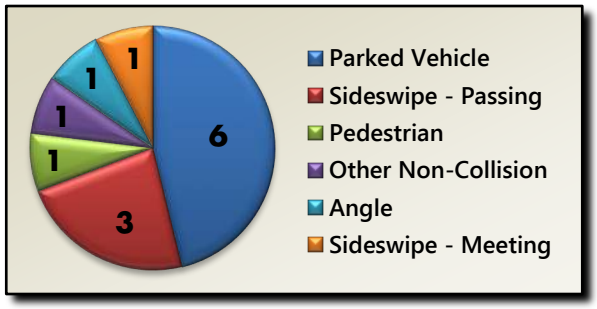


Figure 35: Frequency of Crashes by Crash Type Eastern Avenue: SR 125 to US 50

Crash Data: Eastern Avenue from south of SR 125 to US 50 was identified as a high hazard location through an ODOT crash screening of the Segments II and III roadway network.

As illustrated in **Figure 35**, there were 13 total crashes in this roadway section during the three-year period between 2013 and 2015. Parked vehicles and sideswipe crashes represent 75% of the total crashes. Although parked vehicle crashes are the most prevalent crashes, they do not occur at the same location. There is no correlation between the crash data and a specific contributing cause for the crashes. A plot of all 13 crashes is provided in **Attachment A-2**.

LOS Analysis: No level of service analysis was conducted for this segment.

Geometric Data: No geometric deficiencies were identified for this segment.

Pedestrian Data: No pedestrian data is available for this segment.

2.4.3.5 Wooster Road: Beechmont Circle to Red Bank Road

The section of Wooster Road between Beechmont Circle and Red Bank Road is a two-lane undivided roadway approximately 1.4 miles in length with a posted speed of 35 mph. There are numerous accesses to industrial businesses along this section of Wooster Road.

Stakeholder Input: Thirteen roadway comments identify concerns and needs at Wooster Road between Beechmont Circle and Red Bank Road. Of these concerns, four comments address congestion issues and indicate that extra lanes should be added to this roadway and truck traffic limited during rush hour. Other roadway concerns include the following:

- The road should be repaired (1 comment)
- The road should be repaved and restriped (1 comment)
- Wooster Road occasionally floods (1 comment)
- Air and noise pollution from traffic in this area are concerns at Ault Park (1 comment)
- Large delivery trucks and trailers to Hafner and Cincinnati Paperboard occasionally block Wooster Road as they back into loading docks (1 comment)

- Better signage is needed on Old Wooster Pike (1 comment)

Twenty-seven comments address bicycle access on Wooster Road:

- Although Wooster Road is an important route for cyclists, it is very dangerous (5 comments)
- A bike lane or bike path is needed along the Little Miami River between Lunken Park, Otto Armleder Park, Avoca Park, the Murray Avenue Trail, and the Little Miami Trail (10 comments)
- Marked bike lanes on Wooster are needed (8 comments)
- A bike/pedestrian crossing of the railroad tracks that parallel Eastern Avenue is needed (1 comment)
- A bike trail connection is needed across Wooster Pike from Armleder, along the Oasis Line ROW and connecting to the trail at Old Red Bank Road, which leads to the Murray Road Trail in Fairfax (1 comment).
- A bike path/trail is needed to connect with Downtown Cincinnati or to Hyde Park area (1 comment)
- Sharrows exist in Fairfax but disappear between Wooster Road and Otto Armleder Park (1 comment)

The following pedestrian comments were provided:

- A sidewalk is needed (1 comment)
- A crosswalk is needed at Carustar (1 comment)

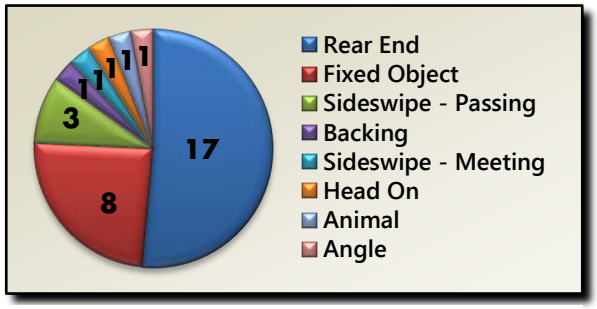


Figure 36: Frequency of Crashes by Crash Type
Wooster Road: Beechmont Circle to Red Bank

Crash Data: The ODOT crash screening of the Segments II and III roadway network identified the sub-segment of Wooster Road from the Cincinnati City Limit to approximately 0.70 miles south as a high hazard area. Therefore, a detailed crash analysis of the entire segment from Beechmont Circle to Red Bank Road was completed.

As illustrated in **Figure 36**, there were 33 total crashes in this roadway section during the three-year period between 2013 and 2015. Rear-end and fixed object crashes represent 75% of the total crashes. Of the 33 total crashes on the segment, 25 (75%) occurred in the high hazard section. Within the high hazard segment, 12 of the 25 crashes were rear-end crashes and eight of the 25 were fixed object crashes. There was not a clustering of crashes at a particular location. Half of the rear end crashes occurred between 3:00 PM and 5:00 PM with the majority of crashes occurring during the day in clear conditions. Thirty-three percent (33%) of the rear-end crashes occurred in wet conditions. Other than the observations described above, there was no correlation between the crash data and a specific contributing cause for rear-end crashes.

Seven of the eight fixed object crashes occurred in clear weather, six involved a vehicle traveling southbound, and four occurred in the dark (lighted). Other than the observations described

above, there was no correlation between the crash data and a specific contributing cause for rear-end crashes. See **Attachment A-2** for a plot of all 33 crashes.

LOS Analysis: No level of service analysis was conducted for this segment.

Geometric Data: No geometric deficiencies were identified for this segment.

Pedestrian Data: No pedestrian data is available for this segment.

2.4.3.6 US 50: SR 125 to Eastern Avenue

The section of US 50 between SR 125 and Eastern Avenue is a four-lane divided, limited-access roadway approximately 0.7 miles in length with a posted speed of 50 mph.

Stakeholder Input: There are three public comments for the section of US 50 between SR 125 and Eastern Avenue:

- US 50 should be widened
- There are dangerous merges in this section of US 50
- There is a street lighting issue in this location

One transit comment indicates that public transit in this area is very limited and there should be more frequent bus service from Downtown Cincinnati.

Crash Data: ODOT's crash screening did not identify this segment as an area of high hazard. Crash data indicates that no crashes occurred over the three-year period (2013 – 2015).

LOS Analysis: A freeway analysis was performed using the HCS. During both the AM and PM peak hours, the eastbound and westbound directions operate at LOS A in 2015, the No Build opening year (2022), and No Build design year (2042) conditions. No improvements are required for the existing, No Build opening year, and No Build design year conditions. These results are supported by the travel time data which shows no significant increase in travel time during the peak hours compared to off-peak hours.

Geometric Data: No geometric deficiencies were identified for this segment.

Pedestrian Data: No pedestrian data is available for this segment.

2.4.3.7 US 50: Eastern Avenue to Red Bank Road

The section of US 50 between Eastern Avenue and Red Bank Road is a four-lane divided, limited-access roadway approximately 0.9 miles in length with a posted speed of 50 mph.

Stakeholder Input: Four roadway comments identify congestion as a concern along US 50 between Eastern Avenue and Red Bank Road. Representative comments are:

- Congestion is a problem (2 comments)
- Columbia Parkway should be widened (1 comment)

Table 12: Linwood/Eastern Avenue Interchange Focus Area Needs Analysis

Primary Needs	Secondary Needs
SR 125/US 50 Interchange	
Address lack of connectivity from SR 125 to eastbound US 50 and from westbound US 50 to SR 125	• Address deficient roadway curves on SR 125 and interchange ramps • Address deficient roadway grade on SR 125 and on US 50 • Address deficient sight distance at the eastbound US 50 exit ramp intersection with SR 125 • Address deficient weave on the eastbound US 50 exit ramp to SR 125 • Address lack of/limited wayfinding to improve regional connectivity
SR 125: US 50 to Beechmont Circle	
None	• Address deficient roadway grade east of viaduct • Address physical connectivity between SR 125/US 50 interchange and Beechmont Circle
Beechmont Circle	
• Address localized connectivity travel patterns within Beechmont Circle • Address pedestrian safety issues crossing SR 125 at bus stops	• Address lack of/limited wayfinding to improve regional connectivity • Address roadway curve and grade deficiencies
Eastern Avenue: SR 125 to US 50	
None	Address bicycle and pedestrian connectivity across railroad to existing Armleder and Lunken bike paths
Wooster Road: Beechmont Circle to Red Bank Road	
• Address bicycle connectivity (designated US Bicycle Route 21)	• Support access to future transit connections
US 50: SR 125 to Eastern Avenue	
None	None
US 50/Eastern Avenue Interchange	
None	Address lack of/limited wayfinding to improve regional connectivity
US 50: Eastern Avenue to Red Bank Road	
None	None

Attachment B

Excerpts from *Conceptual Alternatives Implementation Plan*

CONCEPTUAL ALTERNATIVES IMPLEMENTATION PLAN

Eastern Corridor Segments II and III

PID 86462

JULY 24, 2019

Prepared for:

Ohio Department of Transportation,
District 8
505 South SR 741
Lebanon, Ohio 45036

Prepared by:
Stantec Consulting Services Inc.

Focus Area	PI Mtg Identifier	Identifier	Website Link	Conceptual Project Description	Priority	Maintaining Agency	Phasing Recommendations	Next Steps	Construction Cost Range	Right-of-Way Cost Range
SR 32 / SR 125	A9	32-2a	Link	Connect Five Mile Trail using subdivision streets in Turpin Hills to the end of Patterson Farms Ln, and then by utilizing existing emergency access road connecting to Turpin Lake Place to Little Miami Trail. Final connection to use A7 or A8.	Medium Priority	Anderson Township		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$2,500 to $4,000	$30,000 to $60,000
SR 32 / SR 125	A7	32-1a	Link	Make connection from Turpin Lake subdivision to Little Miami Trail with "mid-block" at-grade pedestrian crossing. Perform speed study in conjuction and move crossing to the intersection.	Medium Priority	Anderson Township	Build after A9	Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$35,000 to $50,000	%5,000 to $10,000
Newtown	B10	RB-3d	Link	Connect Riverside Park and Lake Barber with Little Miami Trail with shared use path. Golf course alignment.	Medium Priority	The Village of Newtown		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$1,175,000 to $1,775,000	$107,000 to $214,000
Newtown	B8	RB-3a	Link	Connect Riverside Park and Lake Barber with Little Miami Trail with shared use path. Portion of alignment along Valley.	Medium Priority	The Village of Newtown		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$160,000 to $240,000	$150,000 to $300,000
Ancor-SR 32 Hill	C10 C11	A-1 A-2	Link	Add access road from Newtown east corporation line to Broadwell Road. Includes adjacent shared use path.	Medium Priority	TBD		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration. Next step will consist of developing alternatives before arriving at a recommended preferred alternative.	$9,100,000 to $16,850,000	$175,000 to $1,450,000
Ancor-SR 32 Hill	C6	I-3e	Link	New alignment and grade separation of eastbound SR 32 over Eight Mile; unsignalized continuous green tee intersection at Eight Mile and westbound SR 32. (Partial eastbound only grade improvements on hill). Includes grade adjustments on Eight Mile Rd.	Medium Priority	ODOT	Construct after C5	Re-evaluate after construction of C5 or if C10/C11 move forward.	$11,650,000 to $17,450,000	$1,850,000 to $3,700,000
Linwood-Eastern_US-50_Red_Bank	E5	BIKE-1a BIKE-2a	Link	Connect Wasson Trail to Eastern (at D2) with shared use path along US 50.	Medium Priority	The City of Cincinnati		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$5,100,000 to $7,700,000	$855,000 to $1,710,000
Linwood-Eastern_US-50_Red_Bank	E7	BIKE-2b X-4d-1 BIKE-4a	Link	Connect Wasson Trail to Armleder with shared use path from Ault Park to Red Bank to Wooster, behind Cincinnati Paperboard to Armleder Trail Loop.	Medium Priority	The City of Cincinnati		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration. Shared use path connection without X-4d-1 could be considered.	$3,100,000 to $4,650,000	$830,000 to $1,660,000
Newtown	B8	RB-1	Link	Connect Riverside Park and Lake Barber with Little Miami Trail with shared use path. Portion of alignment from Riverside Park & Lake Barber to Valley.	Medium Priority	The Village of Newtown		Eastern Corridor Study Analysis complete; turned over to local agency for future consideration.	$820,000 to $1,230,000	$195,000 to $390,000
SR 32 / SR 125		I-22a		Improve signal timing at SR 125 & Elstun intersection.	Medium Priority	ODOT / Anderson Township		Due to planned redevelopement of the Skytop Pavilion, this intersection needs to be analyzed in conjunction with the new development's Traffic Impact Study.	Not available	Not available
SR 32 / SR 125		I-22b		Improve turn lanes at SR 125 & Elstun intersection.	Medium Priority	ODOT / Anderson Township		Due to planned redevelopement of the Skytop Pavilion, this intersection needs to be anlyzed in conjunction with the new development's Traffic Impact Study. Possible items to review would be: addition of westbound right turn lane and extension of northbound left turn lane.	Not available	Not available
US 50 Corridor		I-32b		Mariemont HS considering new access point to connect to US 50 Prominade signal.	Medium Priority	Columbia Township		This alternative is being considered by Mariemont Schools.	Not available	Not available

The Eastern Corridor

Eastern Corridor Segments II and III

Combined Linwood/Eastern Interchange and US 50/Red Bank Interchange Focus Area

Theme

Bicycle and Pedestrian

Primary Needs identified for this theme:

P9) Address pedestrian safety issues crossing SR 125 at bus stops.

P10) Address bicycle connectivity (designated US Bicycle Route 21).

Secondary Needs identified for this theme:

S16) Address bicycle and pedestrian connectivity across the railroad tracks to existing Armleder and Lunken bike paths.

Concept drawings are presented on the following pages.

DESCRIPTION

- Connect Wasson Way Trail to the Armleder Road entrance with a shared-use path along US 50.
  - This concept brings Wasson from Ault Park along Columbia Parkway to Eastern, where it could tie into Concept BIKE-1.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

5/22 MEETING DISCUSSION AND COMMENTS

- A barrier-protected shared-use path would be located along right side of westbound US 50.
- The path would follow the existing exit ramp (5% grade) from US 50 to Eastern Avenue, then cross to Armleder Road using the connection established in the BIKE-1 concept.
- No additional comments received following the 5/22 meeting.

9/7 MEETING DISCUSSION AND COMMENTS

- This concept requires construction of a new bridge crossing from Eastern Avenue to Wooster Road. The bridge would be located immediately east of Linwood Park.
- A shared-use path located next to US 50 would need to be separated by a physical barrier; concrete barriers are proposed. Installing concrete barriers would not impact the hillside or shoulder along US 50, but would require modification of the city gateway.
  - One Committee member expressed concern that cyclists would be traveling a long way without an option to exit the path. Another suggested that, even with the concrete barrier, cyclists might not feel safe, particularly with children traveling so close to vehicular traffic on US 50.
- The BIKE-2b, BIKE-4a and BIKE-4b concepts would need to be construction in conjunction with other projects to complete a full connection. Cost estimates for the necessary combinations are:
  - BIKE-2a: $3.1M to $4.7M
  - BIKE-2b, X-4d-1,BIKE-4a: $4.53M to $7M
- BIKE 2b, X-4d-1, BIKE-4b: $4.43M to $6.8M
- No additional comments received following the 9/7 meeting.

12/12 MEETING DISCUSSION AND COMMENTS

- This project would connect the bike path to Ault Park's hiking trails, which opens up a larger commuter network to local neighborhoods.
- Consider incorporating the spur to the Murray Trail (as outlined in concepts E6/E7) into this concept.
- The priority of this concept will depend on the status and advancement of the Wasson Way trail.

NEXT STEPS/RECOMMENDATION

- Include in the Implementation Plan as a medium priority, including BIKE-2a and BIKE-1a to fully connect Wasson Way Trail to Armleder Park.
- Consider connecting Murray Trail spur.

Safety ECAT Benefit /Cost Ratio	Location	Traffic Operations							Construction Cost	R/W Impacts		Environmental Impacts		Support and/or Facilitate Multi-Modal	Improve Regional Connectivity	Improve Local Access
		Time Period	HCS Results			TransModeler Results				Number of Relocations	R/W Cost	Anticipated Environmental Document	Red Flag Triggers			
			2042 Delay (seconds)	2042 LOS	% Reduction from No Build	2042 Delay (seconds)	2042 LOS	% Reduction from No Build								
									$5.1M to $7.6M	0		D1	Section 4(f)	Improves	Improves	Improves

PRIORITY: MEDIUM

Drawing was presented at the 5/22 meeting.



0 200 400 FEET 800

March 2018

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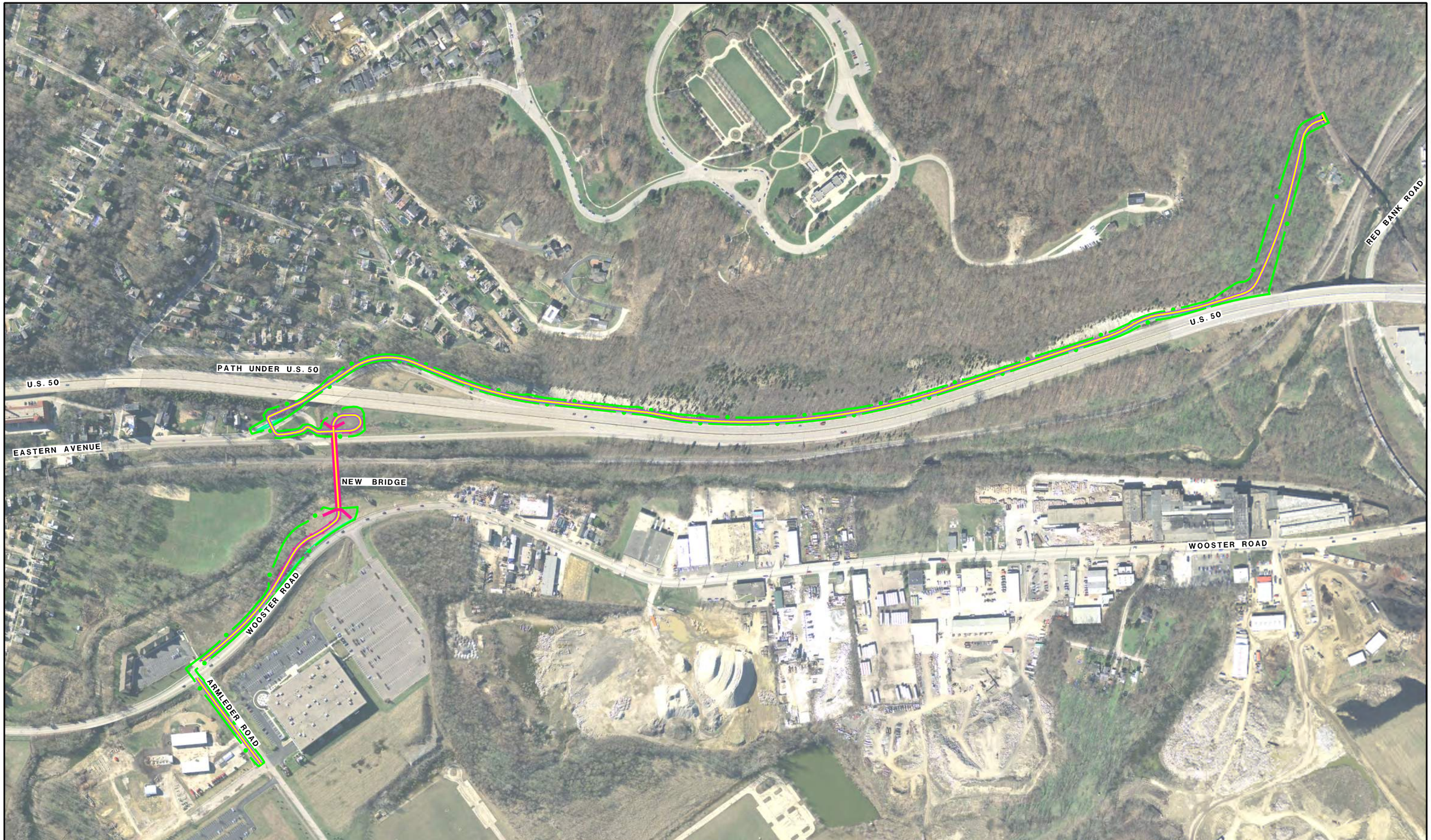
Concept Drawing

Eastern Corridor Multi-Modal Projects
Segment II-III (SR 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-2A

SHARED USE PATH FROM WASSON TRAIL TO ARMLEDER ROAD

Drawing was presented at the 9/7 meeting.



0 200 400 FEET 800

September 2018

N

Stantec

Concept Drawing

Eastern Corridor Multi-Modal Projects
Segment II-III (SR 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-2A (Overall View)

SHARED USE PATH FROM WASSON TRAIL TO ARMLEDER ROAD

Concept drawings are presented on the following pages. Concept is also shown with BIKE-2a (E5).

DESCRIPTION

- Connect the Wasson Way Trail to Armleder Road with shared-use path running on a gravel path in Ault Park to Old Red Bank Road over to Red Bank.
  - This shared-use path would drop out of Ault Park at the first railroad trestle and follow the tracks north to a connection with Red Bank Road.
  - Path would then follow Red Bank south to Wooster Road. Path would continue southwest on Wooster Road to Armleder Road.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

5/22 MEETING DISCUSSION AND COMMENTS

- An on-street bike path on Wooster would be challenging because businesses are located close to the road on both sides in this area.
- Commercial use of the road would make it a challenge to keep the bike path clean. Road debris (gravel, dirt, sand, trash, etc.) would likely collect in the bike path.
- Running the bike path behind the businesses located on the north side of Wooster may be a challenge. Space availability is limited by a creek and old rail tracks (not used since 1982) and buildings. Ownership of the rail tracks may be split between SORTA and Norfolk Southern.
- The consultant team will confirm whether routing a bike path behind businesses on the north side of Wooster may be an option.
- The consultant team will determine who owns the railroad tracks in this area.
- No additional comments received following the 5/22 meeting.

9/7 MEETING DISCUSSION AND COMMENTS

- This concept would be part of a phased-approach to connecting the Wasson Way Trail to Armleder Road using X-4d-1 (Wooster extension to Colbank with roundabout at Red Bank Road and Wooster Road) and BIKE-4a or BIKE-4b.
- The path would connect with the gravel path in Ault Park, drop under the railroad trestle at the back of the park and go north parallel to Old Red Bank road, then over the creek before turning south to follow along the new X-4d or X-4d-1 connector.
- A Committee member asked if instead of following the new connector, would it be possible to continue the path along Old Red Bank Road US 50 of the US 50 ramp. ODOT shared that there is an existing abutment wall under US 50 that is a barrier to a bike path connection.
- The BIKE-2b, BIKE-4a and BIKE-4b concepts would need to be construction in conjunction with other projects to complete a full connection. Cost estimates for the necessary combinations are:
  - BIKE-2a: $3.1M to $4.7M
  - BIKE-2b, X-4d-1,BIKE-4a: $4.53M to $7M
  - BIKE 2b, X-4d-1, BIKE-4b: $4.43M to $6.8M
- No additional comments received following the 9/7 meeting.

12/12 MEETING DISCUSSION AND COMMENTS

- Of the three bike path options in this area [BIKE-2a (E5), BIKE-4b (E6) and BIKE-4a (E7)], E6 received the highest amount of support from the public.
  - The committee surmised that this is because, as drawn, the bike path would travel along a vegetated corridor and creek before linking with the Armleder bike path.
  - H. Hafner & Sons expressed concern with having the bike path cross the company's driveway. They reported that 800 trucks come in and out of the driveway on a daily basis and it is hard to see bikes from the trucks. There is also typically a lot of debris in area.
- E6/E7 estimates do not include the cost of constructing the proposed roundabout at Wooster and Red Bank. If that cost were to be added, the estimates for each would be closer to the cost estimates for concept BIKE-2a (E5).
- The committee discussed eliminating BIKE-4b (E6) due to the concerns of connecting the bike path across the Hafner driveway.
- The committee agreed that concept BIKE-4a (E7) needs to include the proposed roundabout at Wooster and Red Bank. Therefore, the cost estimates for the roundabout should be added to the estimate for BIKE-4a (E7). This will increase the cost significantly. Even so, the committee agreed that this option should still be included in the Implementation Plan for future consideration.
- The priority of this concept will depend on the status and advancement of the Wasson Way trail.
- No further study on E6; include E7 in the Implementation Plan as a medium priority.

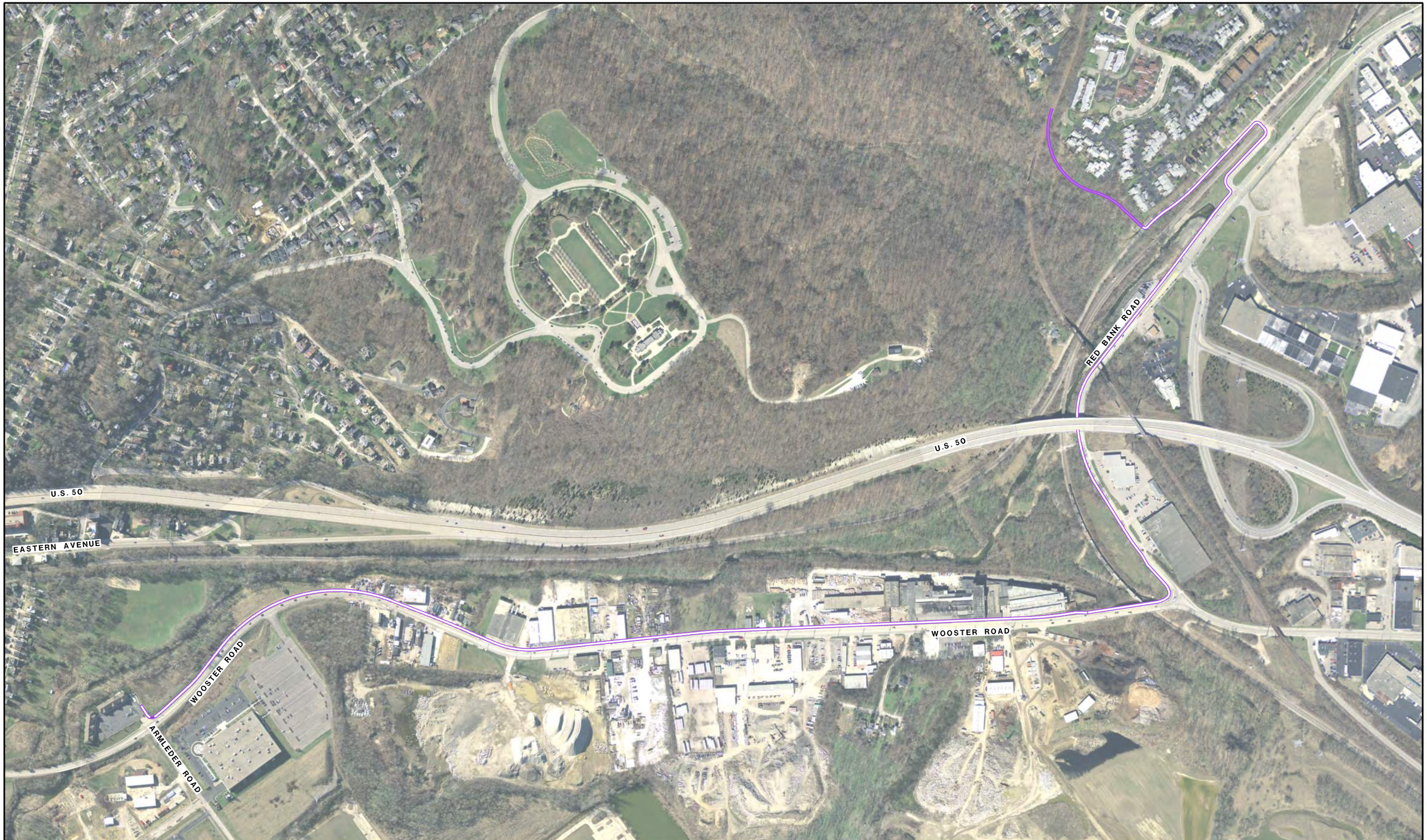
NEXT STEPS/RECOMMENDATION

- No further study on concept E6.
- Include E7 in the Implementation Plan as a medium priority. This includes a connection from Wasson Way Trail to Murray Trail, a shared-use path on the X-4d-1 alignment without the roadway improvements and the roundabout at Wooster and Red Bank.

Safety ECAT Benefit /Cost Ratio	Location	Traffic Operations							Construction Cost	R/W Impacts		Environmental Impacts		Support and/or Facilitate Multi-Modal	Improve Regional Connectivity	Improve Local Access
		Time Period	HCS Results			TransModeler Results				Number of Relocations	R/W Cost	Anticipated Environmental Document	Red Flag Triggers			
			2042 Delay (seconds)	2042 LOS	% Reduction from No Build	2042 Delay (seconds)	2042 LOS	% Reduction from No Build								
									$530K to $800K	0	$380K to $760K	C2	R/W Impacts, Stream Impacts, Waterway Permit, Potential T&E, Section 4(f), ESA Issues	Improves	Improves	Improves

E6 PRIORITY: NO FURTHER STUDY; E7 PRIORITY: MEDIUM

Drawing was presented at the 5/22 meeting.



0 200 400 FEET 800

March 2018

Stantec

Concept Drawing

Eastern Corridor Multi-Modal Projects
Segment II-III (SR 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-2B

SHARED USE PATH FROM WASSON TRAIL TO ARMLEDER ROAD

Drawing was presented at the 9/7 meeting.



0 150 300 FEET 600

N

September 2018

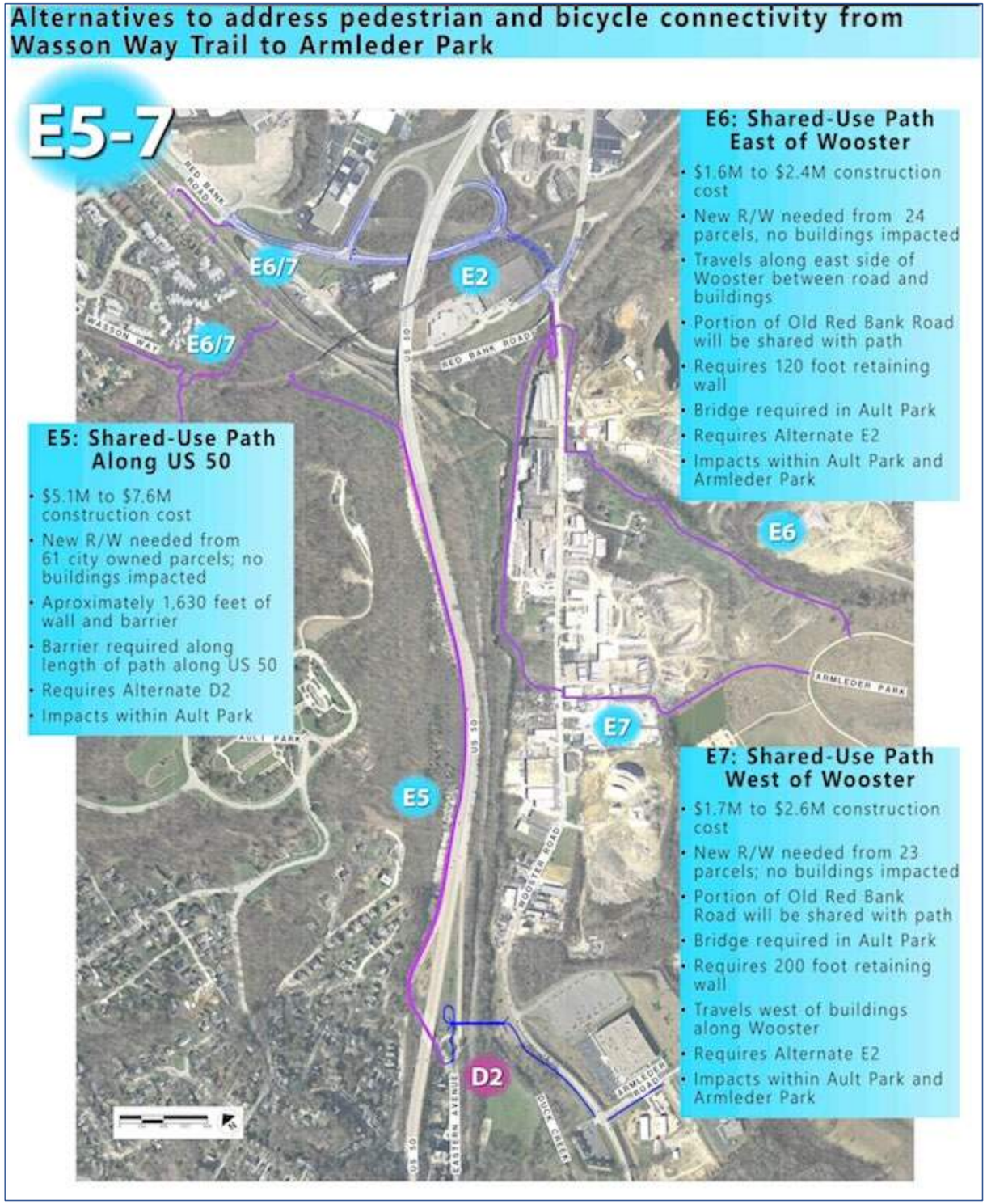
Stantec

Concept Drawing

Eastern Corridor Projects
Segment II-III (S.R. 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-2B

SHARED USE PATH CONNECTION BETWEEN WASSON TRAIL AND ARMLEDER TRAIL



Drawing was presented at the October 24 & 25 Open House meetings.

PUBLIC FEEDBACK RATINGS SUMMARY (E5)

Strongly Oppose	Dislike	Neutral	Like	Strongly Support
6%	11%	24%	23%	36%

(percentages have been rounded)

PUBLIC FEEDBACK RATINGS SUMMARY (E6)

Strongly Oppose	Dislike	Neutral	Like	Strongly Support
9%	2%	23%	25%	42%

(percentages have been rounded)

PUBLIC FEEDBACK RATINGS SUMMARY (E7)

Strongly Oppose	Dislike	Neutral	Like	Strongly Support
14%	3%	29%	20%	34%

(percentages have been rounded)

Concept drawing is presented on the following page.

DESCRIPTION

- Restripe Wooster Road to include bike lanes and/or sharrows.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

5/22 MEETING DISCUSSION AND COMMENTS

- This concept would require widening Wooster Road on both sides.
- Commercial use of the road would make it a challenge to keep the bike path clean. Road debris (gravel, dirt, sand, trash, etc.) would likely collect in the bike path.
- Is there any option to route the bike path between Miami Bluff in Mariemont to the back of Armleder?
  - Concern is that the grade is too steep.
  - The consultant team will determine who owns the railroad tracks in this area, and which of these, if any, could potentially be used for a bike path (City of Cincinnati may have some documentation).

Comments Submitted Following the 5/22 Meeting

(Comments are presented as submitted by Committee members; no edits to content were made.)

- Figure BIKE-3 shows a bike trail extension across Wooster towards Mariemont Avenue near the Mariemont Industrial District. Any proposed bike paths in Mariemont will require Village approval. Also, not bike path information has been provided for the US 50 segment. Mariemont reserves the right to additional comments as this information becomes available from ODOT.

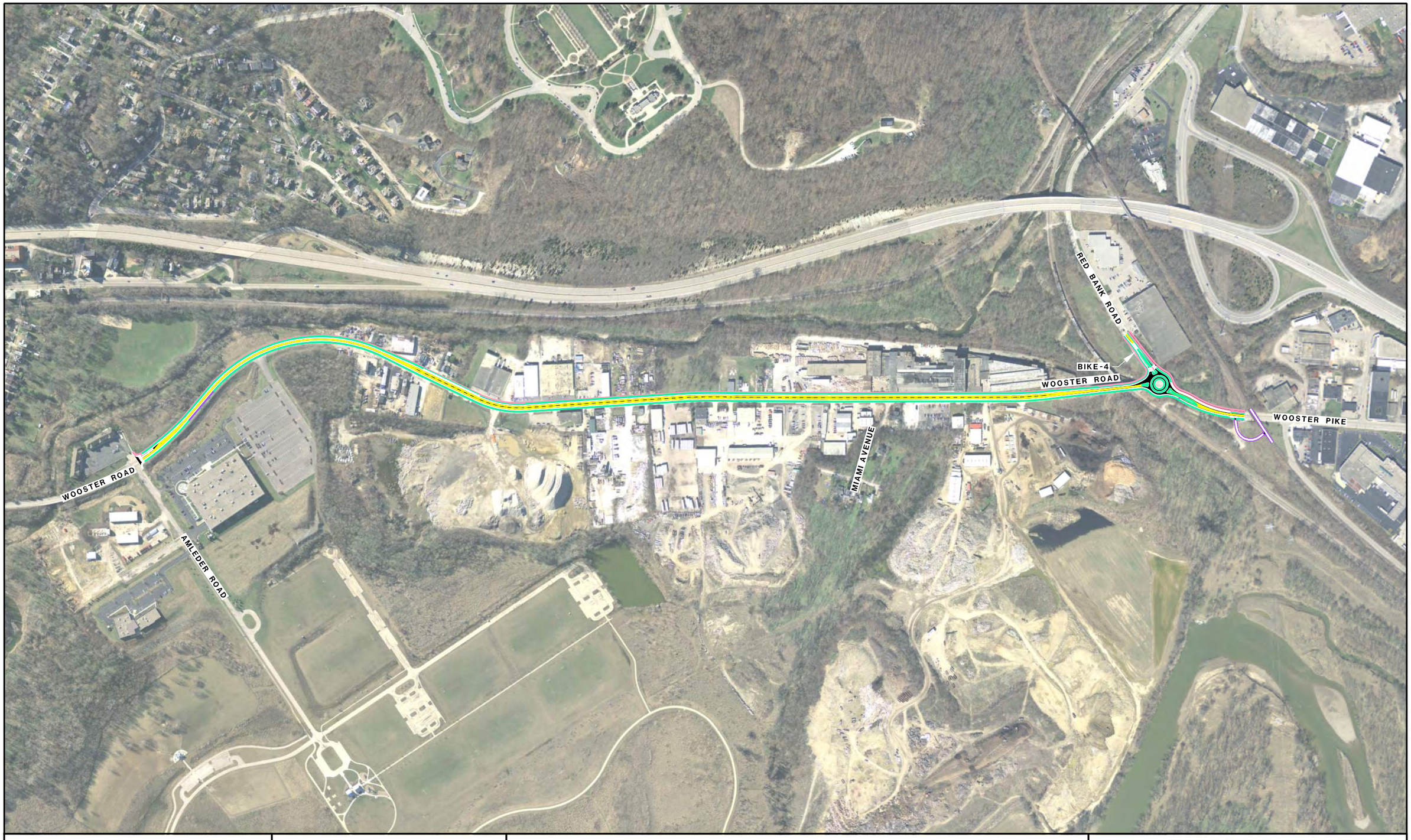
NEXT STEPS/RECOMMENDATION

- No further study due to the high cost of project and right-of-way impacts. Also, it would be difficult to keep the path clear of debris from local truck traffic.

Safety	Traffic Operations	Constructability Issues	Construction Cost	R/W Impacts	Environmental / Community Impacts	Supports and/or Facilitates Multi-Modal	Improve Regional Connectivity	Improve Local Access	RECOMMENDATION
IMPROVES	NEUTRAL	SIMPLE	< $5 MILLION	PROPERTY TAKES	MINIMAL (C1/C2)	IMPROVES	NEUTRAL	NEUTRAL	**NO FURTHER STUDY**

RECOMMENDATION: NO FURTHER STUDY

Drawing was presented at the 5/22 meeting.



0 250 500 FEET 1000

MARCH 2018

Stantec

Concept Drawing

Eastern Corridor Projects
Segment II-III (S.R. 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-3

WOOSTER ROAD TO INCLUDE BIKE LANES

Concept drawing is presented on the following page.

DESCRIPTION

- Improve Wooster Road to include a shared-use path.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

5/22 MEETING DISCUSSION AND COMMENTS

- None discussed.

Comments Submitted Following the 5/22 Meeting

(Comments are presented as submitted by Committee members; no edits to content were made.)

- Figure BIKE-4 shows a bike trail extension across Wooster towards Mariemont Avenue near the Mariemont Industrial District. Any proposed bike paths in Mariemont will require Village approval. Also, not bike path information has been provided for the US 50 segment. Mariemont reserves the right to additional comments as this information becomes available from ODOT.

9/7 MEETING DISCUSSION AND COMMENTS

- Concept advanced as BIKE-4a and BIKE-4b (described on following pages).
- No additional comment received following the 9/7 meeting.

NEXT STEPS/RECOMMENDATION

- Incorporate concept into BIKE-2b; BIKE-4a becomes part of BIKE-2b (E7), while BIKE-4b becomes part of BIKE-2b (E6).

Safety	Traffic Operations	Constructability Issues	Construction Cost	R/W Impacts	Environmental / Community Impacts	Supports and/or Facilitates Multi-Modal	Improve Regional Connectivity	Improve Local Access	RECOMMENDATION
IMPROVES	NEUTRAL	SIMPLE	< $5 MILLION	PROPERTY TAKES	MODERATE (D1/D2)	IMPROVES	NEUTRAL	IMPROVES	**ADVANCE**

RECOMMENDATION: ADVANCE WITH BIKE-2B (E6/E7).

Drawing was presented at the 5/22 meeting.



0 250 500 FEET 1000

MARCH 2018

Stantec

Concept Drawing

Eastern Corridor Projects
Segment II-III (S.R. 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-4

SHARED USE PATH ALONG WOOSTER ROAD

Concept drawing is presented on the following page; Concept also shown with BIKE-2b (E6 and E7).

DESCRIPTION

- Add shared-use path along Wooster Pike behind Cincinnati Paperboard and then crossing Wooster at the greenspace to the Armleder Trail loop.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

9/7 MEETING DISCUSSION AND COMMENTS

- This concept could be combined with X-4d-1 (Wooster extension to Colbank with roundabout at Red Bank Road and Wooster Road) and BIKE-2b to connect the Wasson Way Trail to the Armleder Trail Loop.
- This concept would include a mid-block crossing on Wooster (west of Cincinnati Paperboard's greenspace) with a rectangular rapid flash beacon (RRFB).
- Running the shared-use path behind Cincinnati Paperboard but south of the creek is a tight fit.
- A Committee member asked if it might be possible to take the trail through the existing Norfolk-Southern railyard in Mariemont (Clare Yard). It was reported however, that that area is being preserved for potential future rail use.
- A Committee member asked whether it was possible to rate Concept BIKE-4a and BIKE-4b as to which is more feasible from a construction standpoint. Additional engineering analysis would be required in order to make that determination.
- The BIKE-2b, BIKE-4a and BIKE-4b concepts would need to be construction in conjunction with other projects to complete a full connection. Cost estimates for the necessary combinations are:
  - BIKE-2a: $3.1M to $4.7M
  - BIKE-2b, X-4d-1,BIKE-4a: $4.53M to $7M
  - BIKE 2b, X-4d-1, BIKE-4b: $4.43M to $6.8M
- No additional comments received following the 9/7 meeting.

12/12 MEETING DISCUSSION AND COMMENTS

The following notes as the same as those documented under BIKE-2b (E6, E7):

- Of the three bike path options in this area (E5, E6 and E7), E6 received the highest amount of support from the public.
- The committee surmised that this is because, as drawn, the bike path would travel along a vegetated corridor and creek before linking with the Armleder bike path.
- H. Hafner & Sons expressed concern with having the bike path cross the company's driveway. They reported that 800 trucks come in and out of the driveway on a daily basis and it is hard to see bikes from the trucks. There is also typically a lot of debris in area.
- E6/E7 estimates do not include the cost of constructing the proposed roundabout at Wooster and Red Bank. If that cost were to be added, the estimates for each would be closer to the cost estimates for concept BIKE-1 (E6).
- The committee discussed eliminating E6 due to the concerns of connecting the bike path across the Hafner driveway.
- The committee agreed that concept E7 needs to be include the proposed roundabout at Wooster and Red Bank. Therefore, the cost estimates for the roundabout should be added to the estimate for E7. This will increase the cost significantly. Even so, the committee agreed that this option should still be included in the Implementation Plan for future consideration.
- The priority of this concept will depend on the status and advancement of the Wasson Way trail.

NEXT STEPS/RECOMMENDATION

- Include in the Implementation Plan as part of E7 as a medium priority.

Safety ECAT Benefit /Cost Ratio	Location	Traffic Operations							Construction Cost	R/W Impacts		Environmental Impacts		Support and/or Facilitate Multi-Modal	Improve Regional Connectivity	Improve Local Access
		Time Period	HCS Results			TransModeler Results				Number of Relocations	R/W Cost	Anticipated Environmental Document	Red Flag Triggers			
			2042 Delay (seconds)	2042 LOS	% Reduction from No Build	2042 Delay (seconds)	2042 LOS	% Reduction from No Build								
									$1.3M to $2M	0	$390K to $780K	C2	R/W Impacts, Stream Impacts, Waterway Permit, Potential T&E, Section 4(f), ESA Issues	Improves	Improves	Improves

PRIORITY: MEDIUM

Drawing was presented at the 9/7 meeting.



0 150 300 FEET 600

September 2018

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Concept Drawing

Eastern Corridor Projects
Segment II-III (S.R. 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-4A

SHARED USE PATH BETWEEN RED BANK ROAD AND ARMLEDER TRAIL

Concept drawing is presented on the following page. Concept is also shown with Concept BIKE-2b (E6 and E7).

DESCRIPTION

- Add shared-use path along the south side of Wooster Pike past Hafner parcel to Armleder Trail Loop.

NEEDS ADDRESSED

P10) Address bicycle connectivity (designated US Bicycle Route 21).

9/7 MEETING DISCUSSION AND COMMENTS

- This concept could be combined with X-4d-1 (Wooster extension to Colbank with roundabout at Red Bank Road and Wooster Road) and BIKE-2b to connect the Wasson Way Trail to the Armleder Trail Loop.
- This concept uses the existing Wooster bridge and then crosses under the bridge to get to the east side of Wooster, near the Hafner driveway.
- The path would weave between parking lots, past the Miami Avenue residential area and follow a swale to an eventual connection with the Armleder trail.
- A Committee member asked whether it was possible to rate Concept 4-a and Concept 4-b as to which was more feasible from a construction standpoint. However, additional engineering analysis would be required in order to make that determination.
- The BIKE-2b, BIKE-4a and BIKE-4b concepts would need to be construction in conjunction with other projects to complete a full connection. Cost estimates for the necessary combinations are:
  - BIKE-2a: $3.1M to $4.7M
  - BIKE-2b, X-4d-1,BIKE-4a: $4.53M to $7M
  - BIKE 2b, X-4d-1, BIKE-4b: $4.43M to $6.8M
- No additional comments received following the 9/7 meeting.

12/12 MEETING DISCUSSION AND NOTES

The following notes as the same as those documented under BIKE-2b (E6, E7):

- Of the three bike path options in this area (E5, E6 and E7), E6 received the highest amount of support from the public.
- The committee surmised that this is because, as drawn, the bike path would travel along a vegetated corridor and creek before linking with the Armleder bike path.
- H. Hafner & Sons expressed concern with having the bike path cross the company's driveway. They reported that 800 trucks come in and out of the driveway on a daily basis and it is hard to see bikes from the trucks. There is also typically a lot of debris in area.
- E6/E7 estimates do not include the cost of constructing the proposed roundabout at Wooster and Red Bank. If that cost were to be added, the estimates for each would be closer to the cost estimates for concept BIKE-1 (E6).
- The committee discussed eliminating E6 due to the concerns of connecting the bike path across the Hafner driveway.
- The committee agreed that concept E7 needs to be include the proposed roundabout at Wooster and Red Bank. Therefore, the cost estimates for the roundabout should be added to the estimate for E7. This will increase the cost significantly. Even so, the committee agreed that this option should still be included in the Implementation Plan for future consideration.
- The priority of this concept will depend on the status and advancement of the Wasson Way trail.

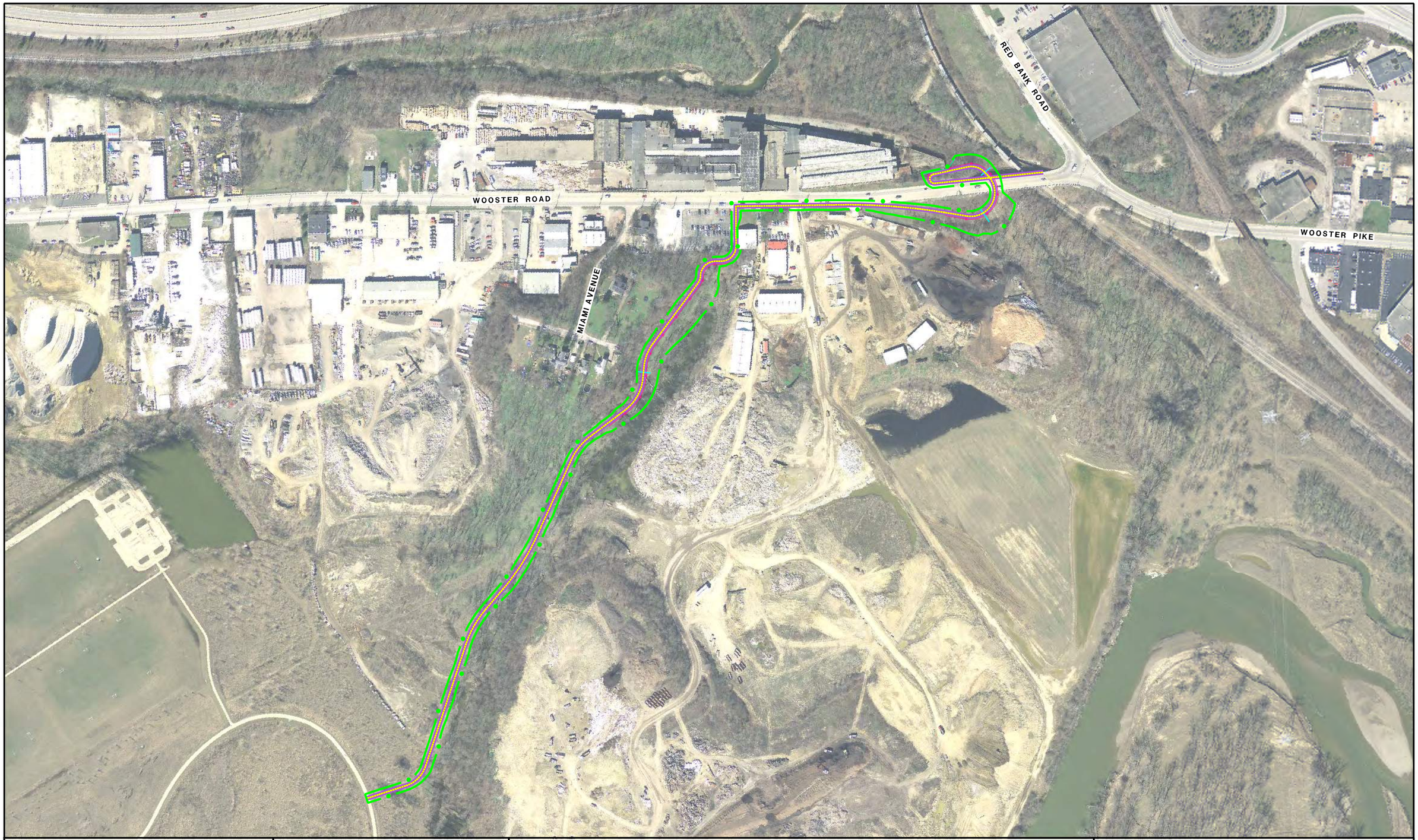
NEXT STEPS/RECOMMENDATION

- No further study.

Safety ECAT Benefit /Cost Ratio	Location	Traffic Operations							Construction Cost	R/W Impacts		Environmental Impacts		Support and/or Facilitate Multi-Modal	Improve Regional Connectivity	Improve Local Access
		Time Period	HCS Results			TransModeler Results				Number of Relocations	R/W Cost	Anticipated Environmental Document	Red Flag Triggers			
			2042 Delay (seconds)	2042 LOS	% Reduction from No Build	2042 Delay (seconds)	2042 LOS	% Reduction from No Build								
									$1.2M to $1.8M	0	$450K to $900K	C2	R/W Impacts, Stream Impacts, Waterway Permit, Potential T&E, Section 4(f), ESA Issues	Improves	Improves	Improves

RECOMMENDATION: NO FURTHER STUDY

Drawing presented at the 9/7 meeting.



0 150 300 FEET 600

September 2018

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Concept Drawing

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Segment II-III (S.R. 32 Corridor)
HAM-32F-0.00; PID 86462

Figure BIKE-4B

SHARED USE PATH BETWEEN RED BANK ROAD AND ARMLEDER TRAIL

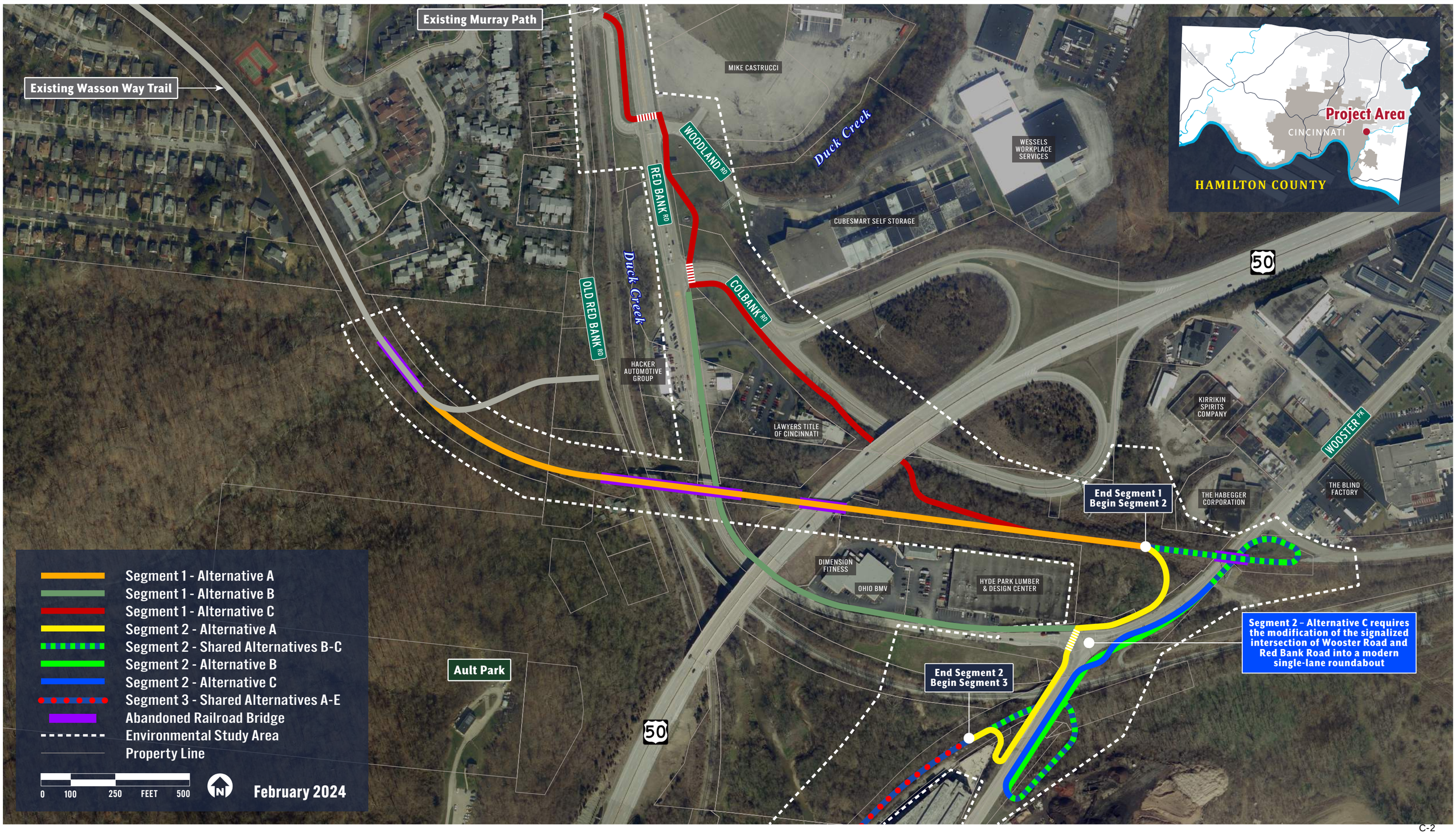
Attachment C

- Alternative Design Maps
- Plan and Profile Sheets

Alternative Design Maps

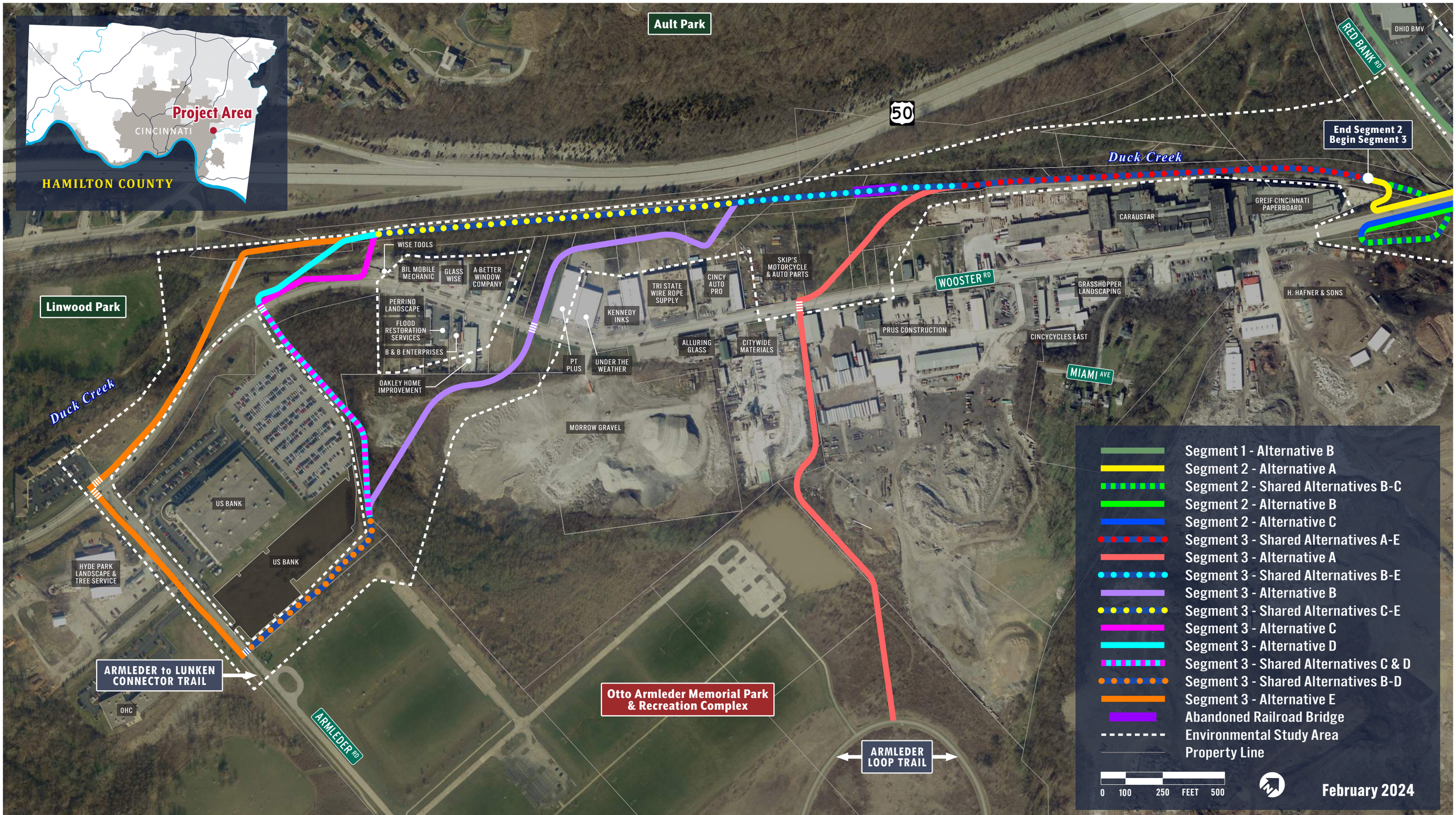
Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



Shared Use Path Alternatives

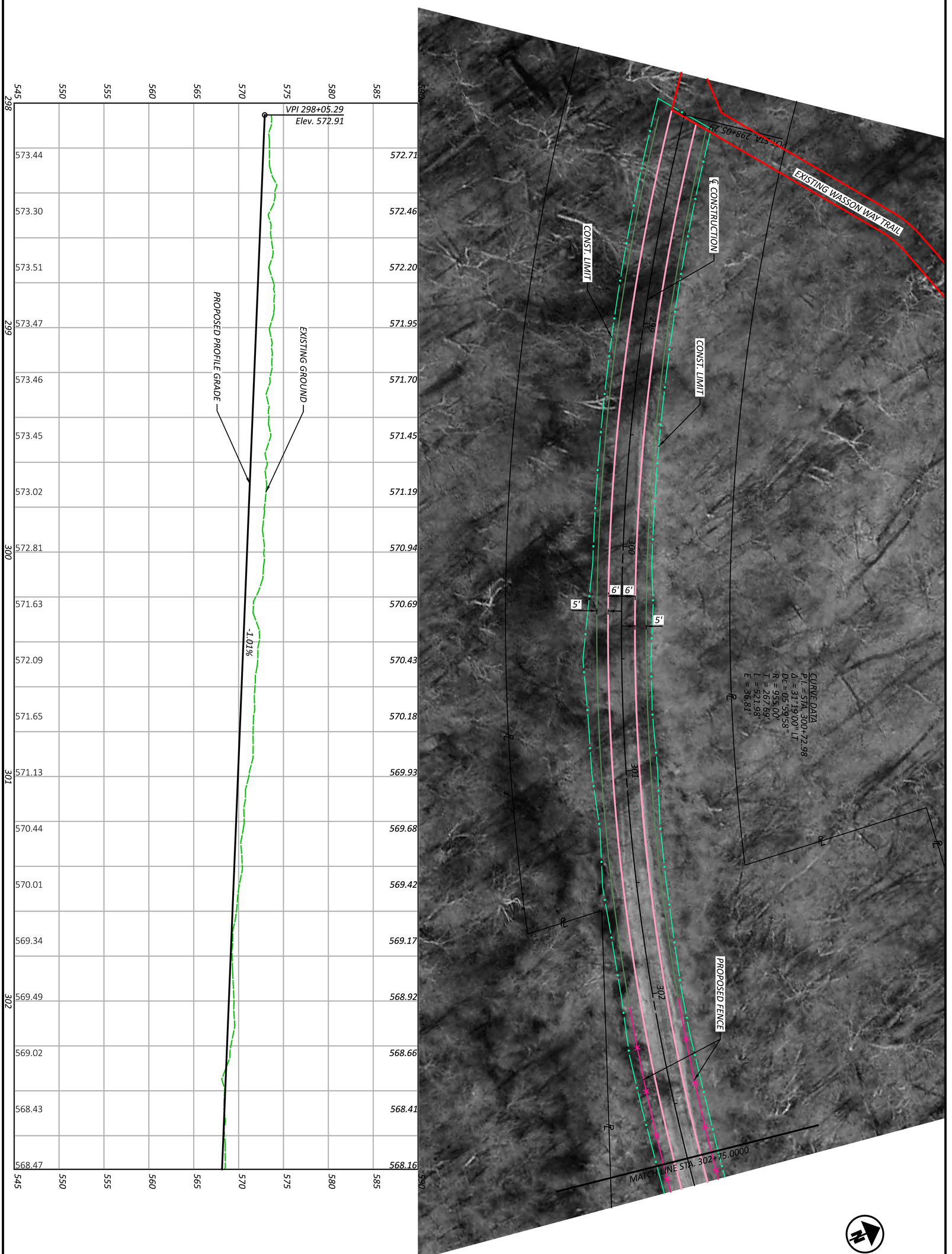
Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



Plan and Profile Sheets

HAM-WASSON WAY TO OTTO ARMLEDER

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SEGMENT 1 - ALTERNATIVE A
STA. 298+05.29 TO STA. 302+75.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.1	5

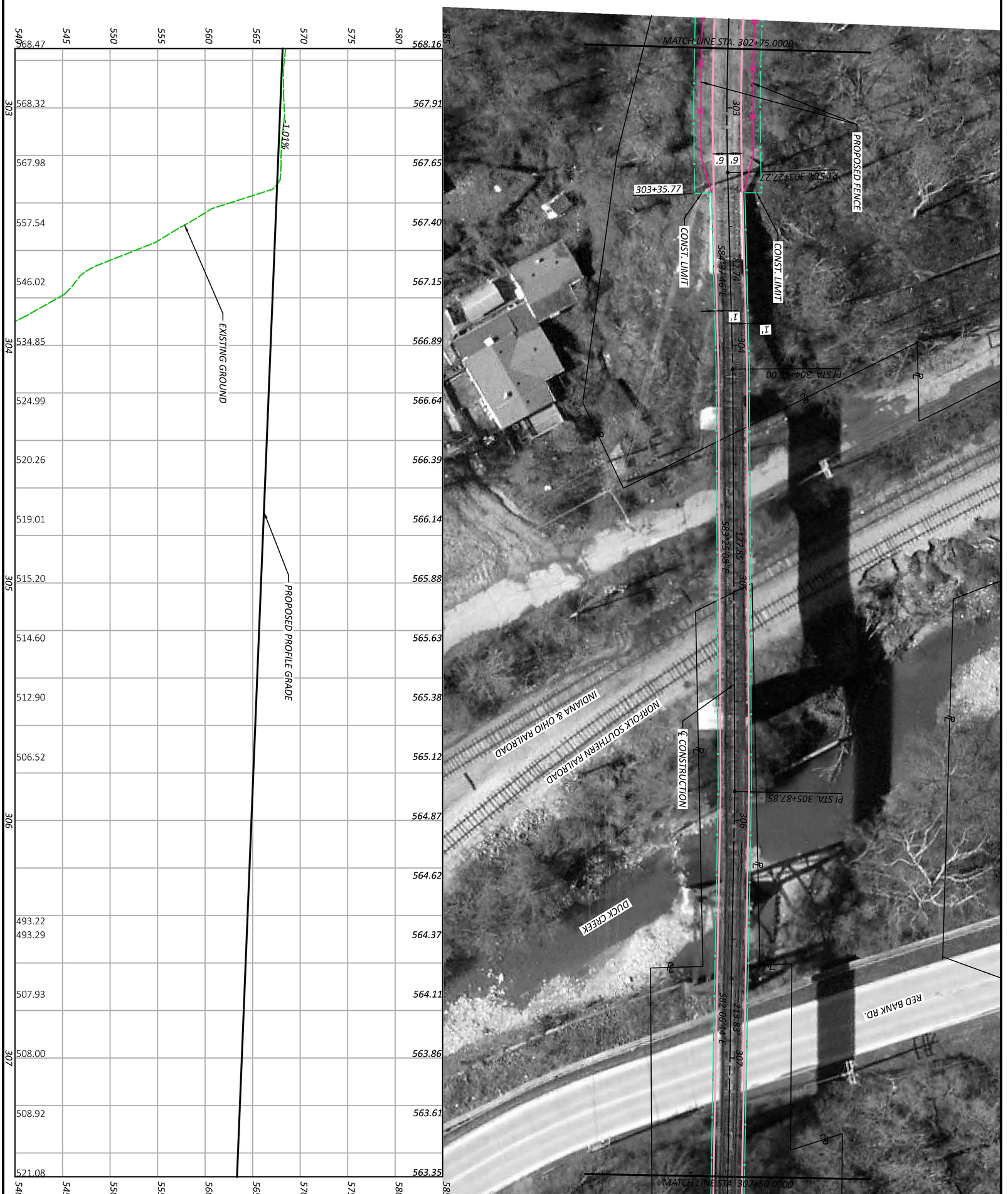
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400

DESIGN AGENCY

HAM-WASSON WAY TO OTTO ARMLEDER

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DESIGN AGENCY

DESIGNER JGB

REVIEWER SNS 01-26-24

PROJECT ID 113603

SHEET P.2 TOTAL 5

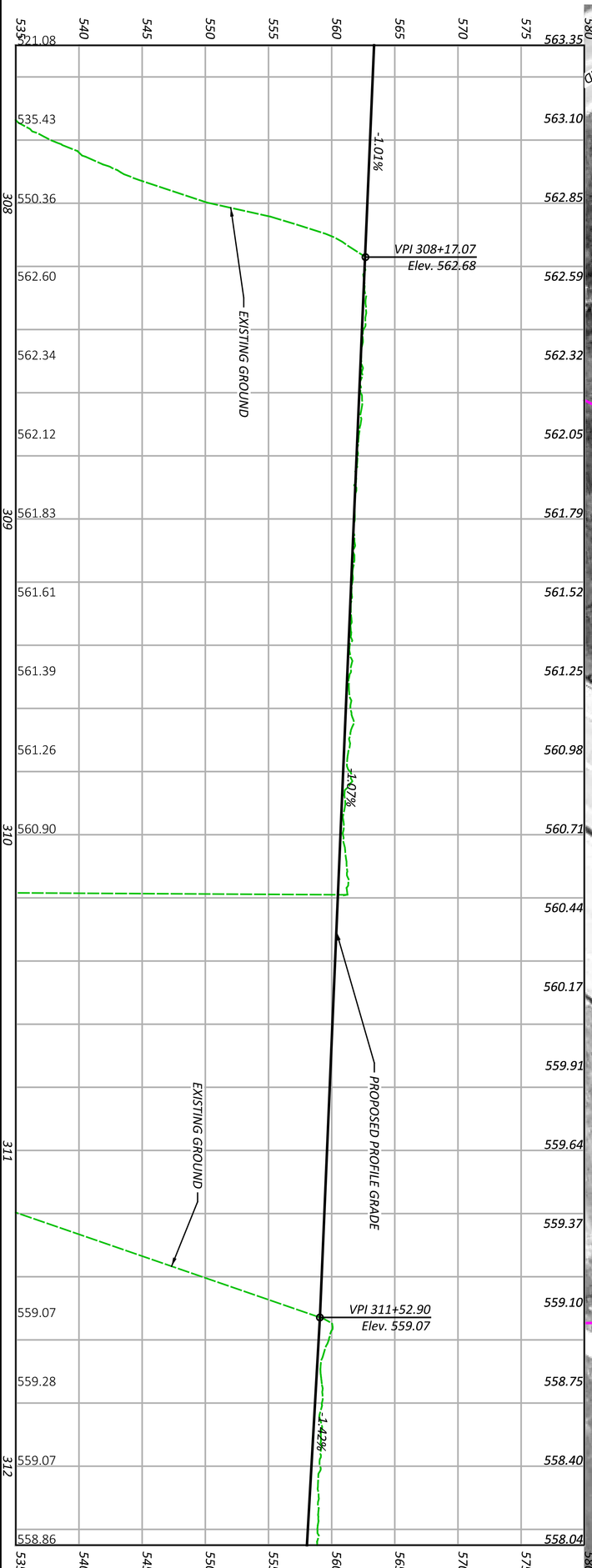
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STA. 302+75.00 TO STA. 307+75.00

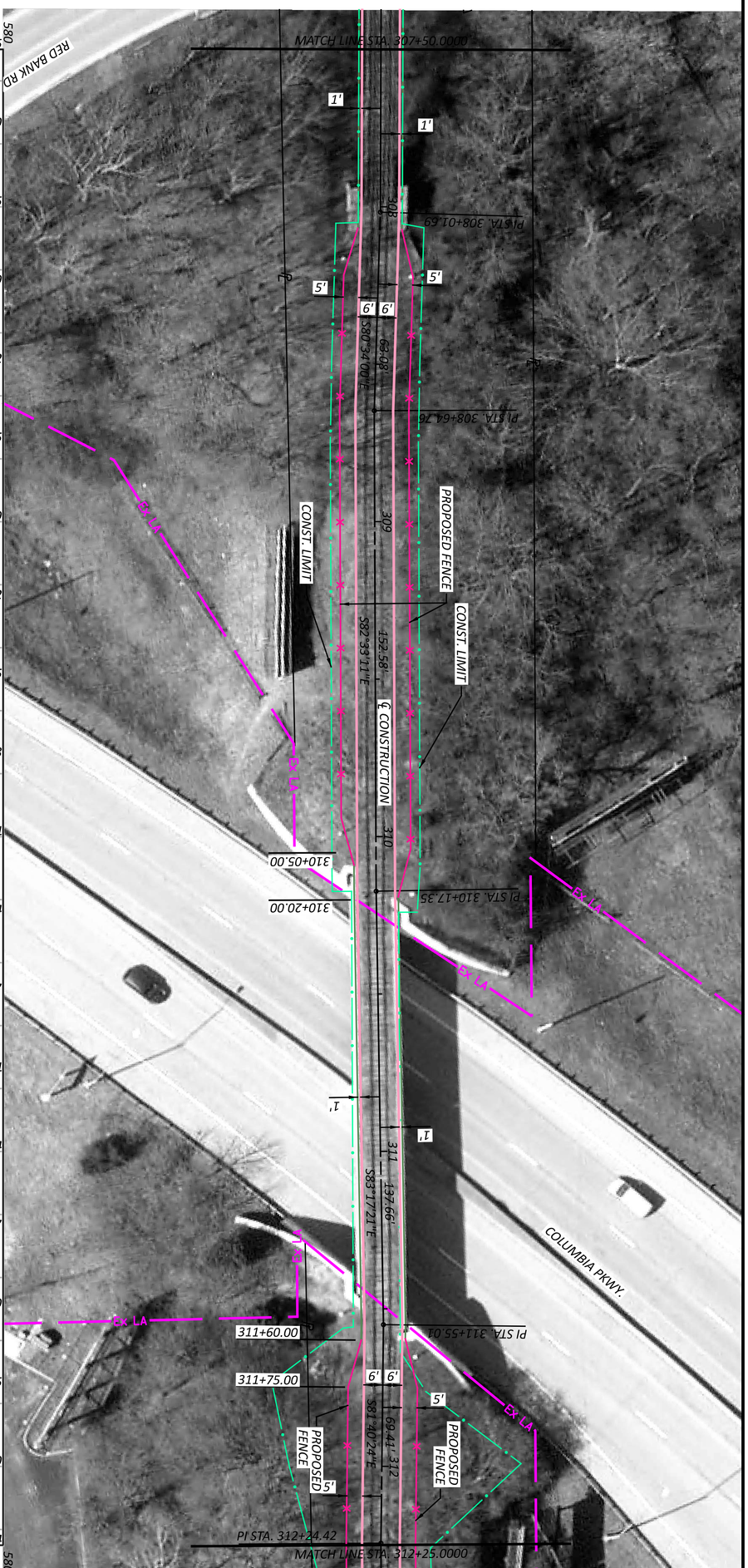
HORIZONTAL SCALE IN FEET
0 20
10 40

C-6

HAM-WASSON WAY TO OTTO ARMLEDER

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SHEET	TOTAL
P.3	5

PROJECT ID: 113603

REVIEWER: SNS 01-26-24

DESIGNER: JGB

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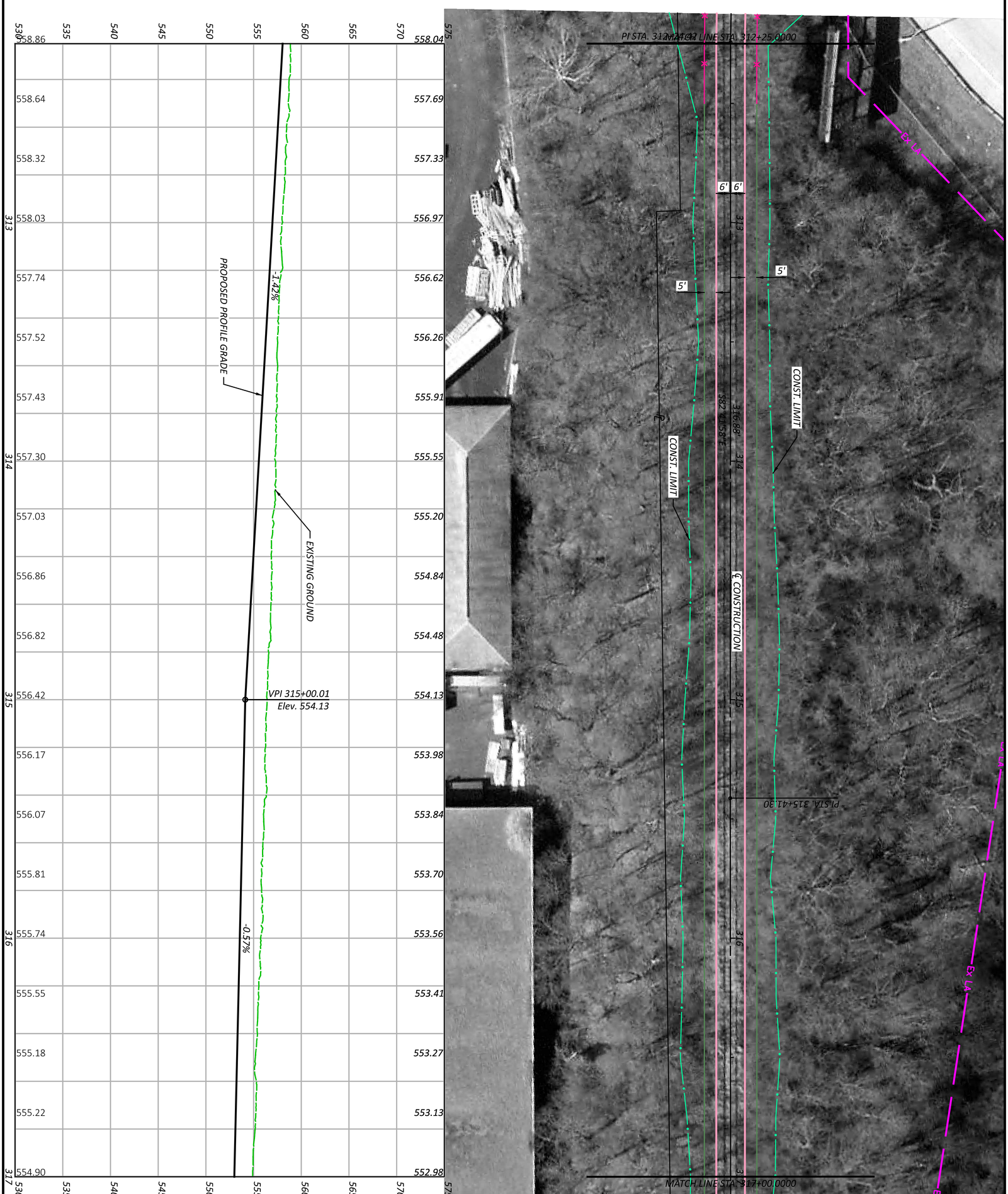
SEGMENT 1 - ALTERNATIVE A
STA. 307+75.00 TO STA. 312+25.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C7

HAM-WASSON WAY TO OTTO ARMLEDER

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SHEET	TOTAL
P.4	5

PROJECT ID: 113603

REVIEWER: SNS 01-26-24

DESIGNER: JGB

DESIGN AGENCY

SEGMENT 1 - ALTERNATIVE A
STA. 312+25.00 TO STA. 317+00.00

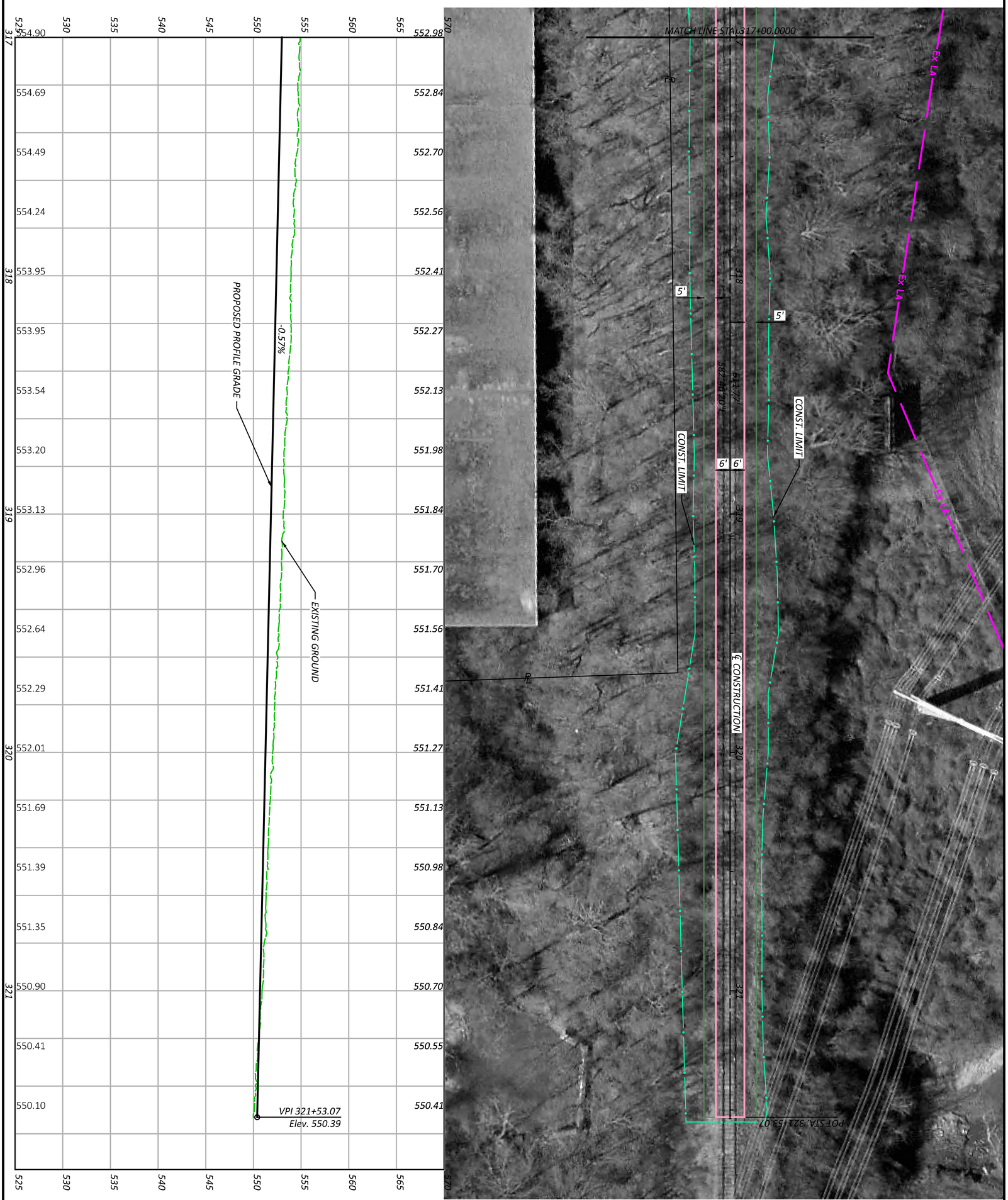
HORIZONTAL SCALE IN FEET

0 20
10 40

C-8

HAM-WASSON WAY TO OTTO ARMLEDER

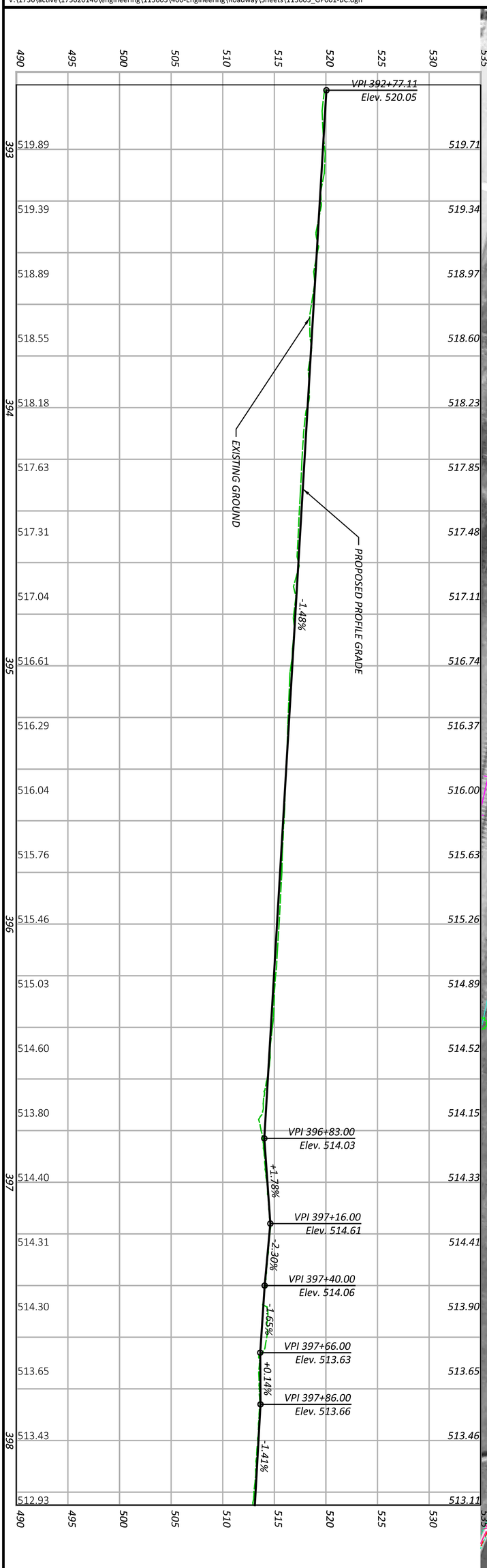
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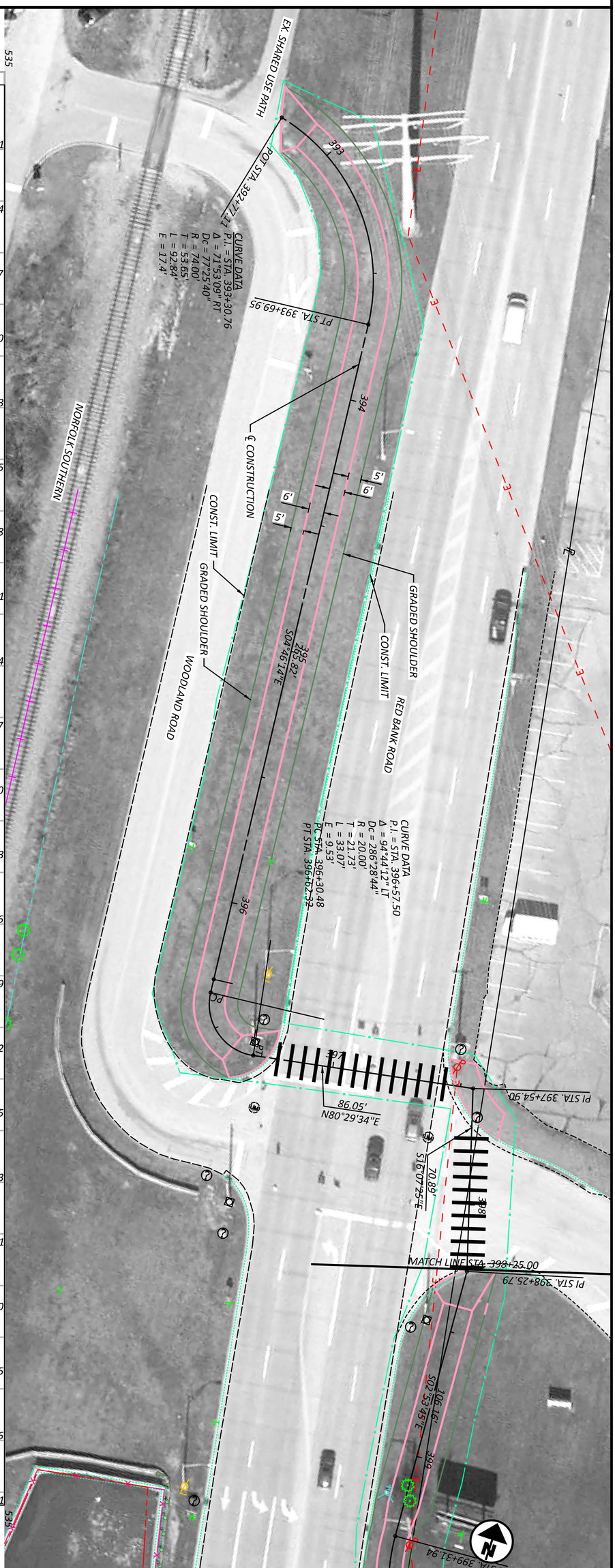


SHEET P.5	TOTAL 5	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400	DESIGN AGENCY	SEGMENT 1 - ALTERNATIVE A SHEET SUB-TITLE	HORIZONTAL SCALE IN FEET 0 20 10 40

HAM-WASSON WAY TO OTTO ARMLEDER

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SHEET P.1 TOTAL 6	PROJECT ID 113603	REVIEWER SNS 01-30-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

SEGMENT 1 - ALTERNATIVE C
STA. 392+77.11 TO STA. 398+25.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-10

HAM-WASSON WAY TO OTTO ARMLEDER

SEGMENT 1 - ALTERNATIVE C
STA. 398+25.00 TO STA. 403+66.65

HORIZONTAL SCALE IN FEET
0 10 20 40

CURVE DATA
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Dc = 77°25'36"
R = 74.00'
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L = 41.36'
E = 2.99'

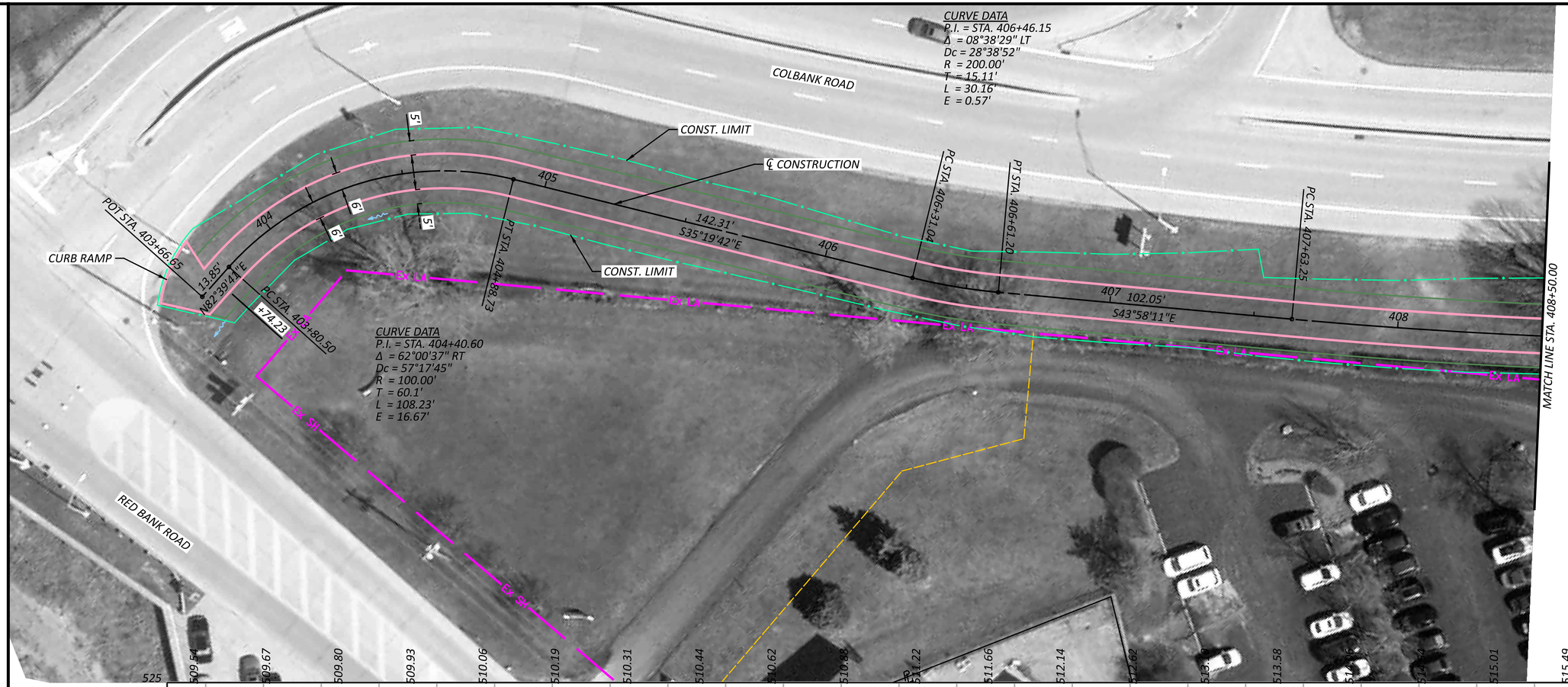
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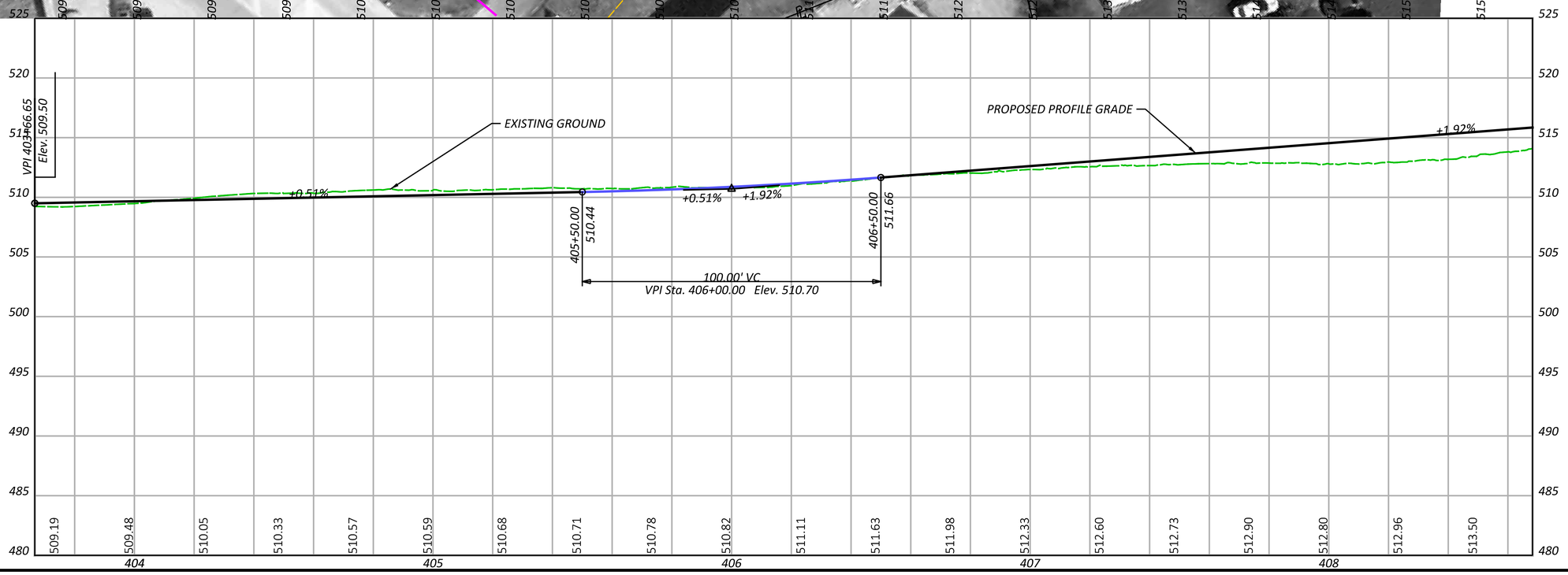
CONST. LIMIT
℄ CONSTRUCTION
12" STORM
GRADED SHOULDER
PI STA. 398+25.00
PC STA. 399+31.94
PT STA. 399+73.30
PC STA. 400+95.97
PT STA. 401+53.29
PI STA. 402+86.10
POT STA. 403+23.35
COLBANK ROAD
RED BANK ROAD
DUCK CREEK
MATCH LINE STA. 398+25.00
106.16' S02°53'45"E
122.66' S34°55'16"E
132.82' S09°27'36"W
87.15' S08°50'01"E

DESIGN AGENCY
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DESIGNER JGB
REVIEWER SNS 01-30-24
PROJECT ID 113603
SHEET P.2 TOTAL 6

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HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 1 - ALTERNATIVE C
STA. 403+66.65 TO STA. 408+50.00

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DESIGNER	JGB
REVIEWER	SNS 01-30-24
PROJECT ID	113603
SHEET	P.3
TOTAL	6

HAM-WASSON WAY TO OTTO ARMLEDER

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COLBANK ROAD
CURVE DATA
P.I. = STA. 410+21.15
Δ = 16°18'28" LT
Dc = 03°10'59"
R = 1,800.00'
T = 257.90'
L = 512.32'
E = 18.38'

PROPOSED RETAINING WALL
℄ CONSTRUCTION
CONST. LIMIT
CONST. LIMIT
MATCH LINE STA. 408+50.00
MATCH LINE STA. 413+50.00
PT STA. 412+75.57
US 50
LAWYERS TITLE
EX. LA
℄

HORIZONTAL SCALE IN FEET
0 10 20 40

EXISTING GROUND
PROPOSED PROFILE GRADE
100.00' VC
VPI Sta. 410+85.00 Elev. 520.00
100.00' VC
VPI Sta. 412+85.00 Elev. 521.00
EX. BRIDGE SUBSTRUCTURE
(TO BE FIELD SURVEYED)
8' APPROXIMATE MINIMUM
VERTICAL CLEARANCE
+1.92%
+0.50%
+1.92%
+0.50%
+0.50%
+4.82%
+4.82%
410+35.00 519.04
411+35.00 520.25
412+35.00 520.75
413+35.00 523.41

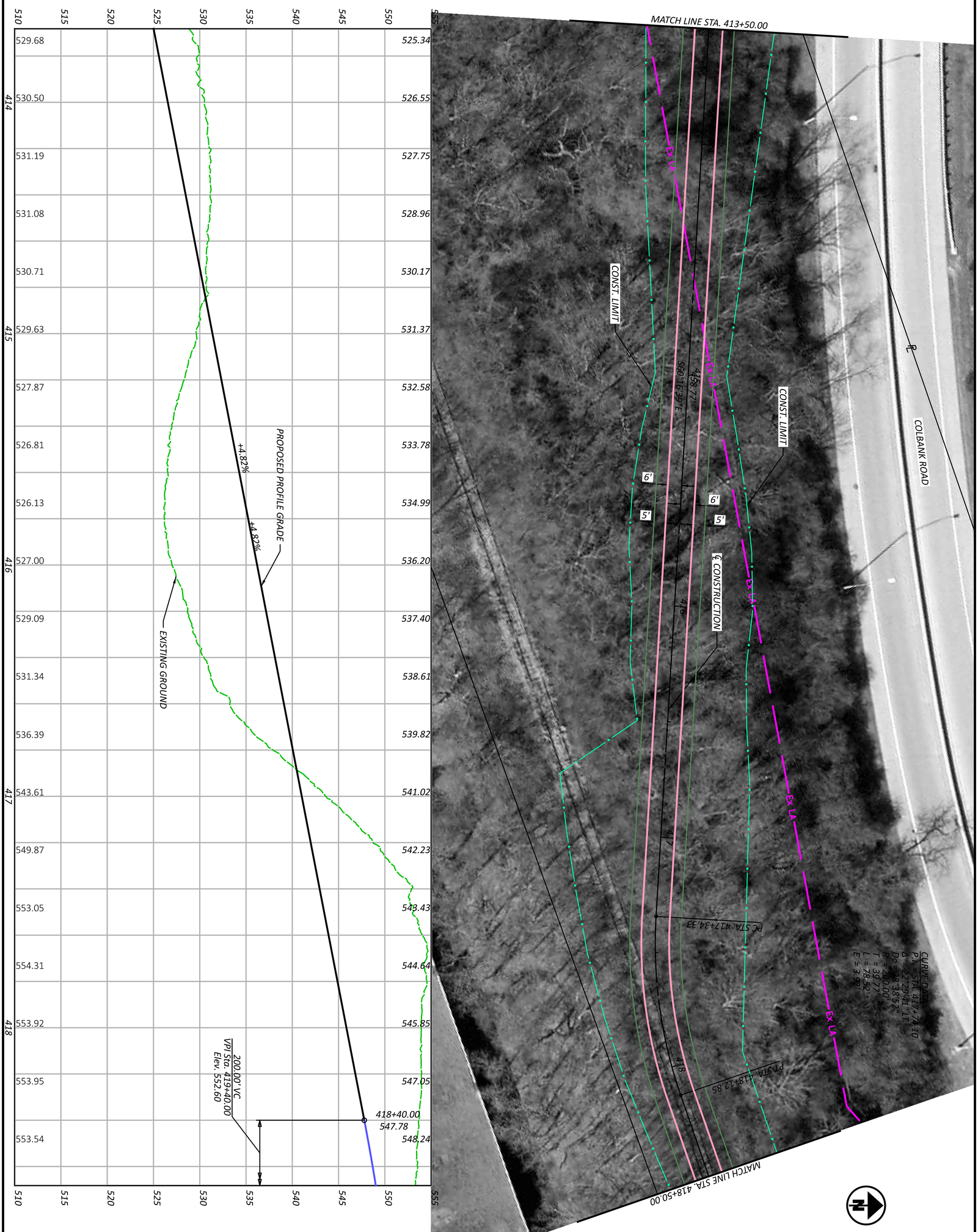
SEGMENT 1 - ALTERNATIVE C
STA. 408+50.00 TO STA. 413+50.00

DESIGN AGENCY
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10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-30-24
PROJECT ID 113603
SHEET P.4 TOTAL 6

HAM-WASSON WAY TO OTTO ARMLEDER

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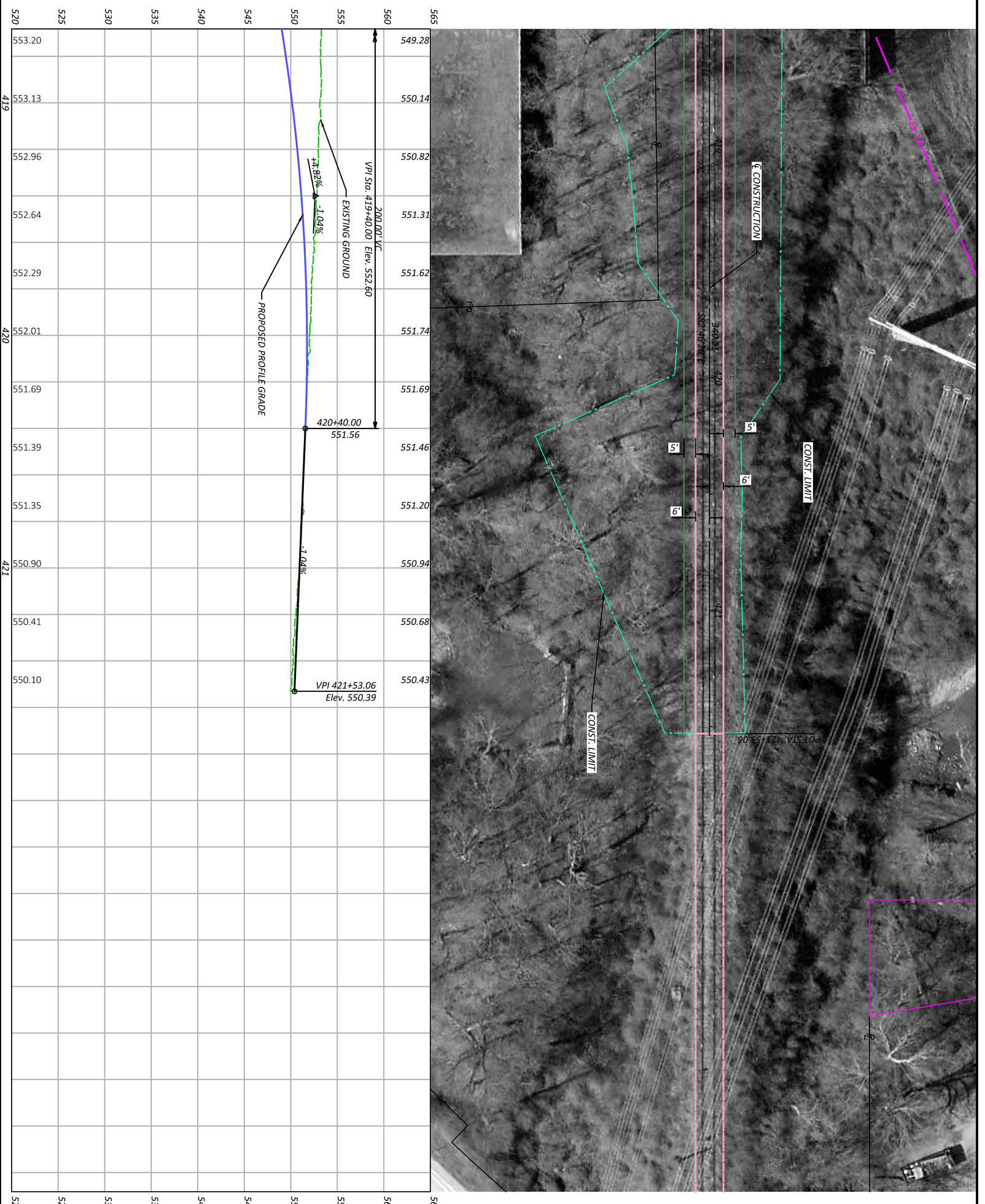
SHEET P.5 TOTAL 6	PROJECT ID 113603	REVIEWER SNS 01-30-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400	SEGMENT 1 - ALTERNATIVE C STA. 413+50.00 TO STA. 418+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-14

HAM-WASSON WAY TO OTTO ARMLEDER

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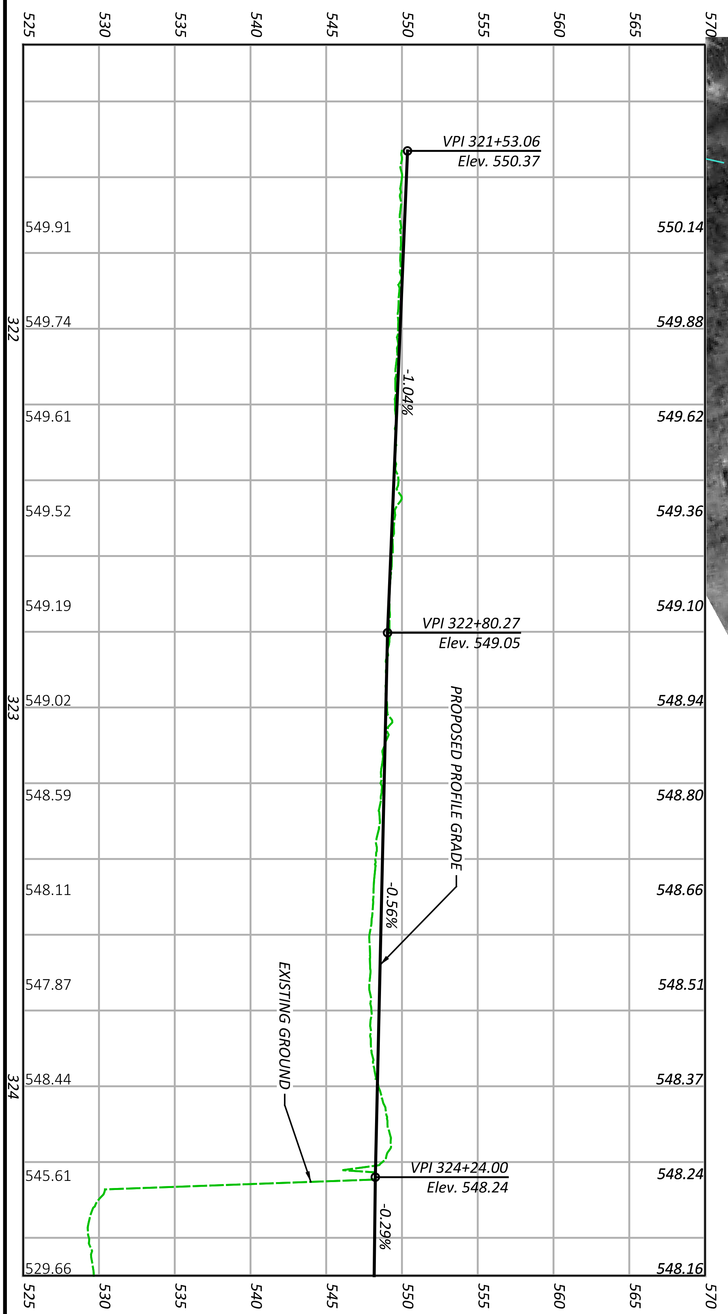


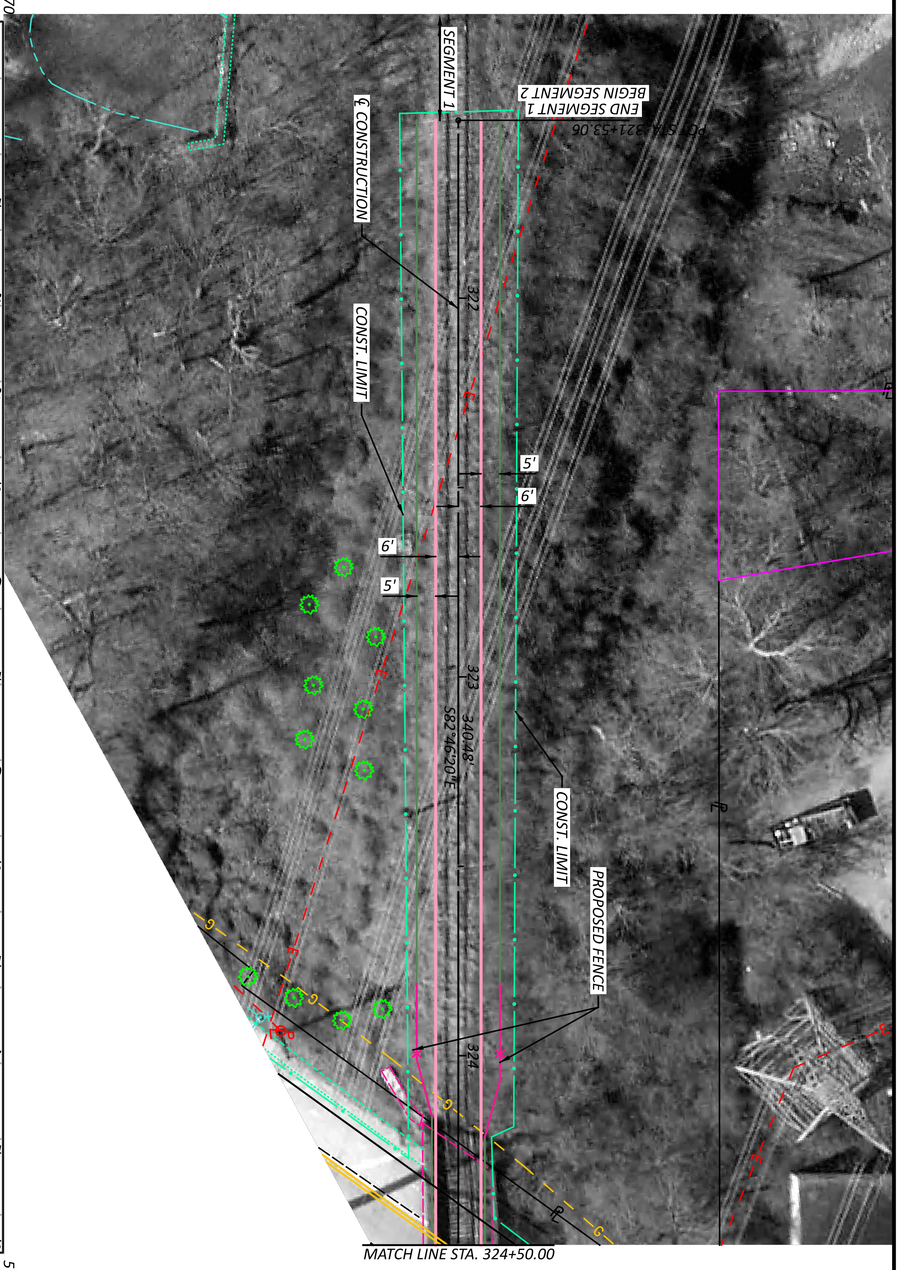
SEGMENT 1 - ALTERNATIVE C
STA. 418+50.00 TO STA. 421+53.06

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_2-B - Plan 2 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 12:24:43 PM USER: mmondlak
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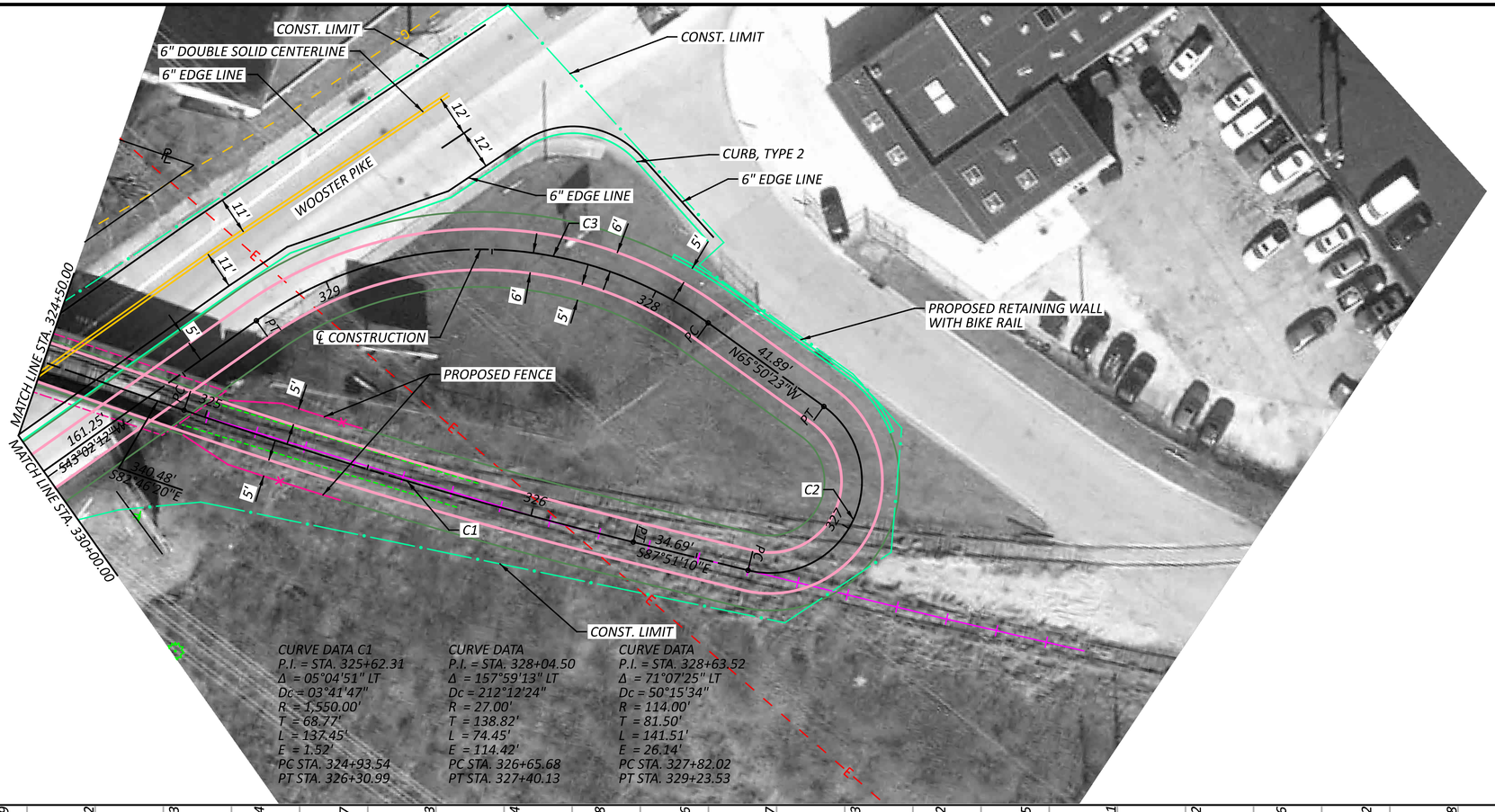
SEGMENT 2 - ALTERNATIVE B
STA. 321+53.06 TO STA. 324+50.00

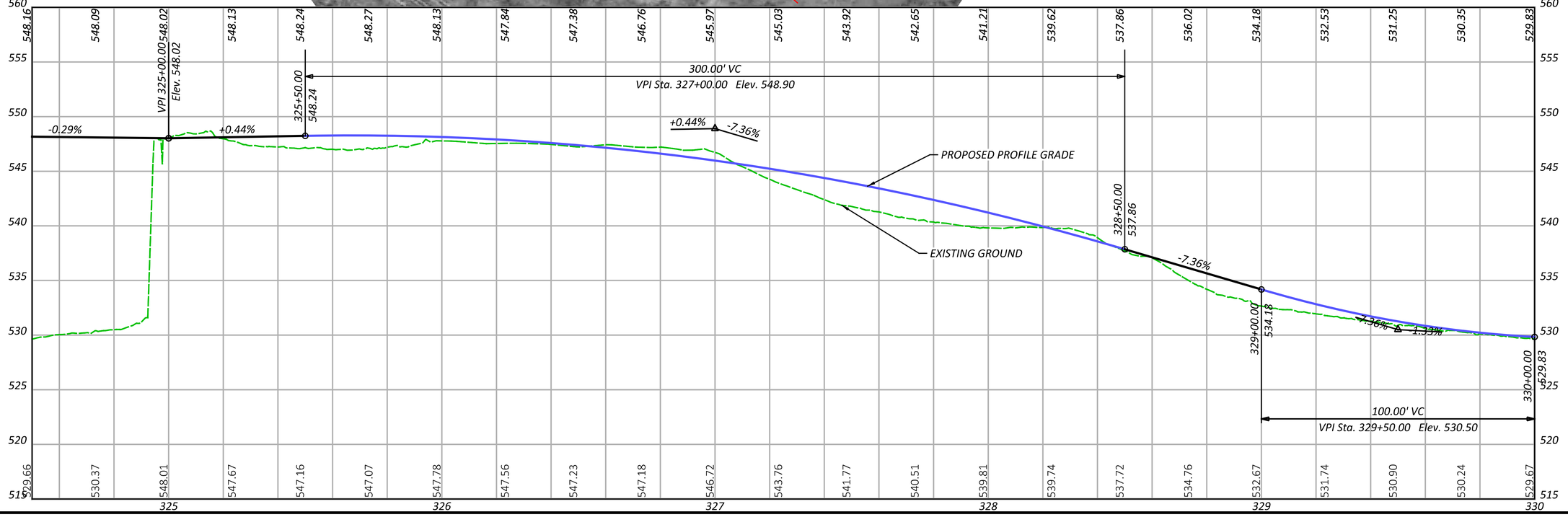
HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	P.1
TOTAL	6
PROJECT ID	113603
REVIEWER	SNS 07-01-23
DESIGNER	JGB
DESIGN AGENCY	Stantec

Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400

C-16





HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 2 - ALTERNATIVE B
STA. 324+50.00 TO STA. 330+00.00

HAM-WASSON WAY TO OTTO ARMLEDER

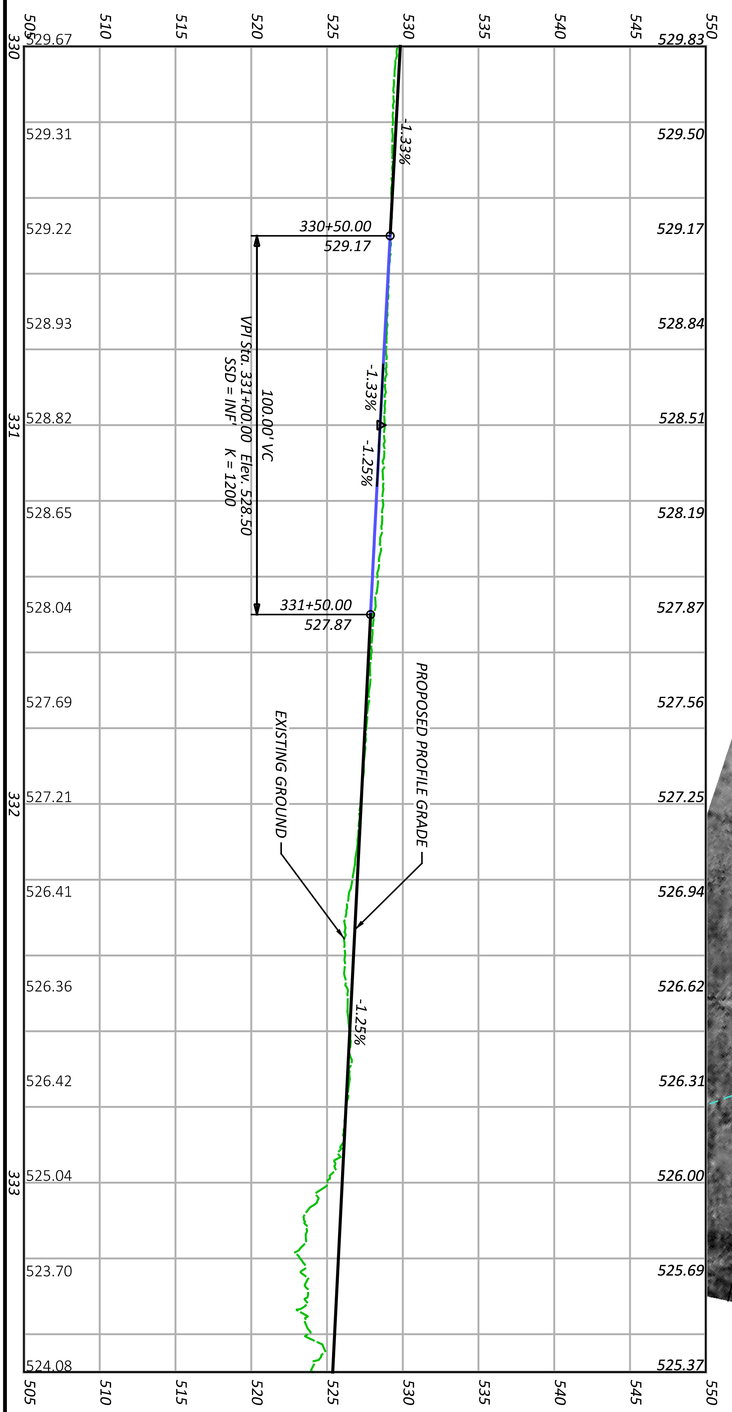
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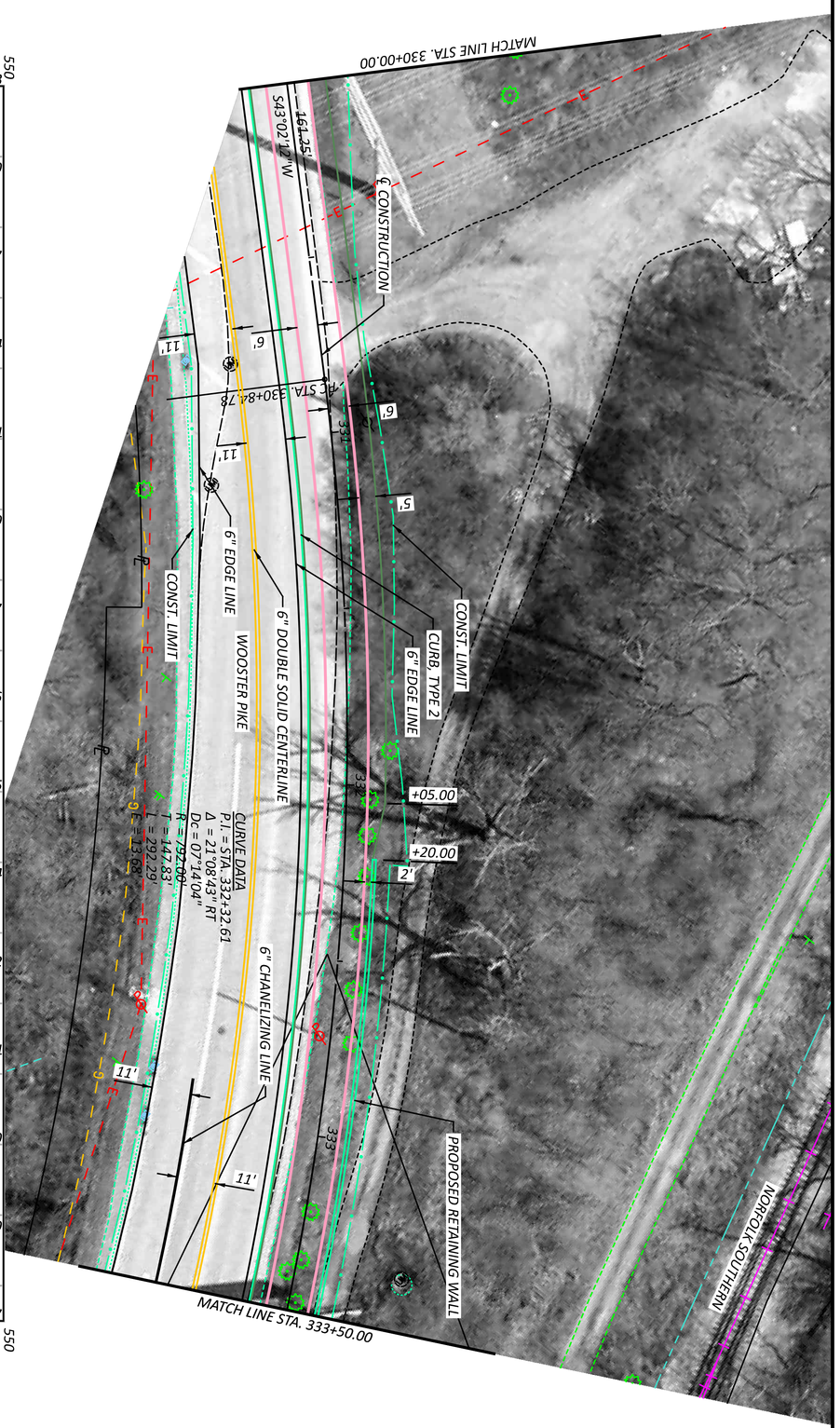
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER	JGB
REVIEWER	SNS 07-01-23
PROJECT ID	113603
SHEET	P.2
TOTAL	6

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_2-B-2 - Plan 4 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 12:25:44 PM USER: mmondlak
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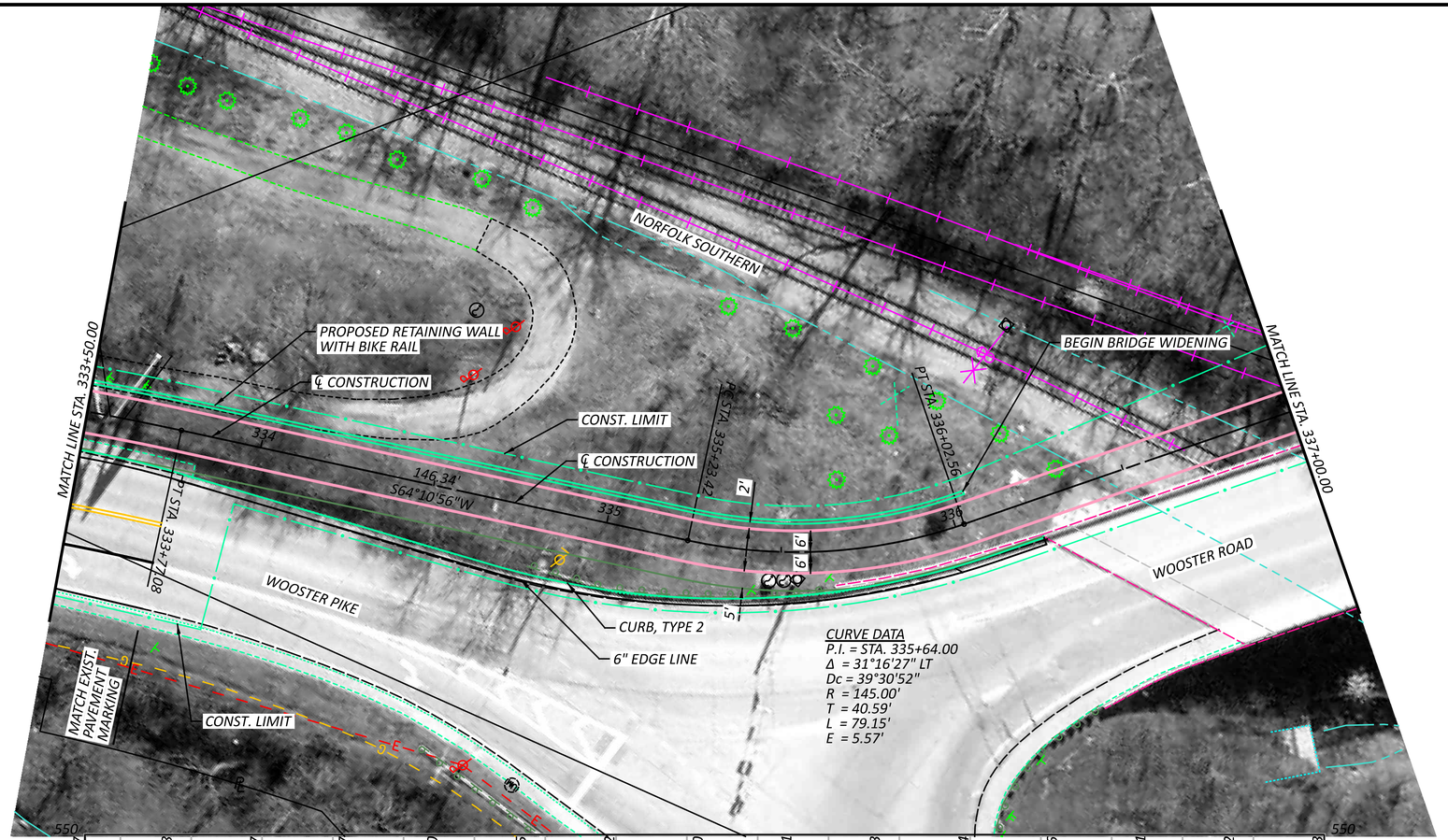


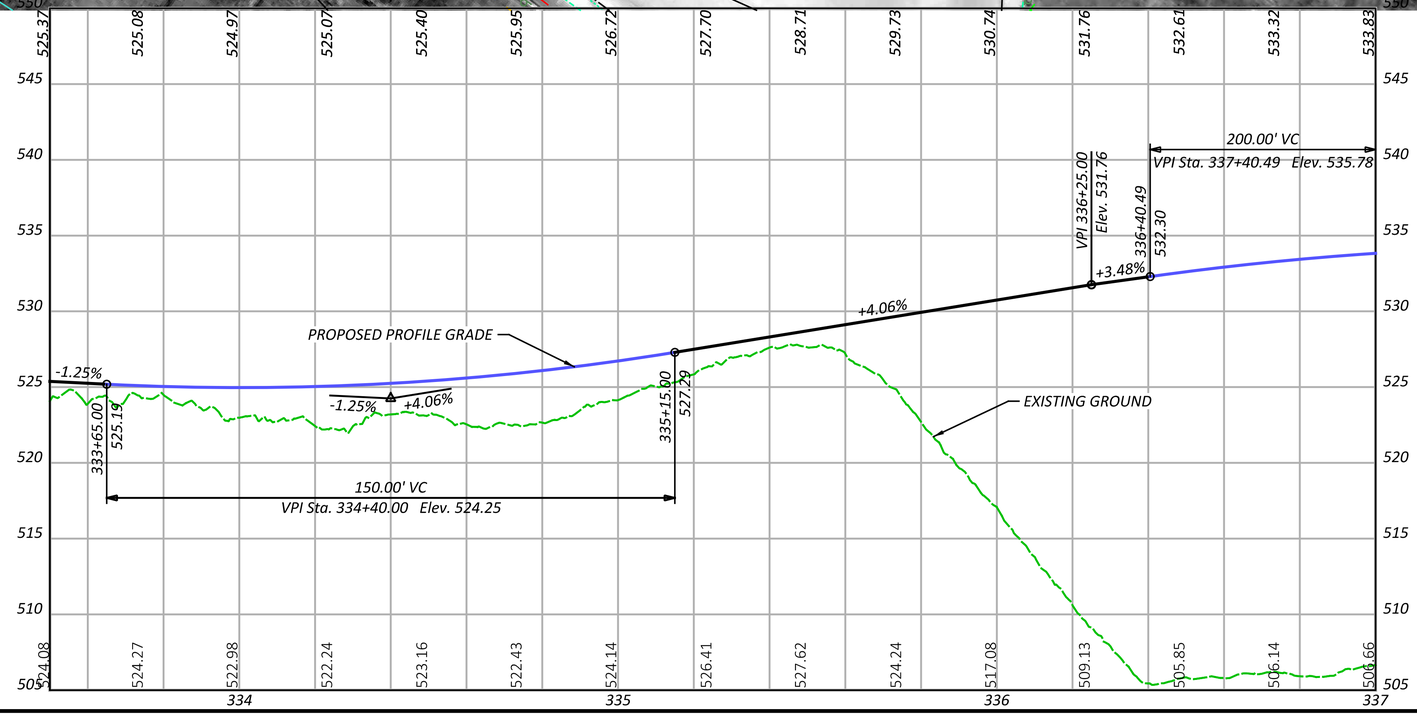
SHEET P.3 TOTAL 6	PROJECT ID 113603	REVIEWER SNS 07-01-23	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

SEGMENT 2 - ALTERNATIVE B
STA. 330+00.00 TO STA. 333+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-18





HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 2 - ALTERNATIVE B
STA. 333+50.00 TO STA. 337+00.00

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

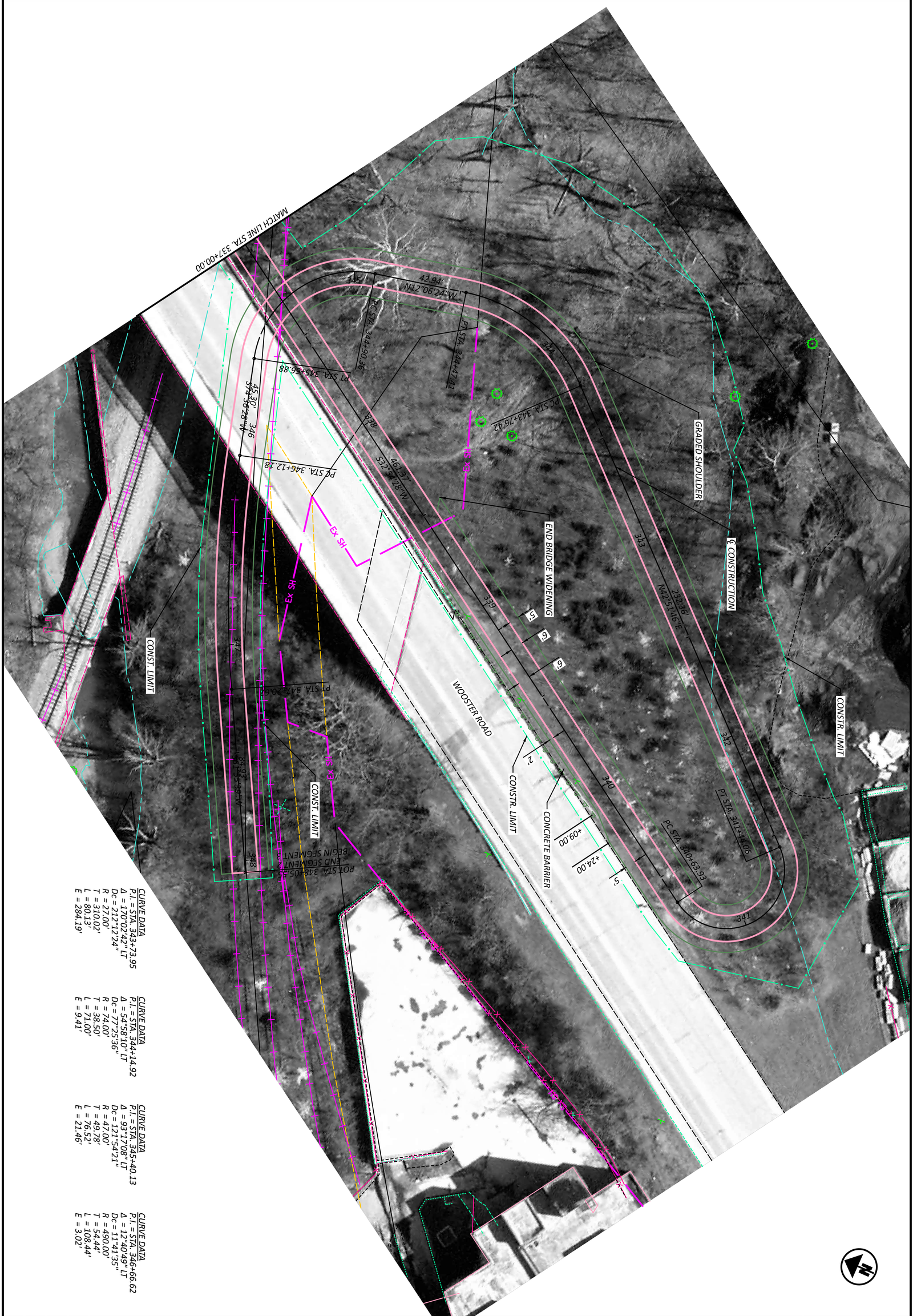
DESIGNER JGB
REVIEWER SNS 07-01-23
PROJECT ID 113603
SHEET P.4 TOTAL 6

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_2-B-2 - Plan 5 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 5:02:49 PM USER: mmondlak
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HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_2-B-4 - Plan 11 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 12:25:53 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP002-2B.dgn



SEGMENT 2 - ALTERNATIVE B
STA. 337+00.00 TO STA. 348+05.55

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.5	6

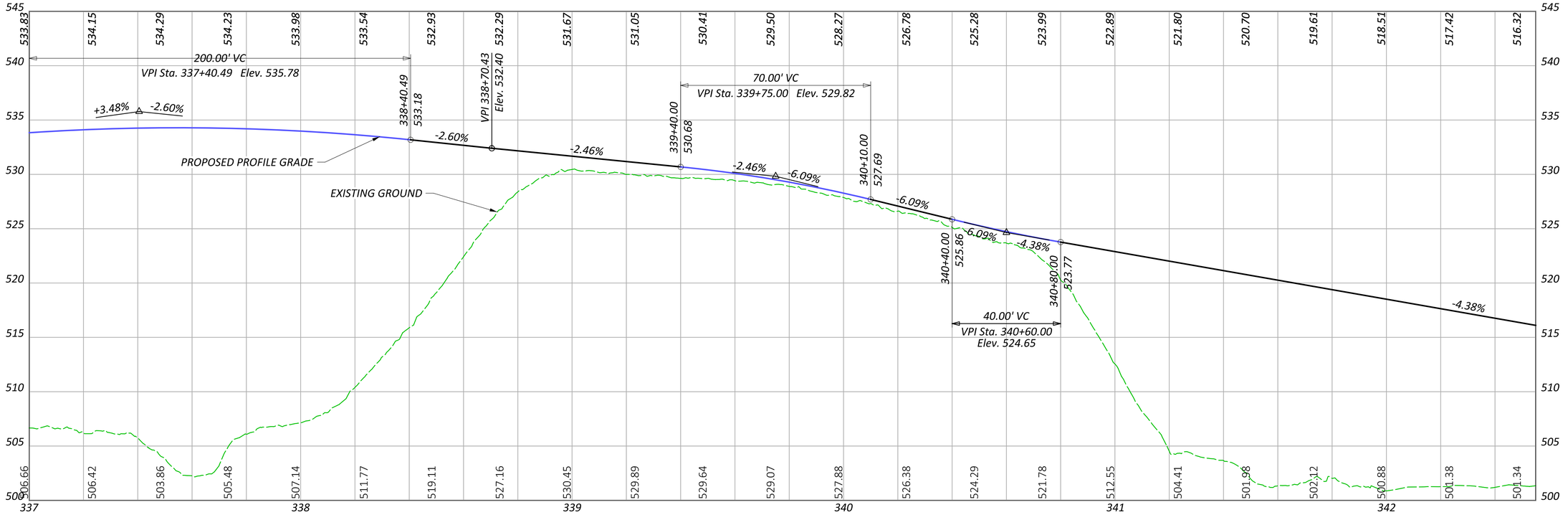
PROJECT ID: 113603

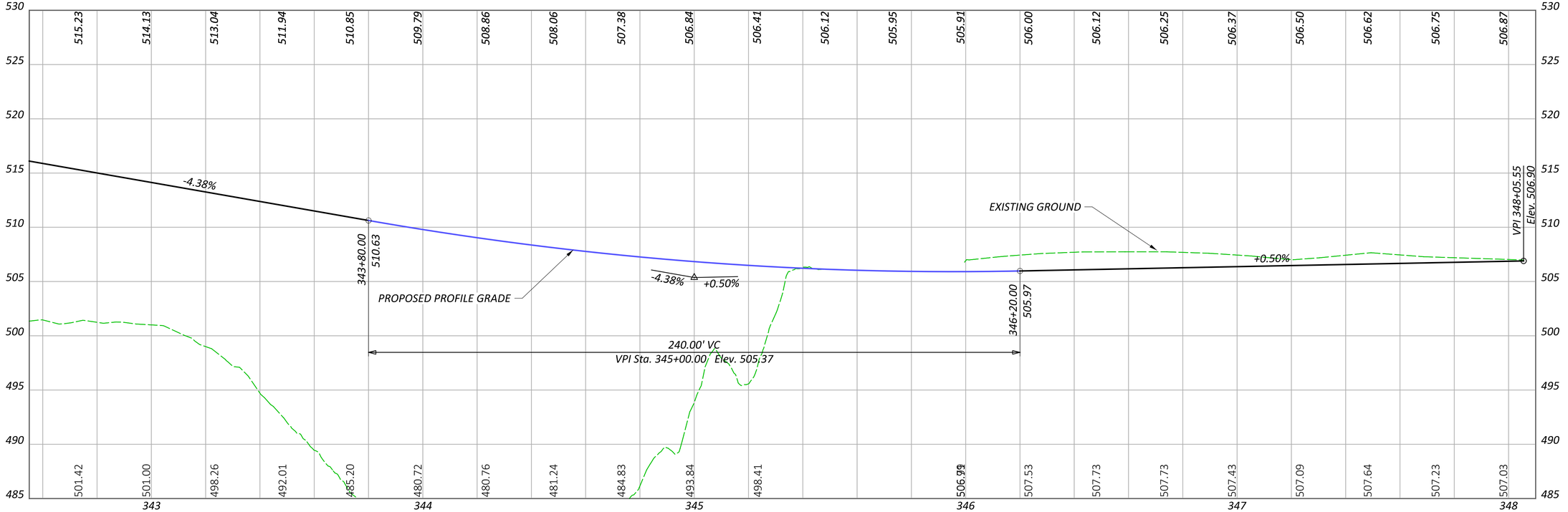
REVIEWER: SNS 07-01-23

DESIGNER: JGB

DESIGN AGENCY

Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400





HAM-WASSON WAY TO OTTO ARMLEDER

SEGMENT 2 - ALTERNATIVE B
STA. 337+00.00 TO STA. 348+05.55

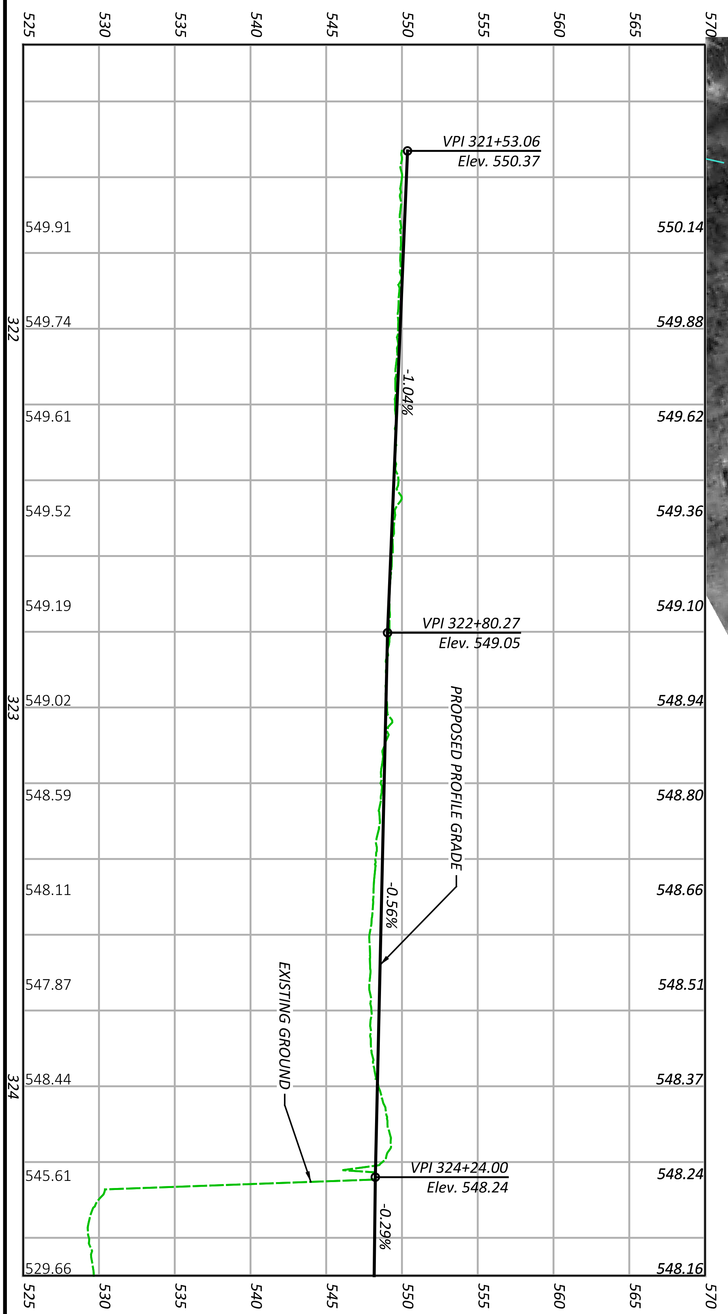
MODEL: PGL-2-B-3 - Profile 11 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 12:26:00 PM USER: mmondlak
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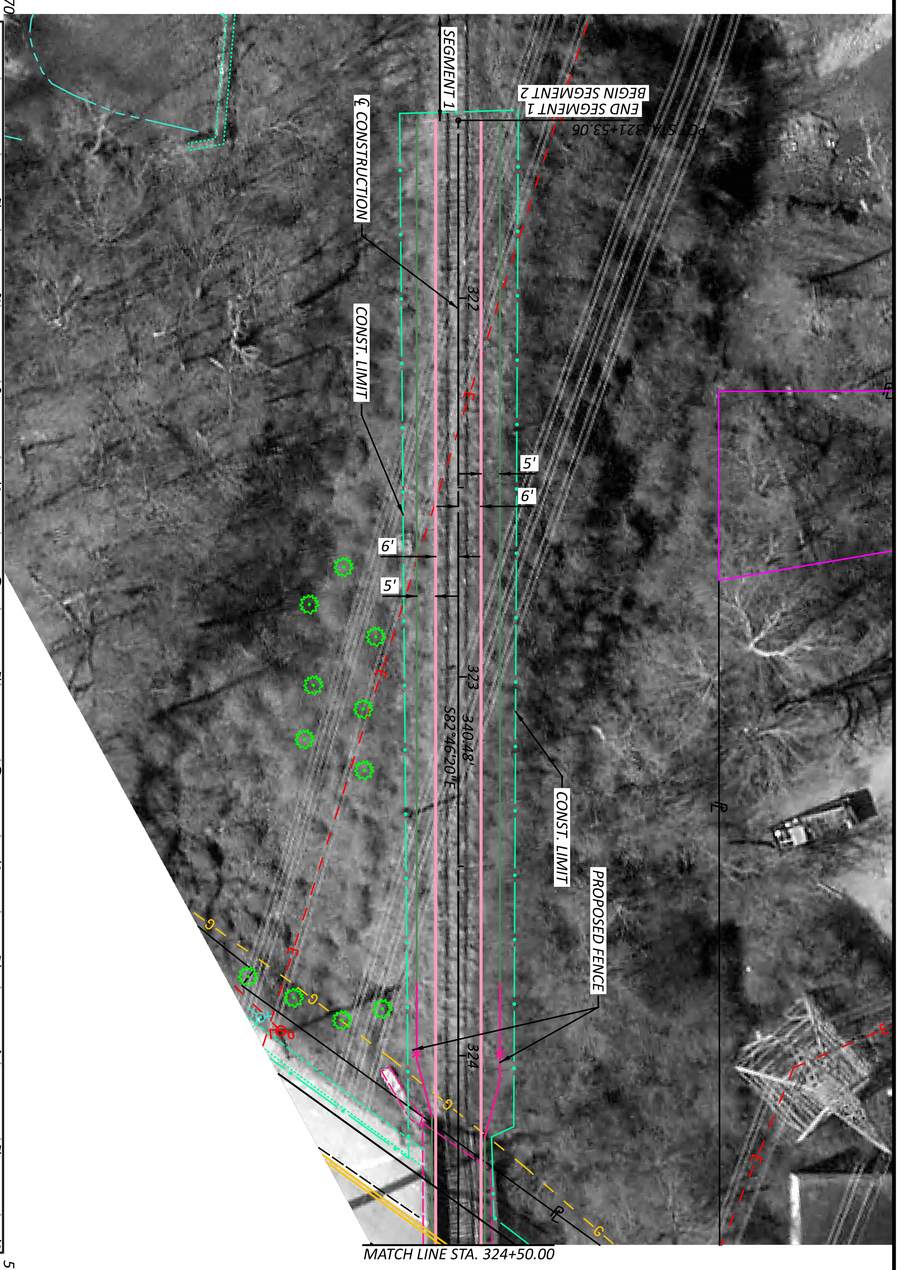
DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER	JGB
REVIEWER	SNS 02-01-24
PROJECT ID	113603
SHEET	P.6
TOTAL	6

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_2-B - Plan 2 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:56:42 PM USER: mmondlak
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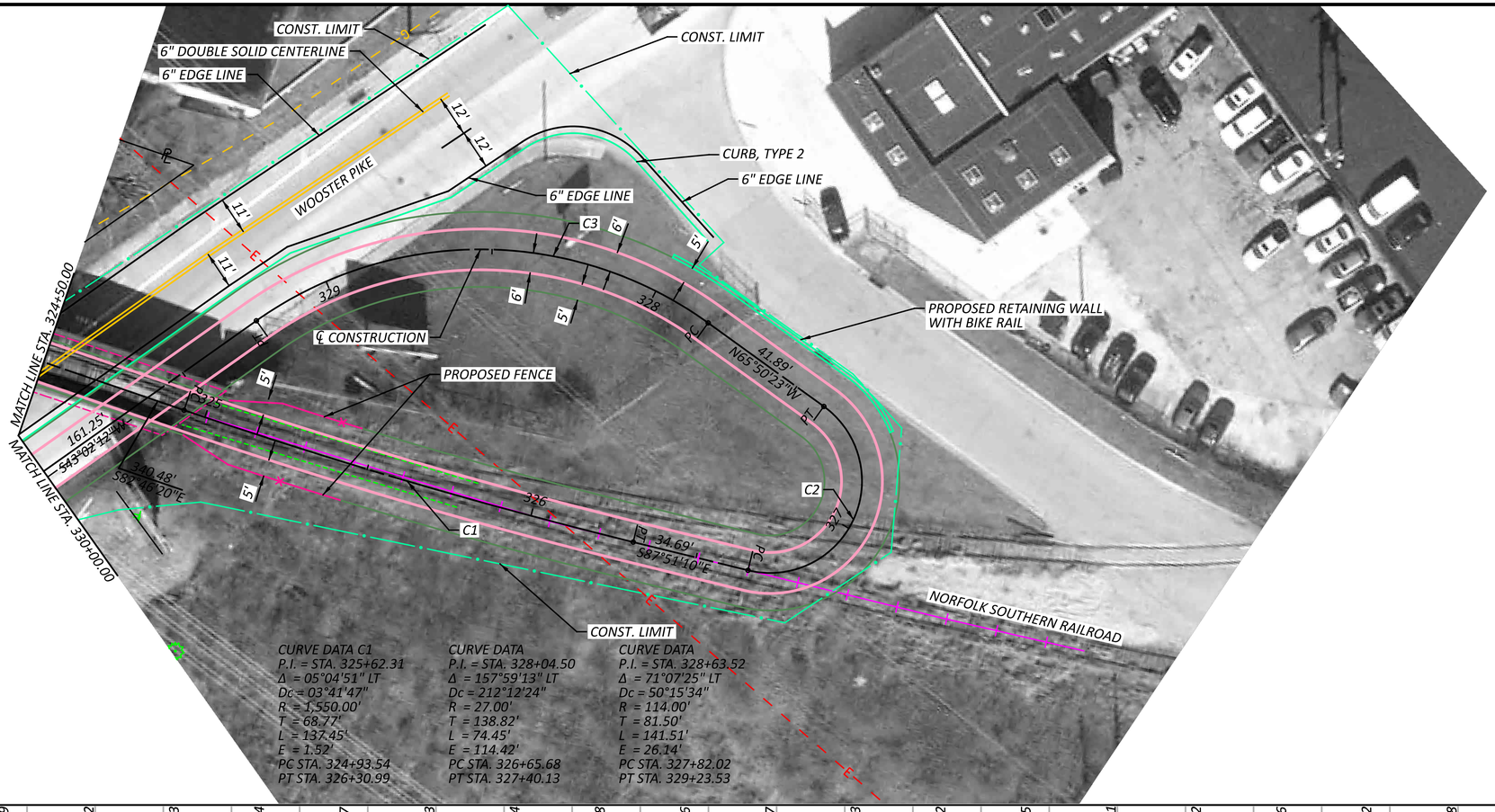


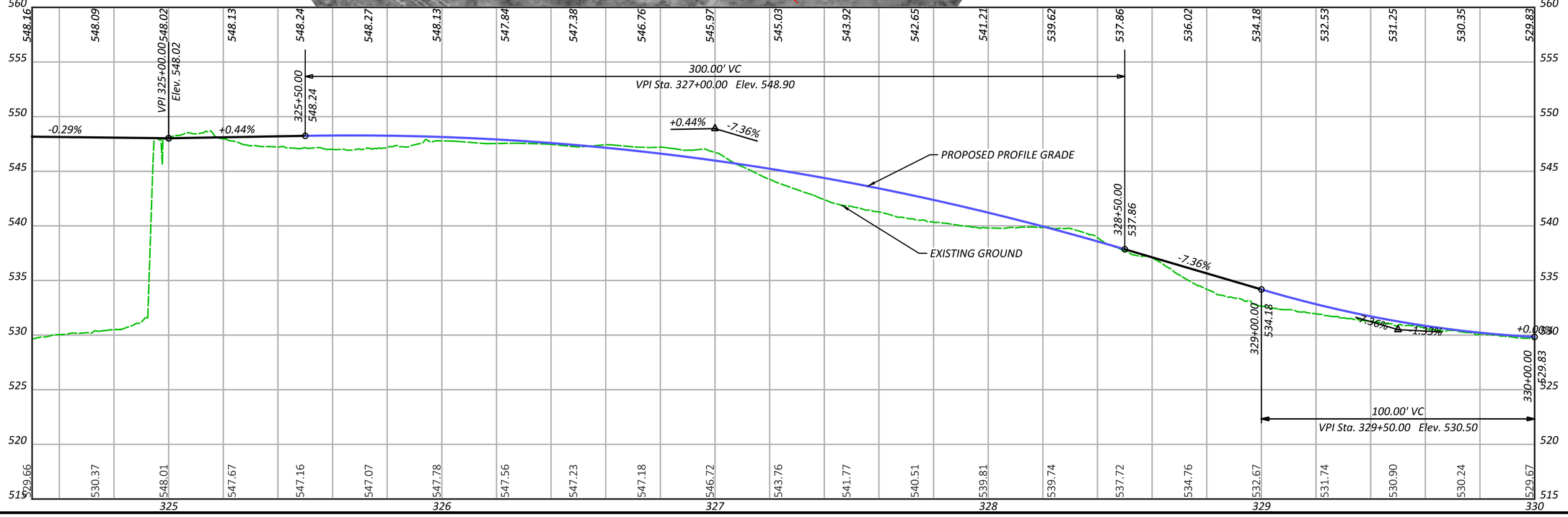


SHEET P.1 TOTAL 6	PROJECT ID 113603	REVIEWER SNS 07-01-23	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

SEGMENT 2 - ALTERNATIVE C
STA. 321+53.06 TO STA. 324+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40





HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 2 - ALTERNATIVE C
STA. 324+50.00 TO STA. 330+00.00

HAM-WASSON WAY TO OTTO ARMLEDER

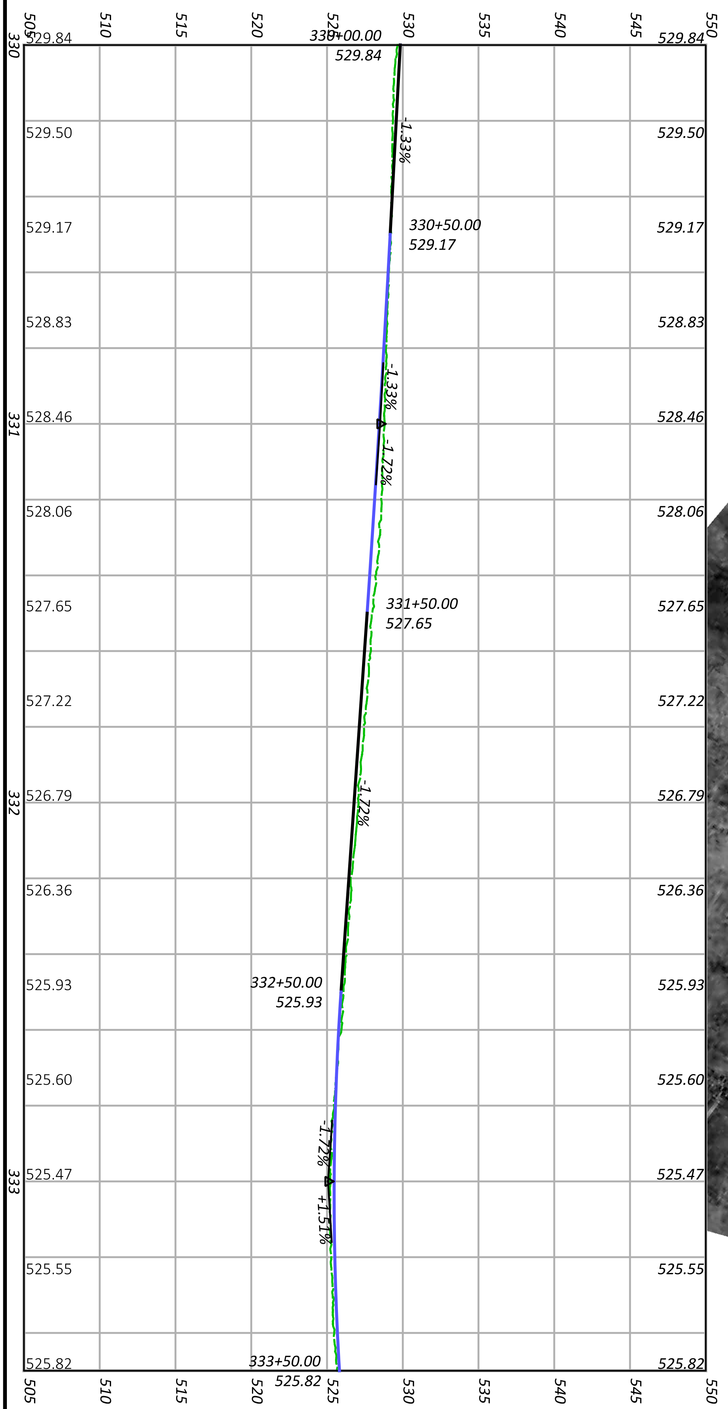
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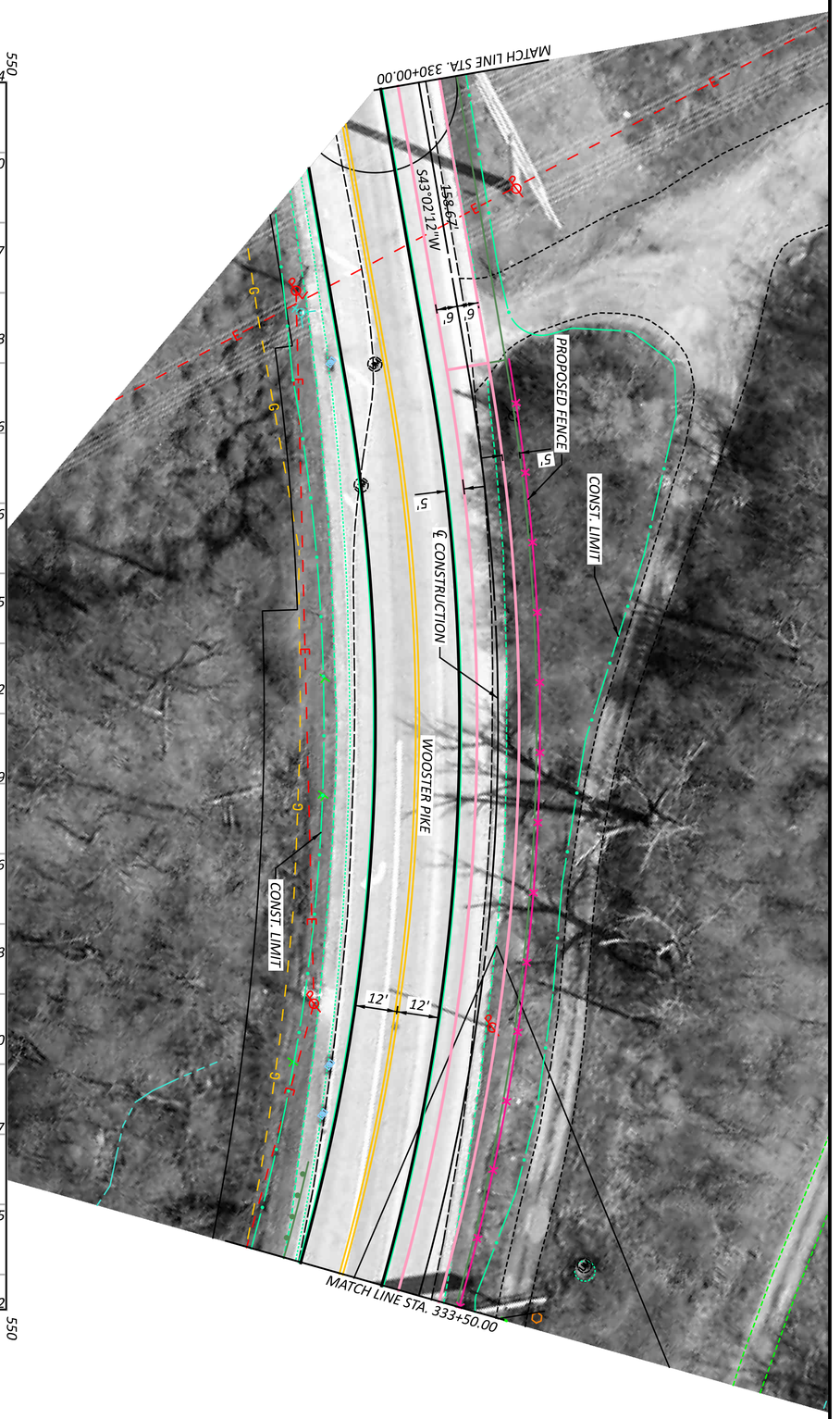
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 07-01-23
PROJECT ID 113603
SHEET P.2 TOTAL 6

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_BK2C - Plan 1 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:58:10 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP002-C.dgn





SEGMENT 2 - ALTERNATIVE C
STA. 330+00.00 TO STA. 333+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.3	6

PROJECT ID: 113603
PID 03-05-24
REVIEWER
DESIGNER JGB

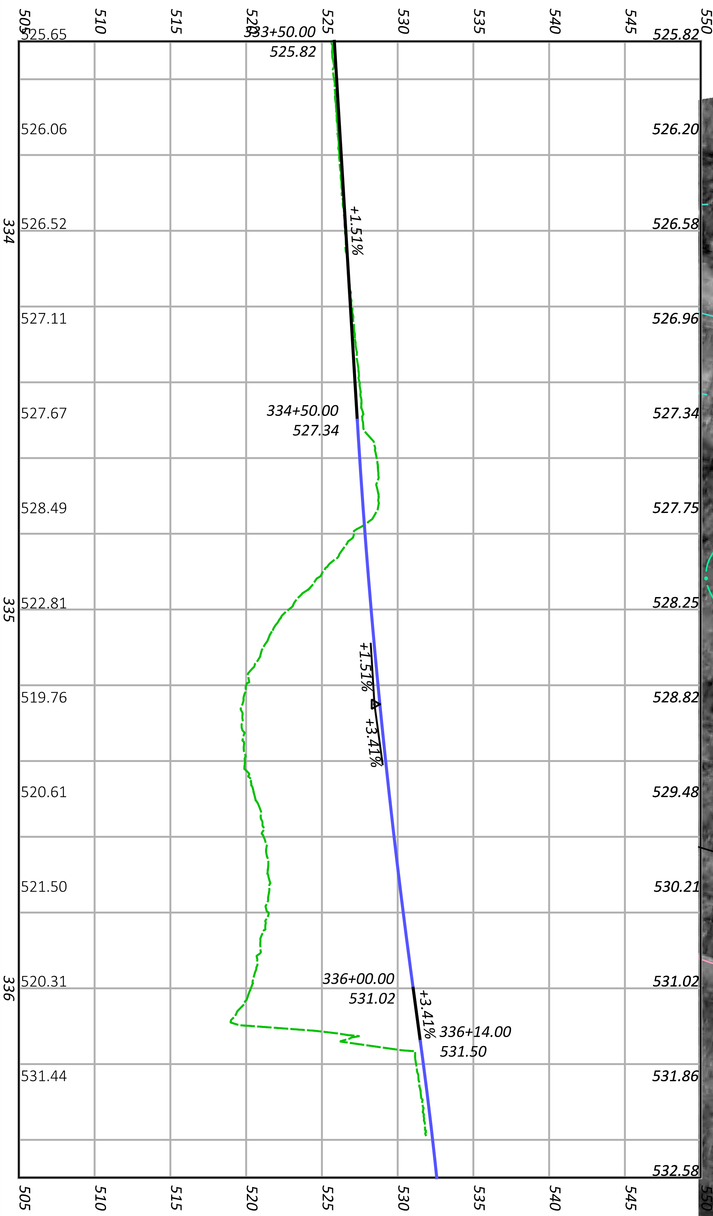
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400

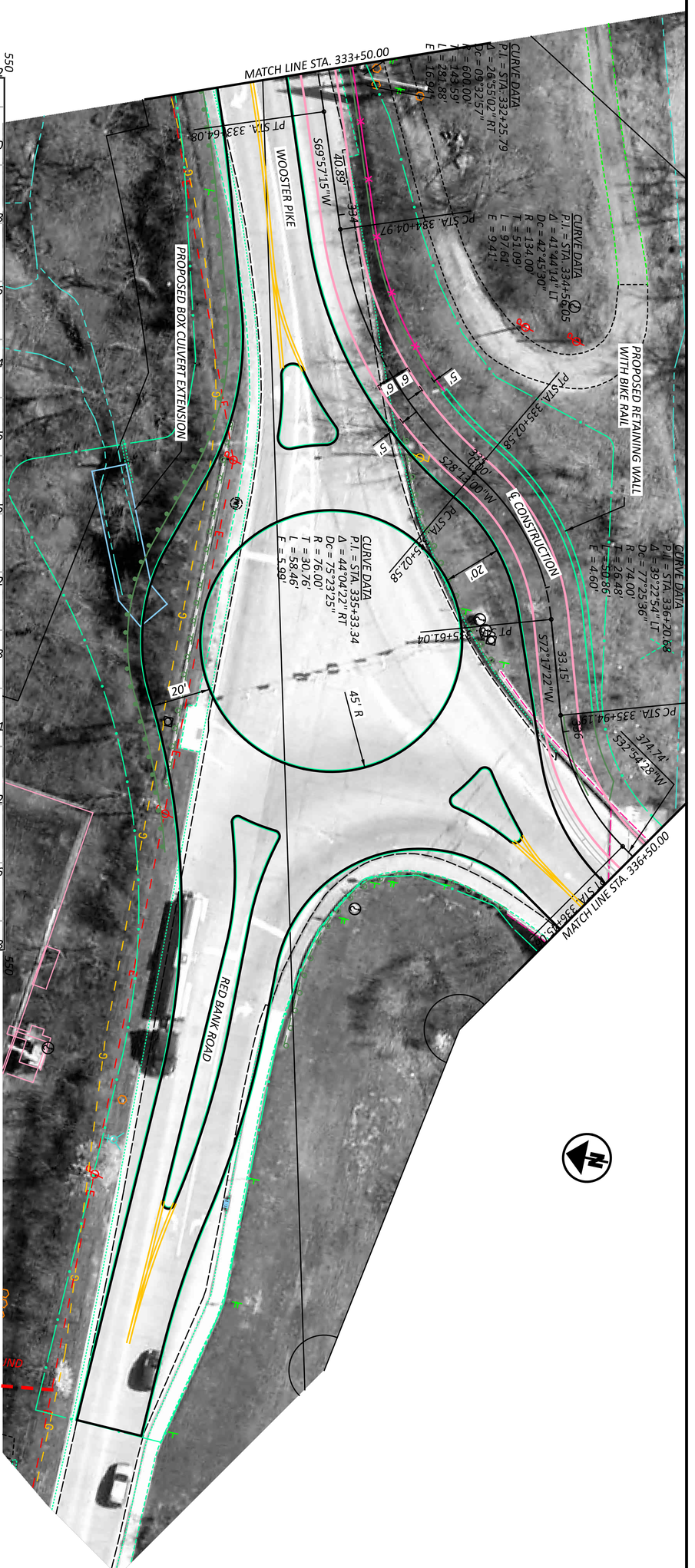
DESIGN AGENCY

C-24

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_BK2C - Plan 2 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:58:15 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP002-C.dgn





SHEET P.4	TOTAL 6	PROJECT ID 113603	PID 03-05-24	REVIEWER JGB	DESIGNER

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

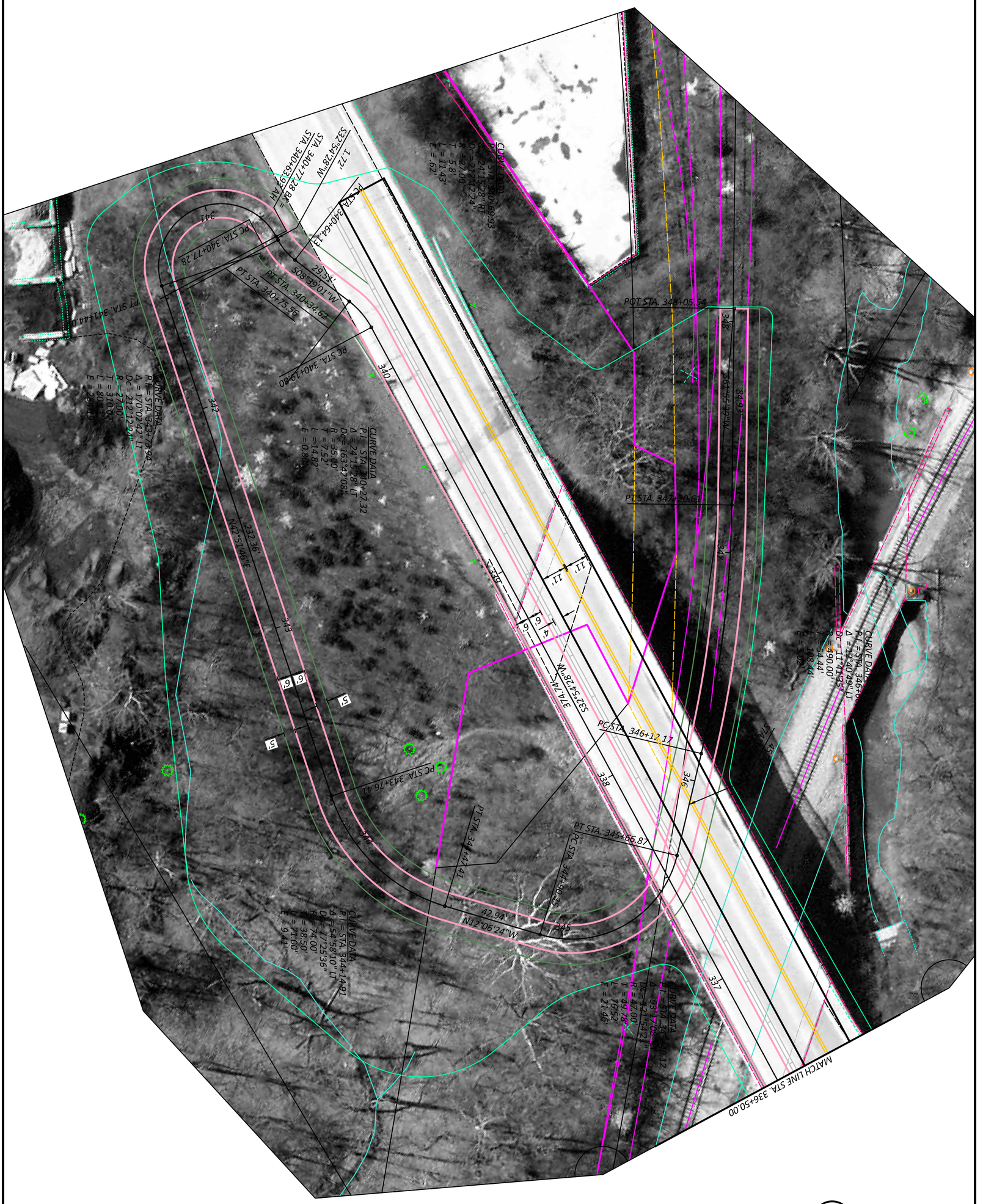
SEGMENT 2 - ALTERNATIVE C
SHEET SUB-TITLE

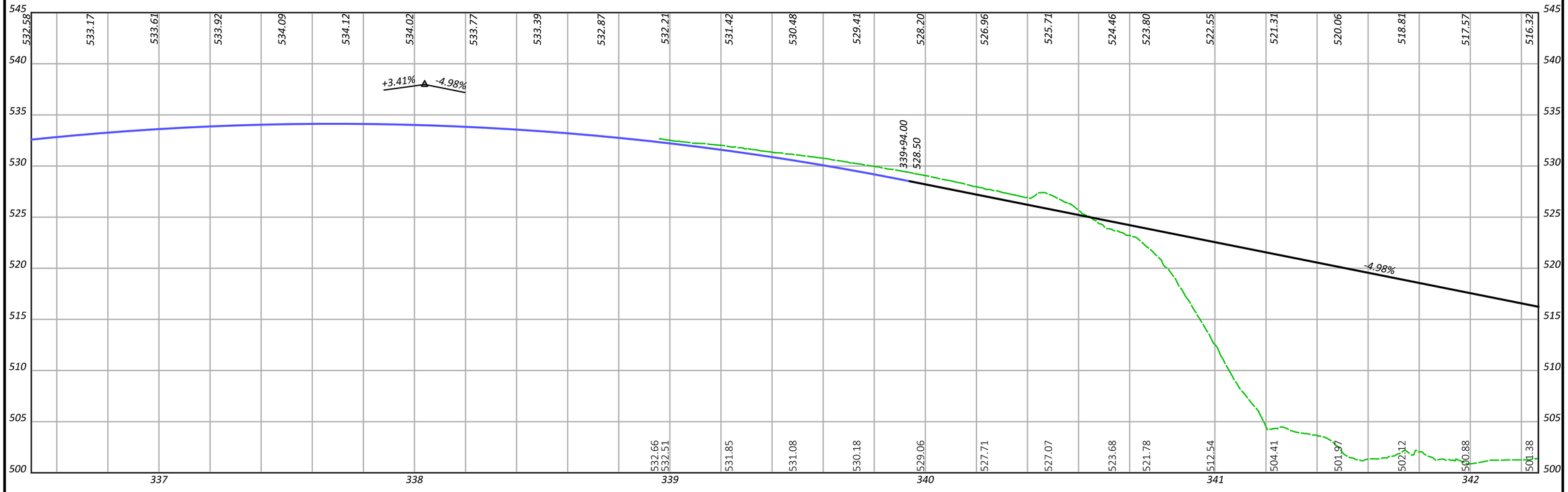
HORIZONTAL SCALE IN FEET
0 20
10 40

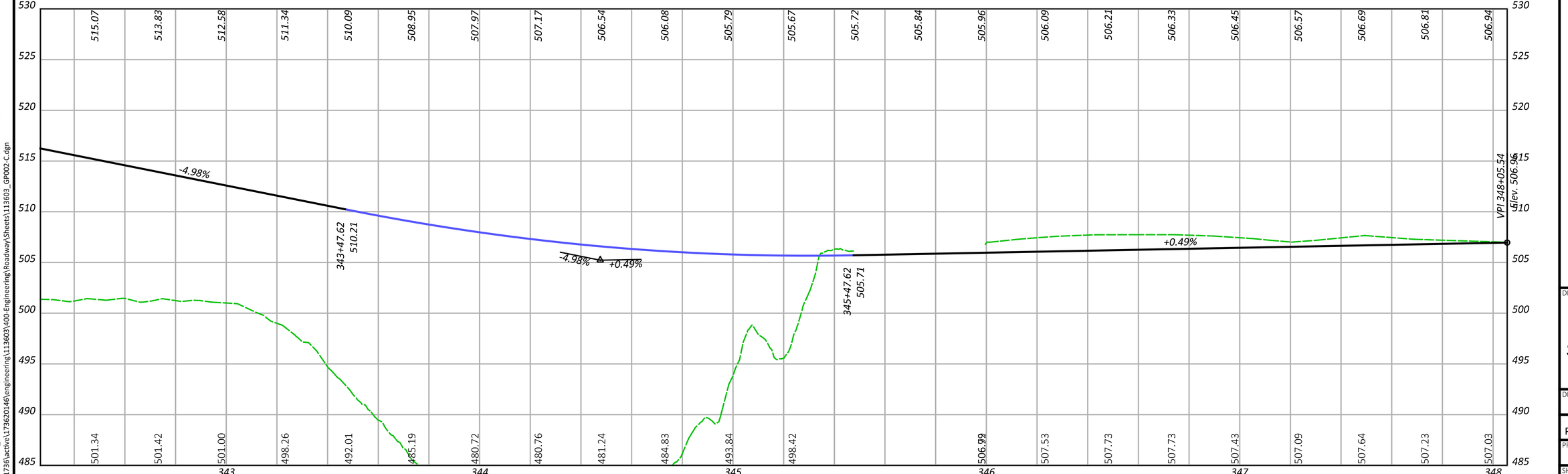
C-25

HAM-WASSON WAY TO OTTO ARMLEDER

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V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP002-C.dgn


PC STA. 340+64.13
PT STA. 340+75.58
PC STA. 340+77.28
PT STA. 341+44.07
PC STA. 343+76.41
PT STA. 344+47.41
PC STA. 345+66.87
PT STA. 346+05.54
PC STA. 346+12.17
PT STA. 347+20.61
MATCH LINE STA. 336+50.00
CURVE DATA
P.I. = STA. 340+27.32
Δ = 24°15'28" LT
Dc = 163°12'08"
R = 35.00'
T = 7.57'
L = 14.82'
E = 0.80'
CURVE DATA
P.I. = STA. 343+73.94
Δ = 170°02'42" LT
Dc = 212°12'32"
R = 27.00'
T = 41.03'
L = 80.12'
E = 57.73'
CURVE DATA
P.I. = STA. 344+14.91
Δ = 45°58'10" LT
Dc = 47°25'36"
R = 38.50'
T = 16.65'
L = 30.88'
E = 3.48'
CURVE DATA
P.I. = STA. 346+30.12
Δ = 12°30'49" LT
Dc = 11°41'34"
R = 490.00'
T = 53.94'
L = 107.00'
E = 5.90'
CURVE DATA
P.I. = STA. 347+00.12
Δ = 90°00'00" RT
Dc = 81°51'42"
R = 47.00'
T = 47.00'
L = 73.83'
E = 15.46'
S52°54'28"W
1.72'
STA. 340+65.93
S37°54'28"W
42.94'
N12°06'24"E
232.36'
N42°59'46"E
S32°54'28"W
S37°54'28"W
42.94'
N77°06'24





HAM-WASSON WAY TO OTTO ARMLEDER

SEGMENT 2 - ALTERNATIVE C
STA. 336+50.00 TO STA. 348+05.54

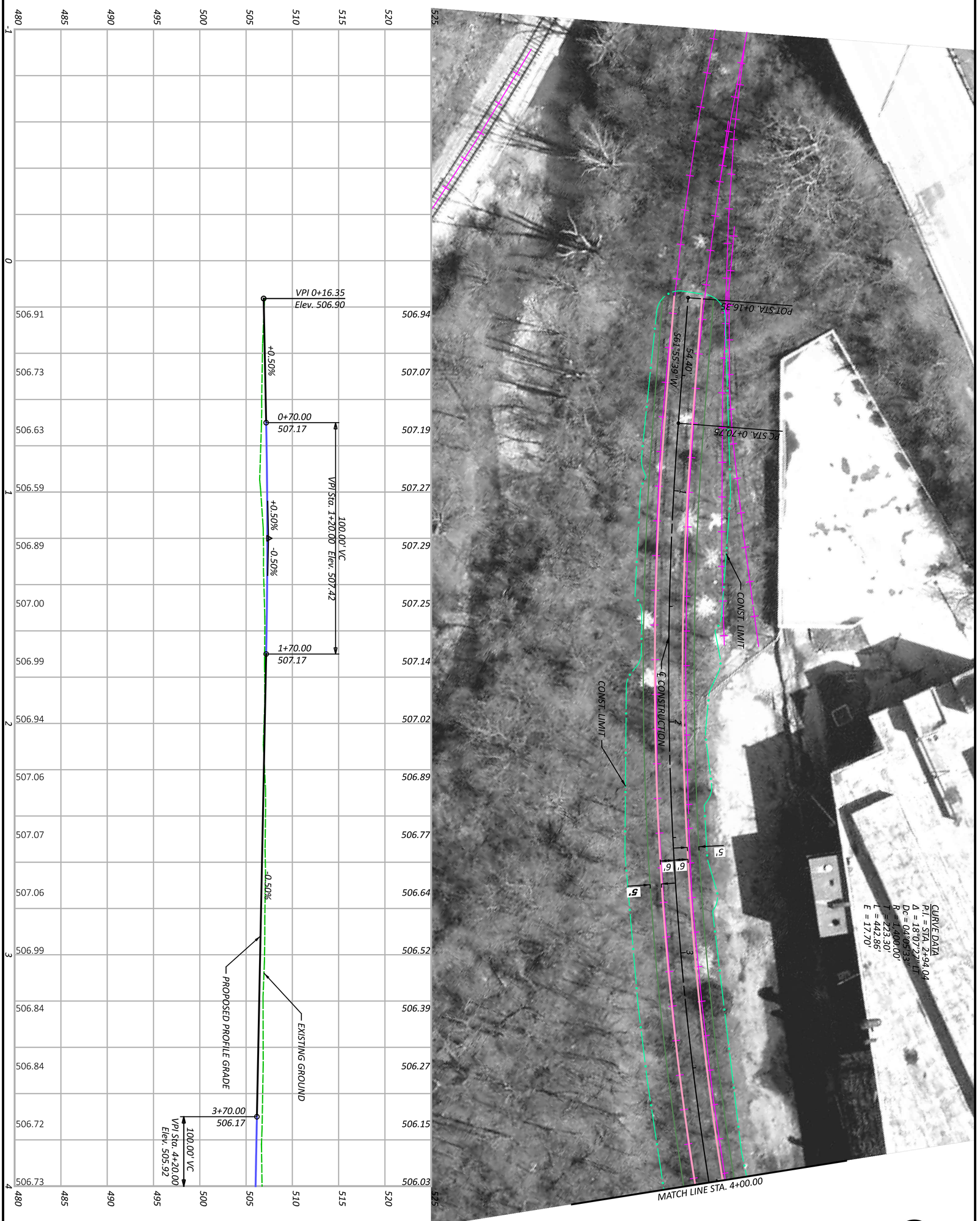
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V:\1736\active\173620146\engineering\1136O3\400-Engineering\Roadway\Sheets\113603_GP002-C.dgn

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER	JGB
REVIEWER	PJD 03-05-24
PROJECT ID	0113603
SHEET	P.6
TOTAL	6

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 7 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:17:55 AM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-AB.dgn



SEGMENT 3 - ALTERNATIVE B
STA. 00+06.35 TO STA. 4+00.00

HORIZONTAL
SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.1	13

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400

C-28

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 8 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:18:47 AM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-AB.dgn



SEGMENT 3 - ALTERNATIVE B
STA. 4+00.00 TO STA. 9+00.00

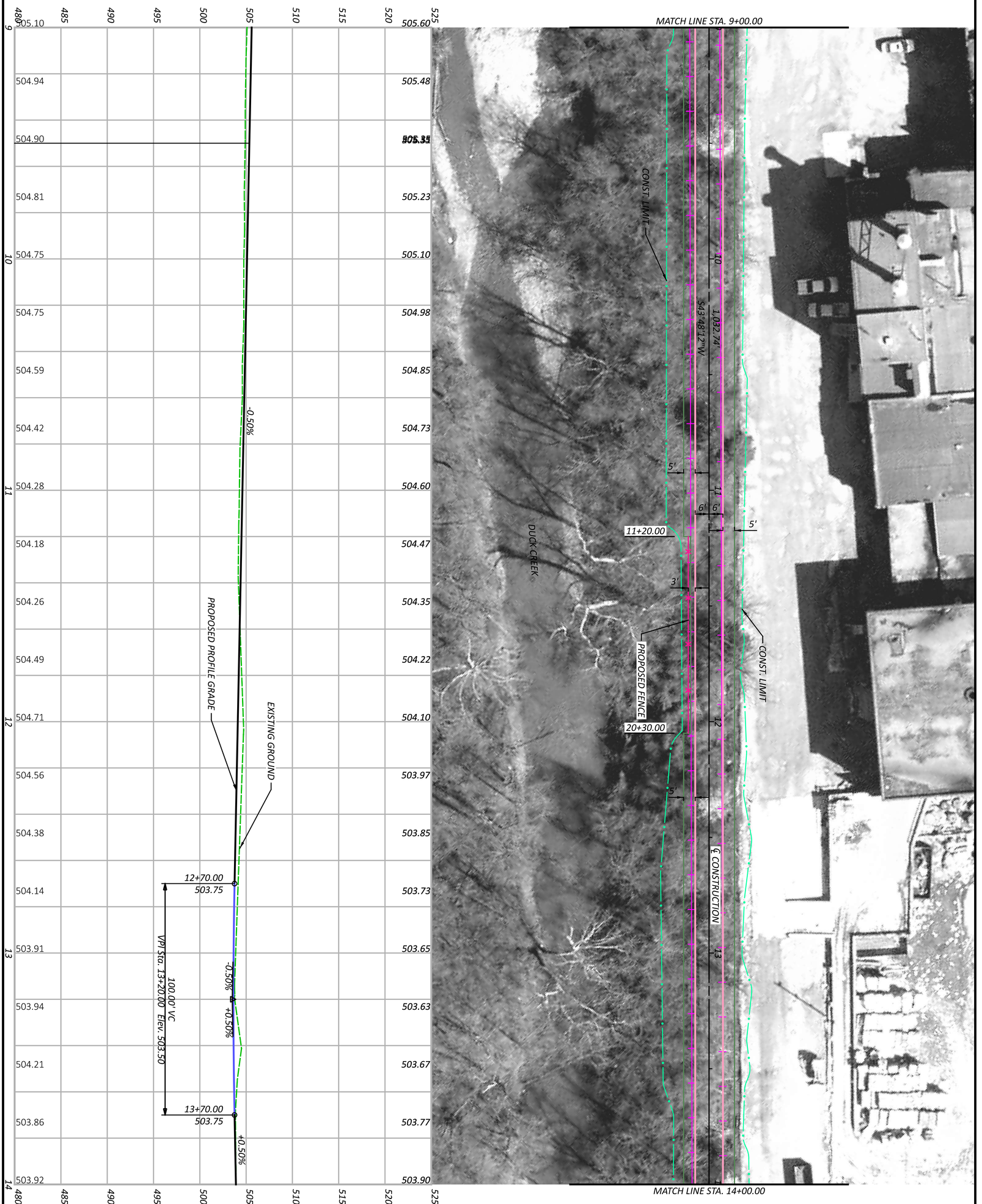
SHEET	P.2
TOTAL	13
PROJECT ID	113603
REVIEWER	SNS 01-26-24
DESIGNER	JGB
DESIGN AGENCY	Stantec

10200 Alliance Road, Suite 200
Cincinnati, OH 45242
(513) 842-8200

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 9 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:18:53 AM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-AB.dgn



SHEET	TOTAL
P.3	13

PROJECT ID: 113603

REVIEWER: SNS 01-26-24

DESIGNER: JGB

DESIGN AGENCY

Stantec

10200 Alliance Road, Suite 200
Cincinnati, OH 45242
(513) 842-8200

SEGMENT 3 - ALTERNATIVE B
STA. 9+00.00 TO STA. 14+00.00

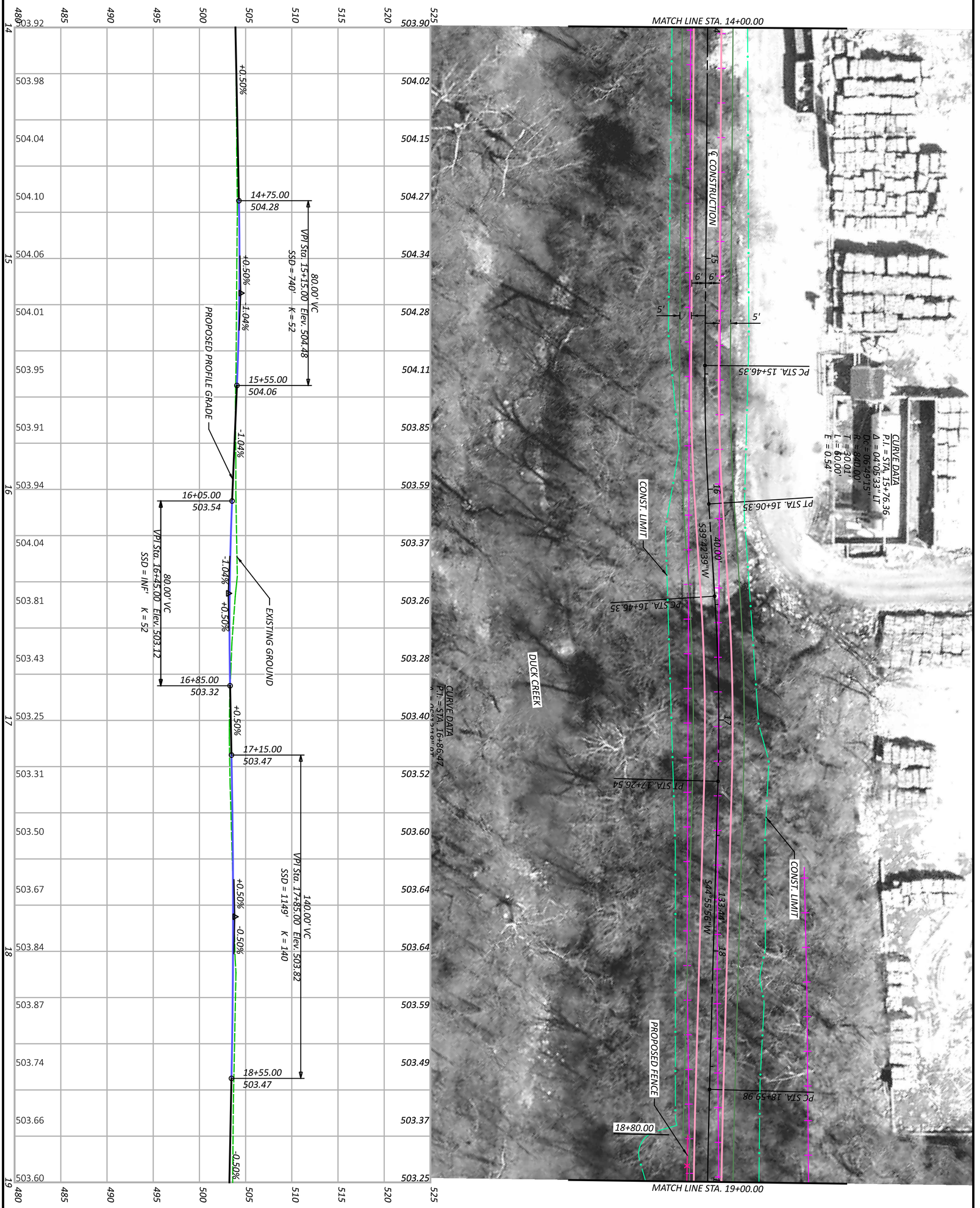
HORIZONTAL SCALE IN FEET

0 20
10 40

C-30

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 10 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:18:57 AM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-AB.dgn



DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 200
Cincinnati, OH 45242
(513) 842-8200

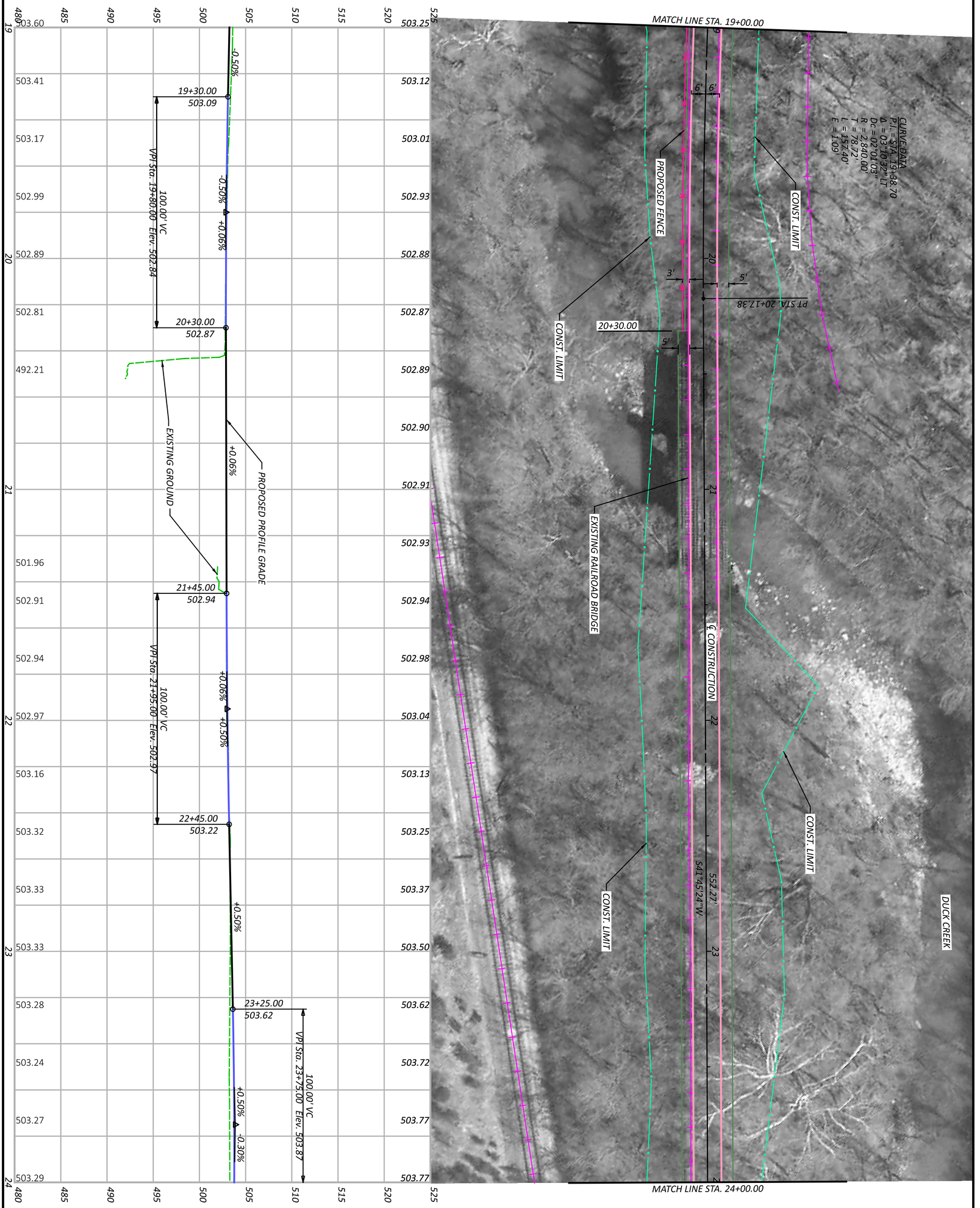
DESIGNER	REVIEWER	PROJECT ID	SHEET	TOTAL
JGB	SNS 01-26-24	113603	P.4	13

SEGMENT 3 - ALTERNATIVE B
STA. 14+00.00 TO STA. 19+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 11 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:03 AM USER: mmondlak
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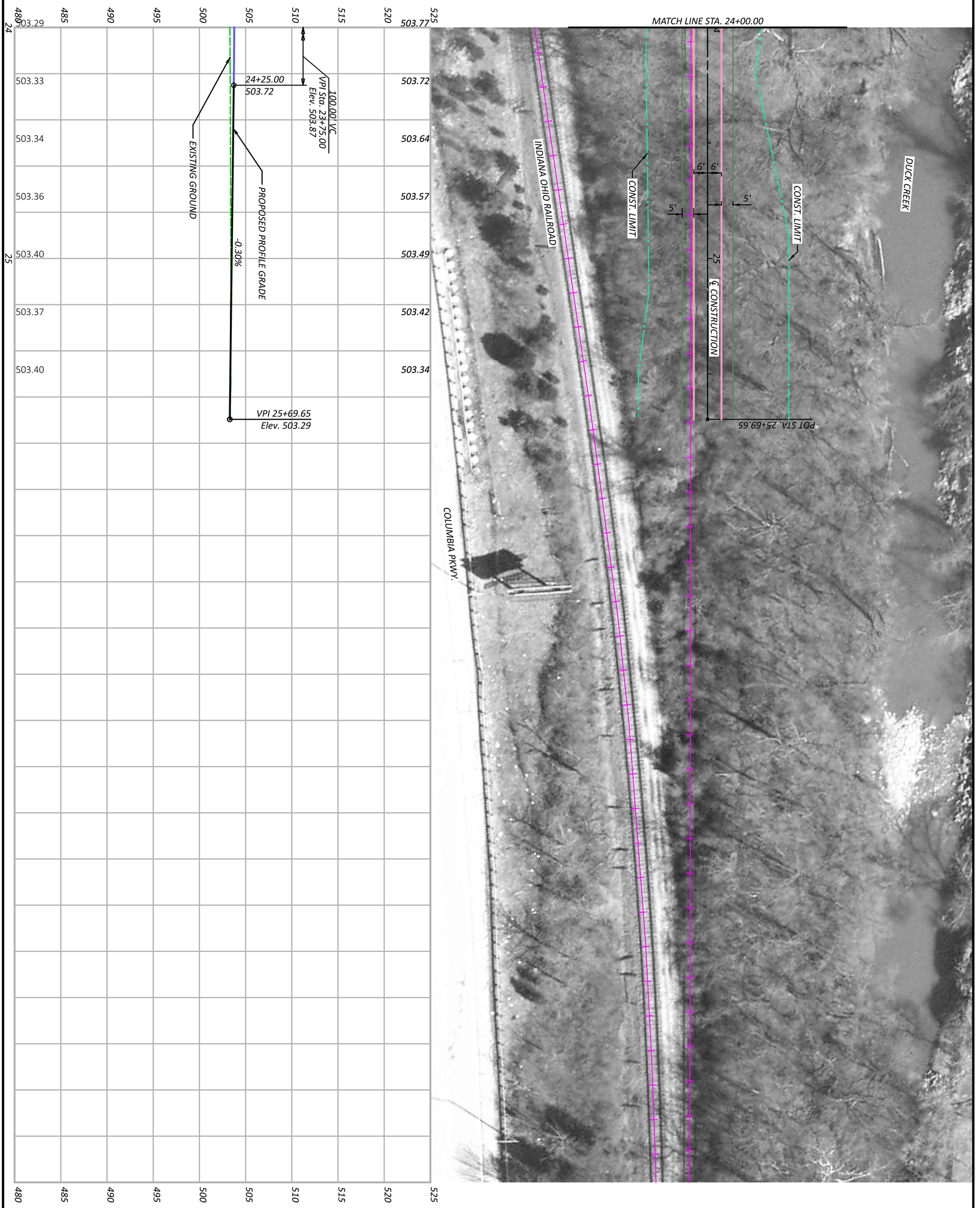
SHEET P.5	TOTAL 13	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

SEGMENT 3 - ALTERNATIVE B
STA. 19+00.00 TO STA. 24+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 12 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:09 AM USER: mmondlak
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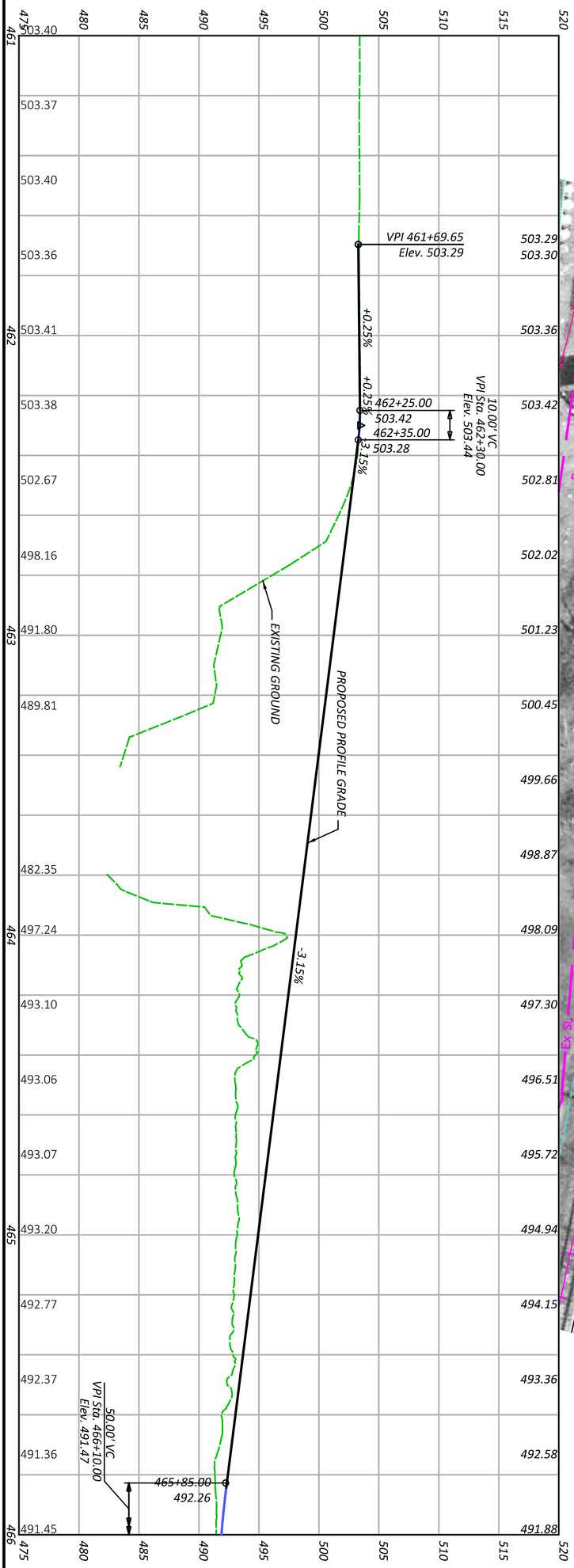
SHEET P.6	TOTAL 13	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

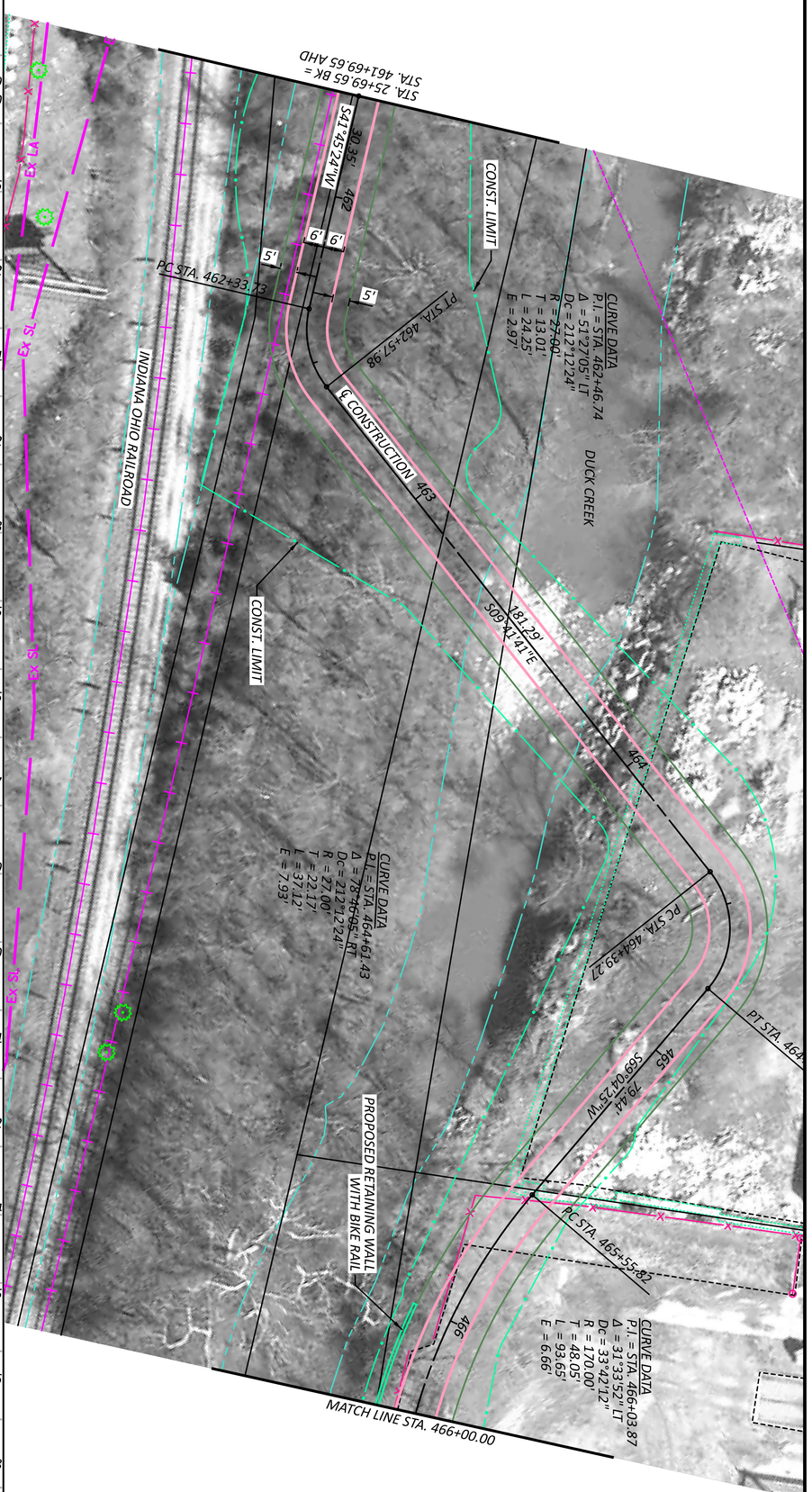
SEGMENT 3 - ALTERNATIVE B
STA. 19+00.00 TO STA. 24+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 8 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:25 AM USER: mmondlak
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SHEET P-7	TOTAL 13	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

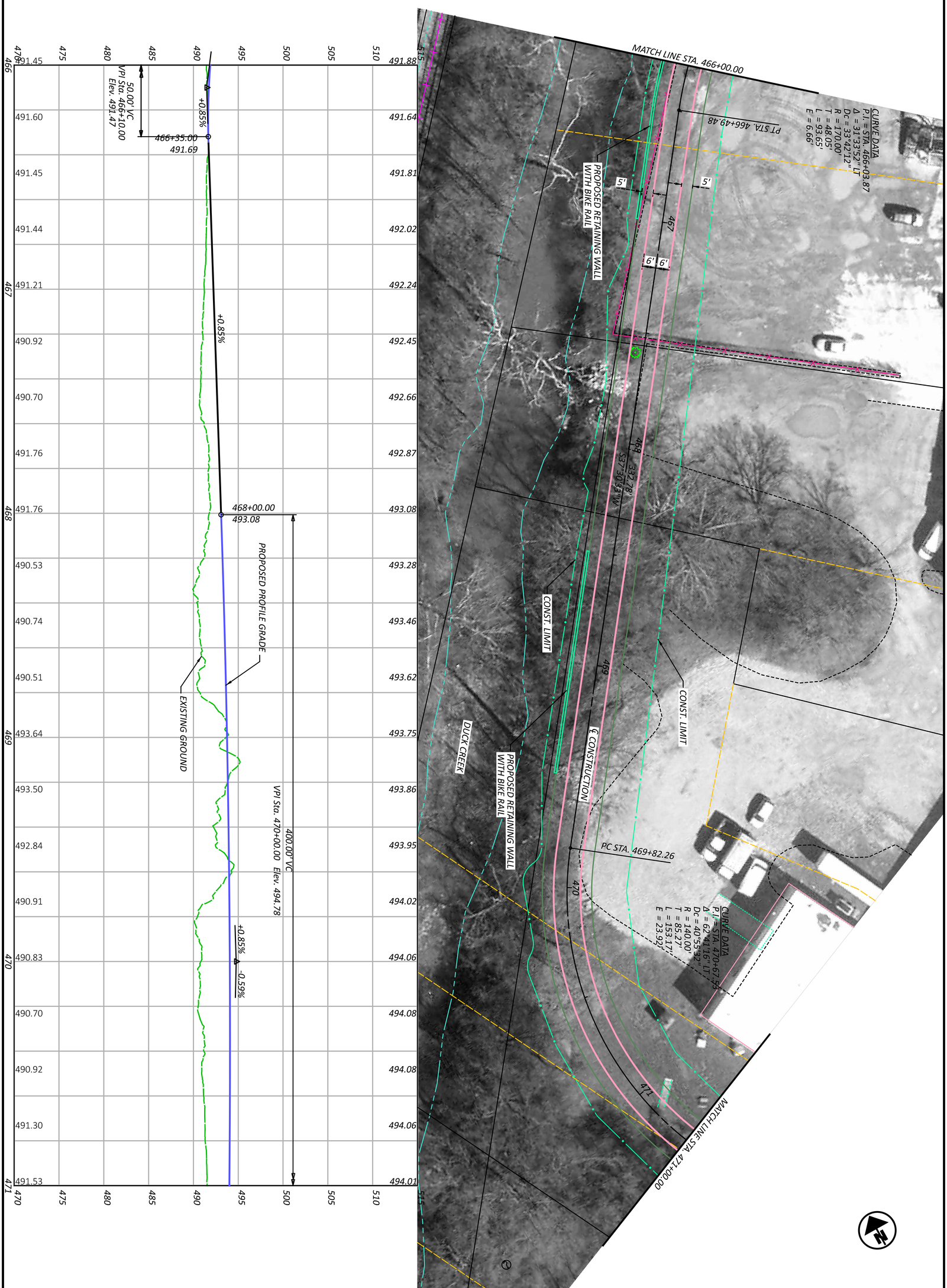
SEGMENT 3 - ALTERNATIVE B
STA. 461+69.65 TO STA. 466+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-34

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 9 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:29 AM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE B
STA. 466+00.00 TO STA. 471+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.8	13

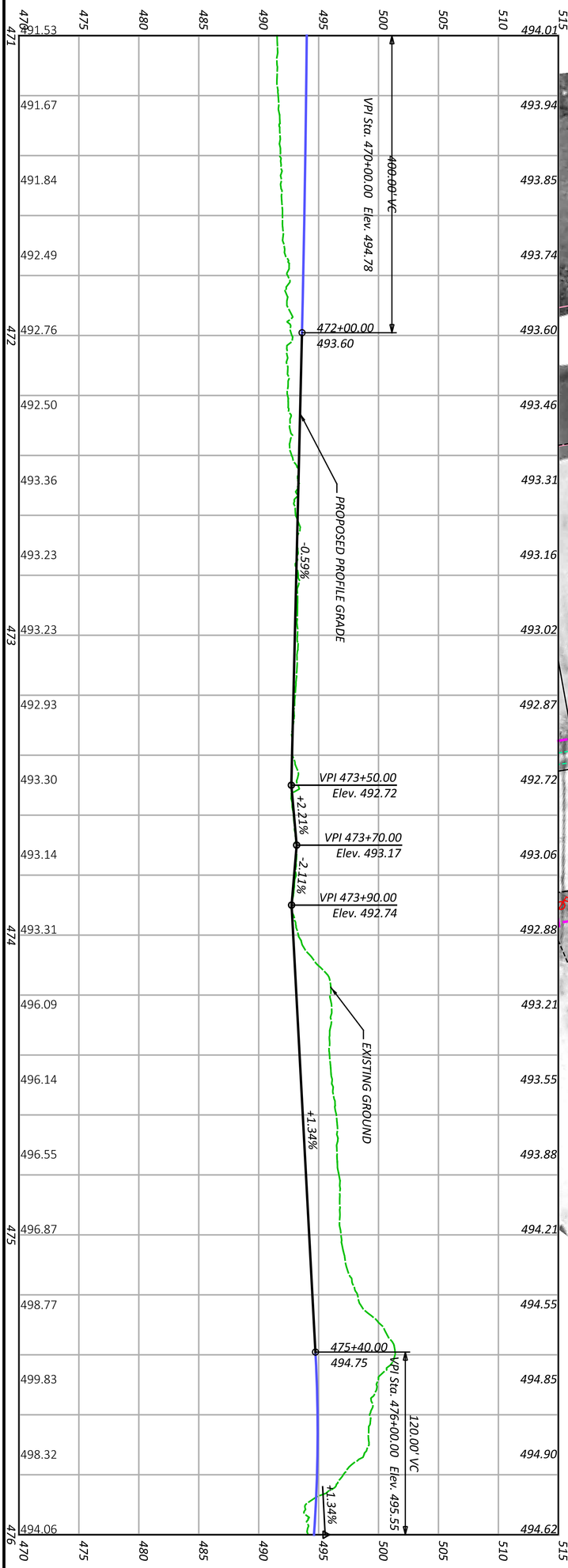
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

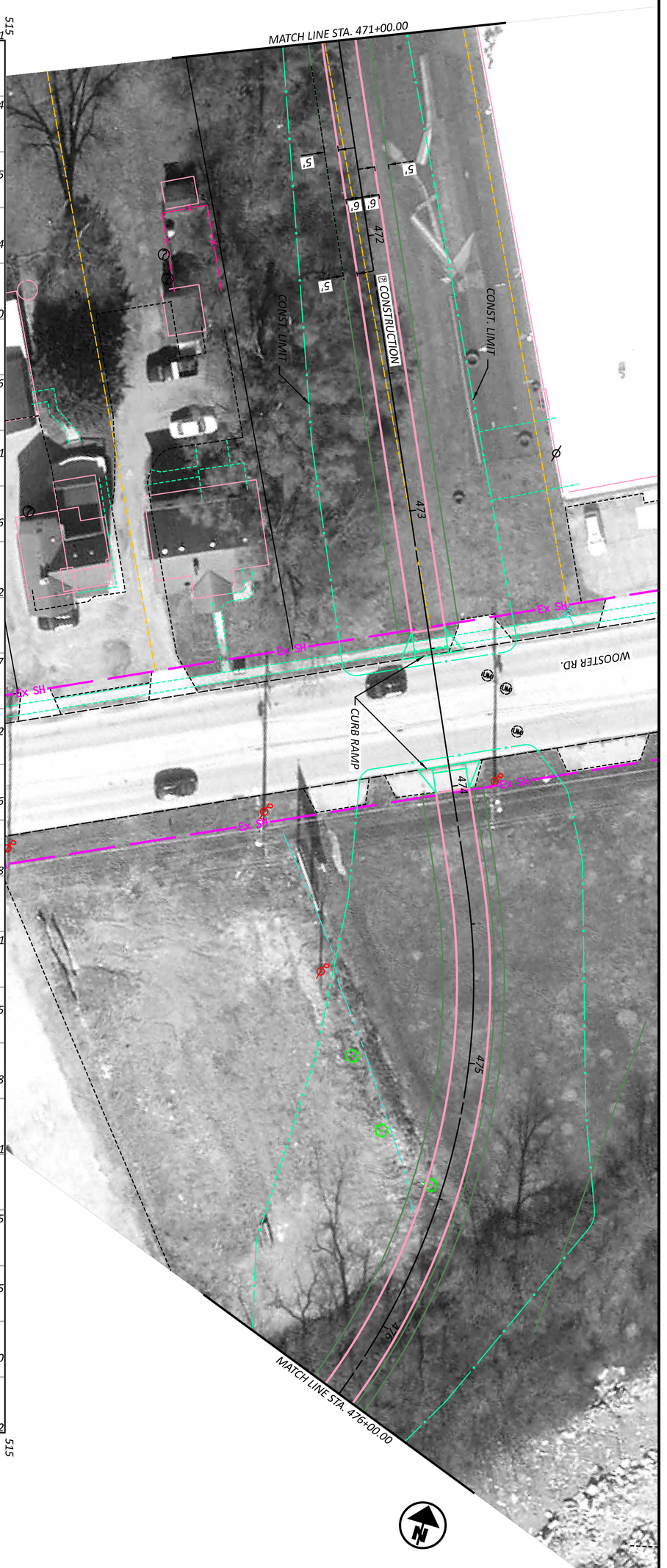
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

C-35

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 10 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:35 AM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-B.dgn





SEGMENT 3 - ALTERNATIVE B
STA. 471+00.00 TO STA. 476+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

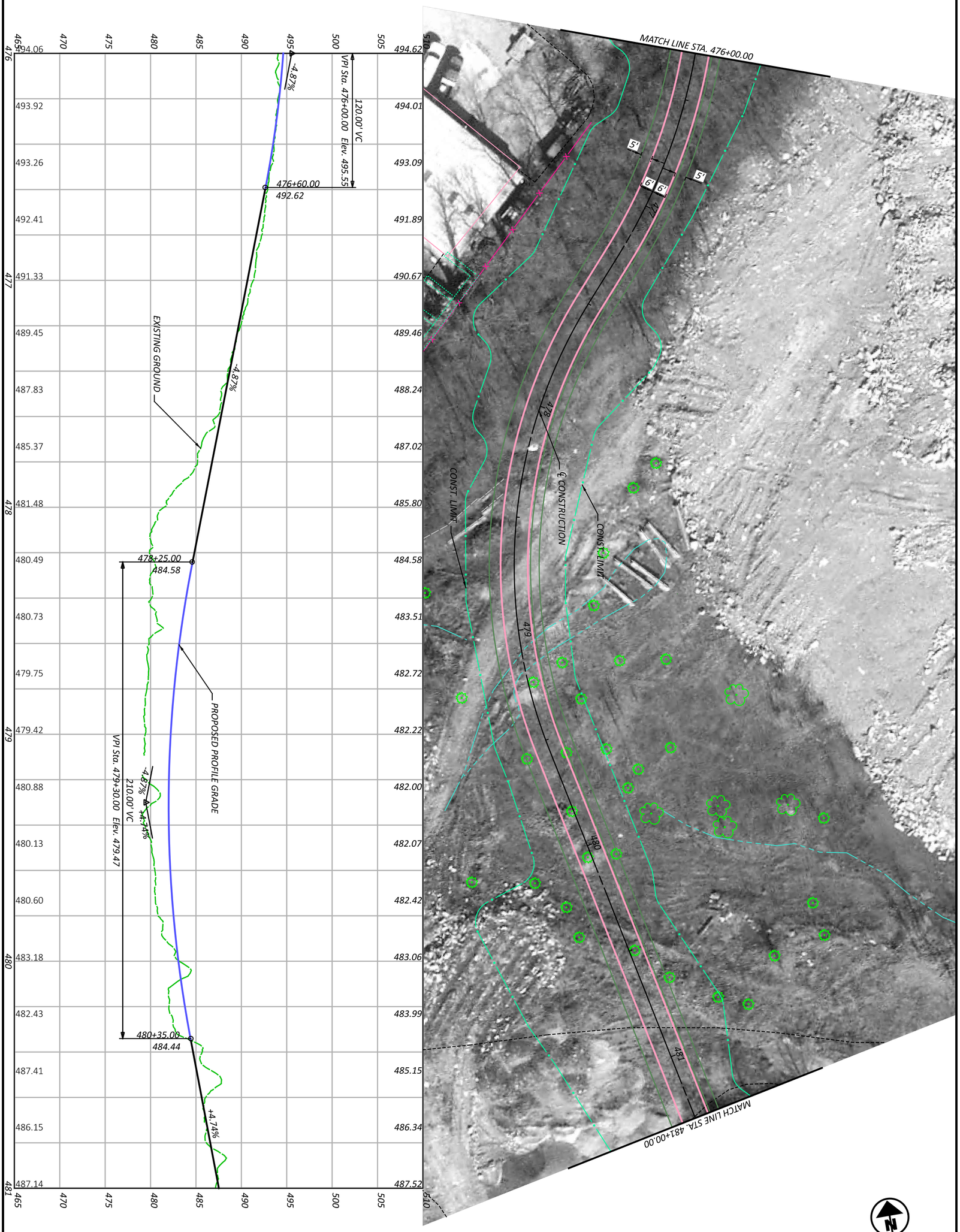
SHEET	TOTAL
P.9	13

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

C-36

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 11 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:41 AM USER: mmondlak
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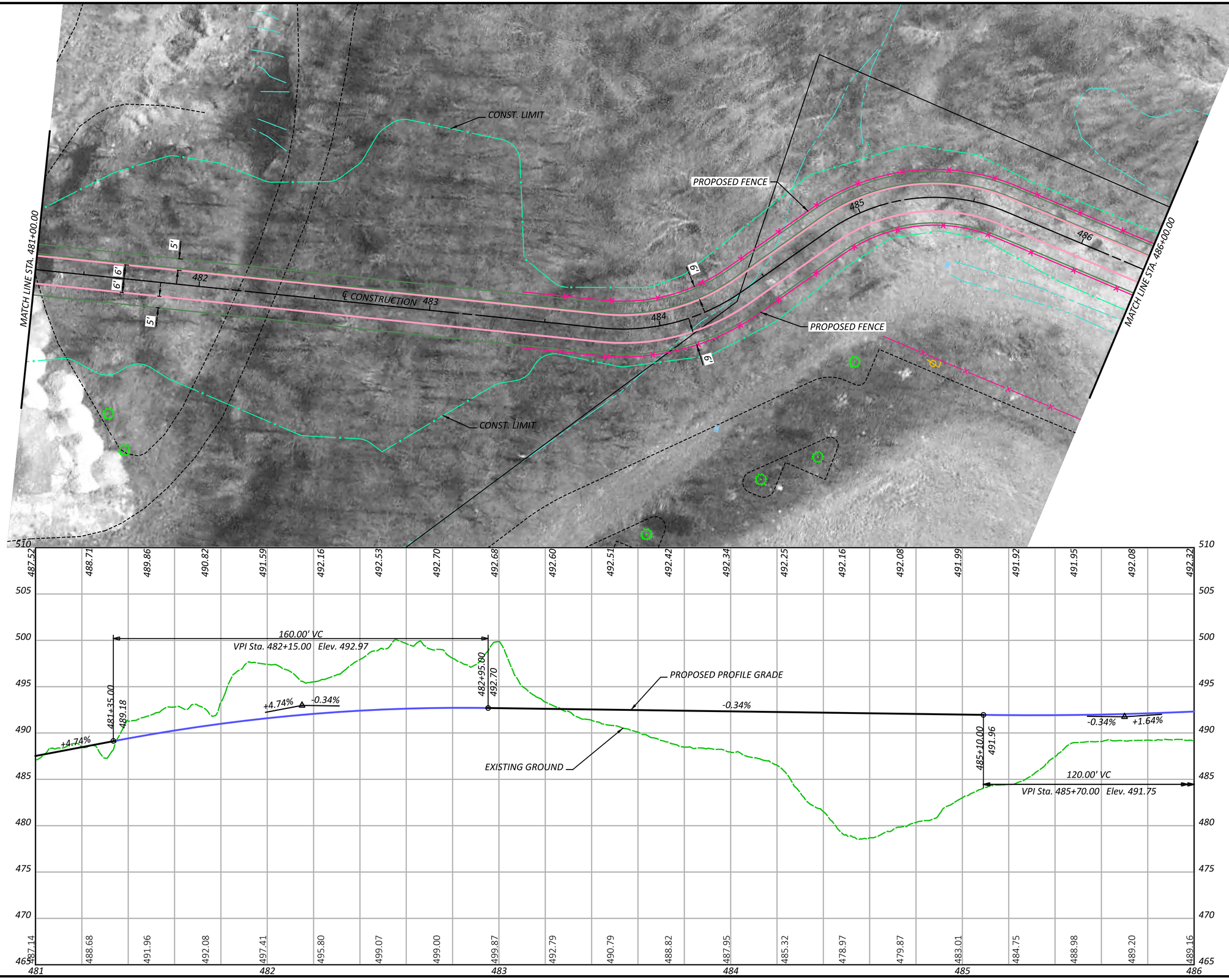
SHEET P.10	TOTAL 13	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

SEGMENT 3 - ALTERNATIVE B
STA. 476+00.00 TO STA. 481+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 12 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:47 AM USER: mmondlak
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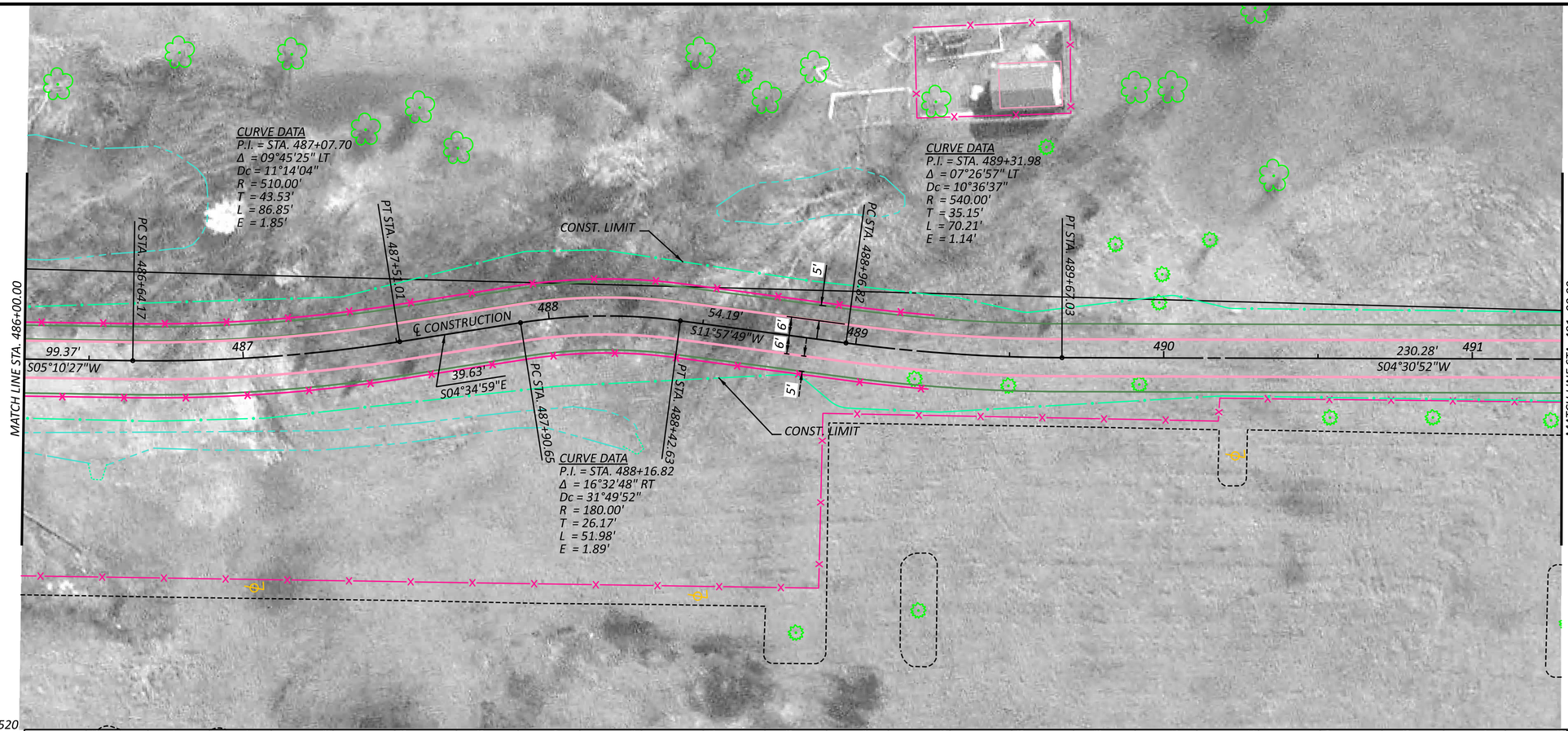


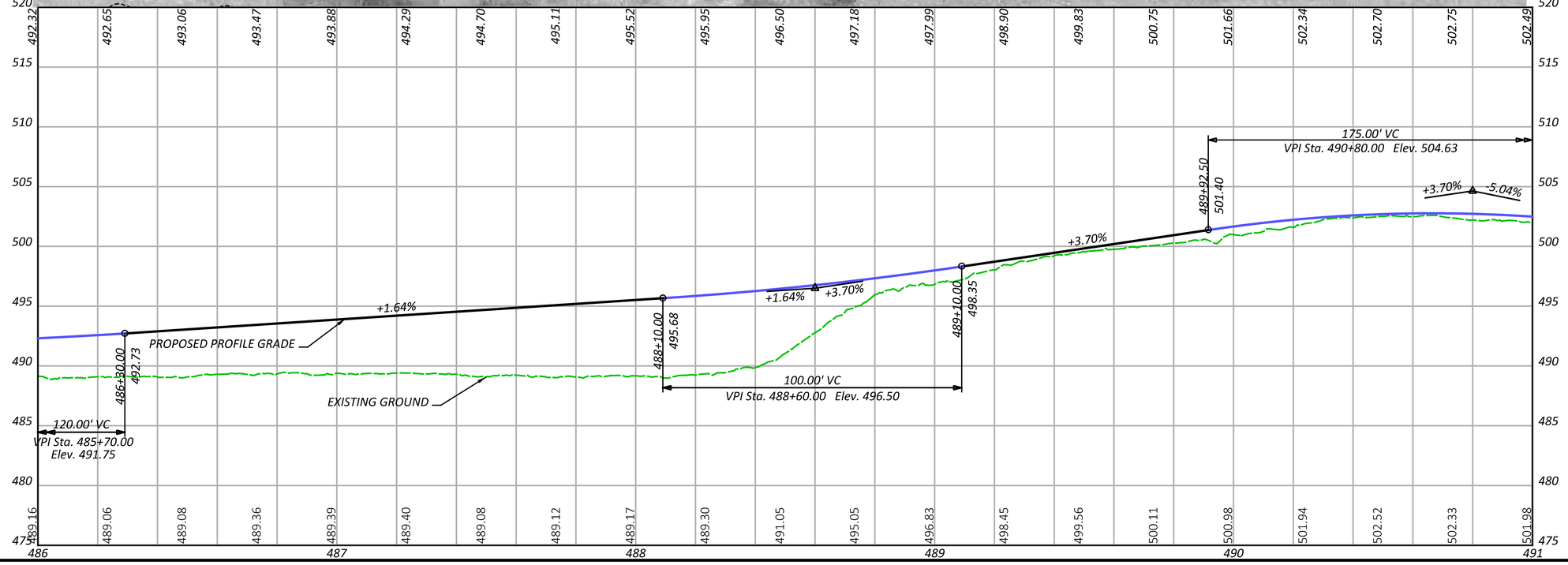
HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE B
STA. 481+00.00 TO STA. STA. 486+00.00

DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.11 TOTAL 13





HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE B
STA. 486+00.00 TO STA. 491+00.00

HAM-WASSON WAY TO OTTO ARMLEDER

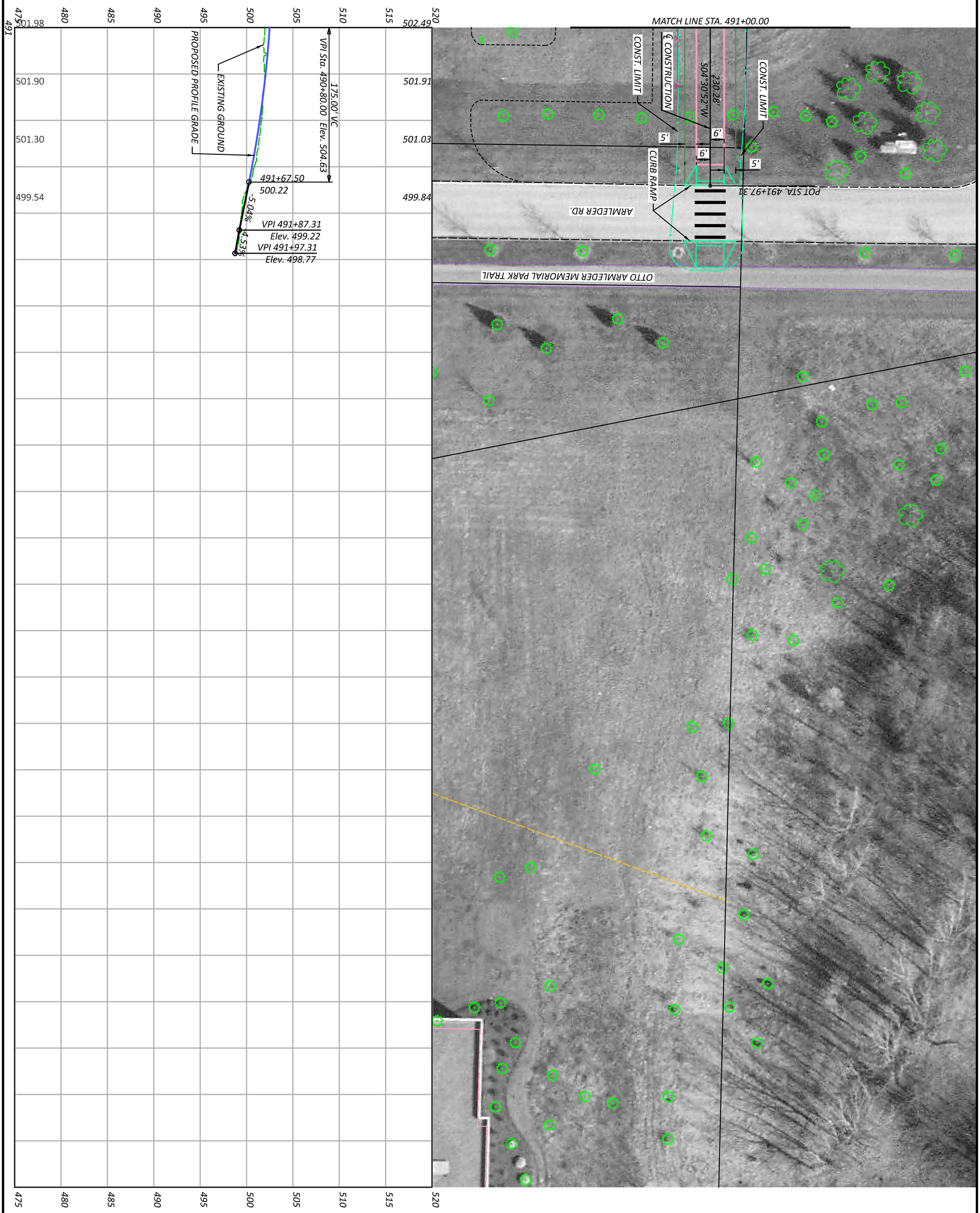
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DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.12 TOTAL 13

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 14 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/6/2024 TIME: 10:19:57 AM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE B
STA. 491+00.00 TO STA. 491+68.23

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.13	13

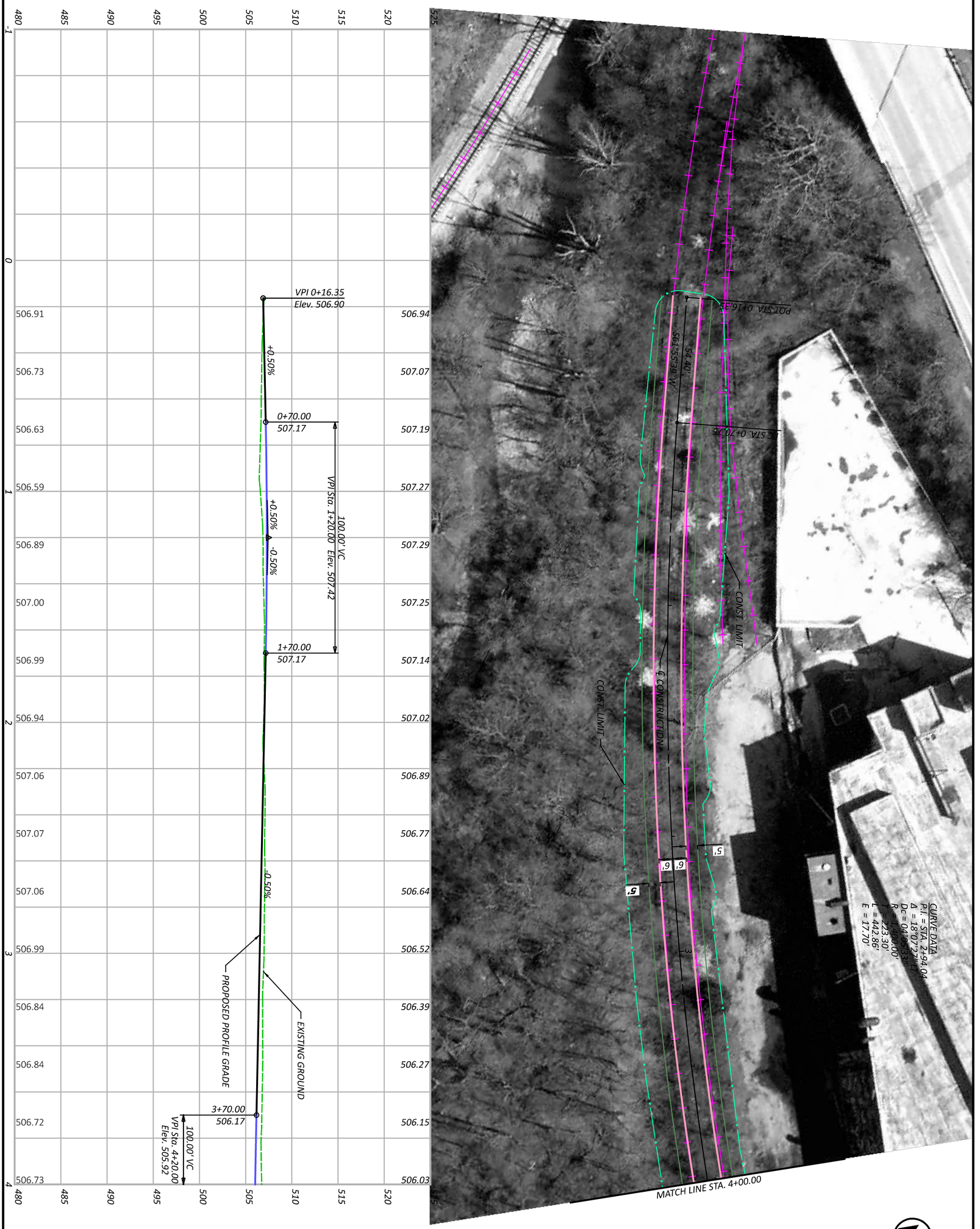
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

DESIGN AGENCY

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 7 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:48 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 00+06.35 TO STA. 4+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

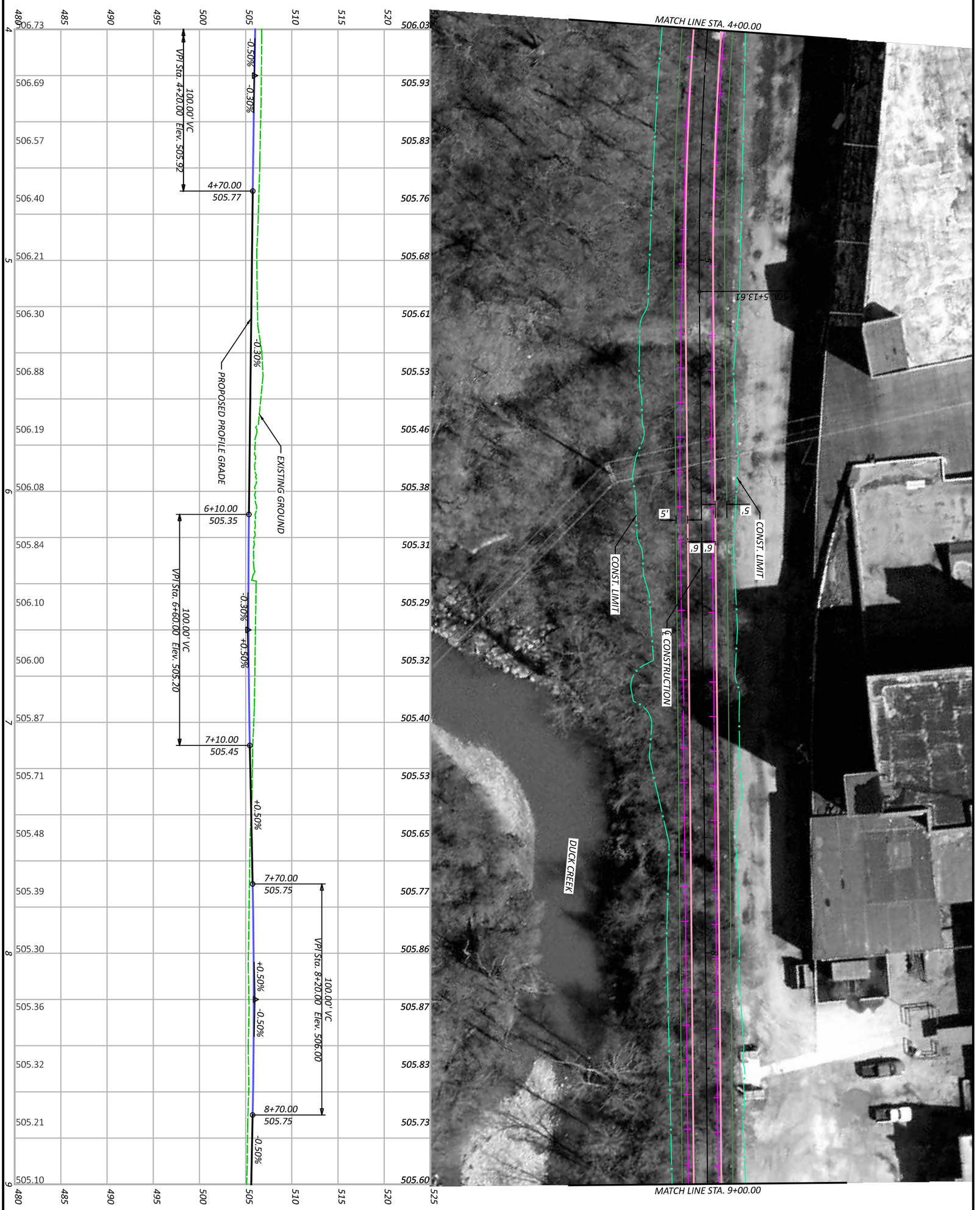
SHEET	TOTAL
P.1	17

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 8 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:50 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 4+00.00 TO STA. 9+00.00

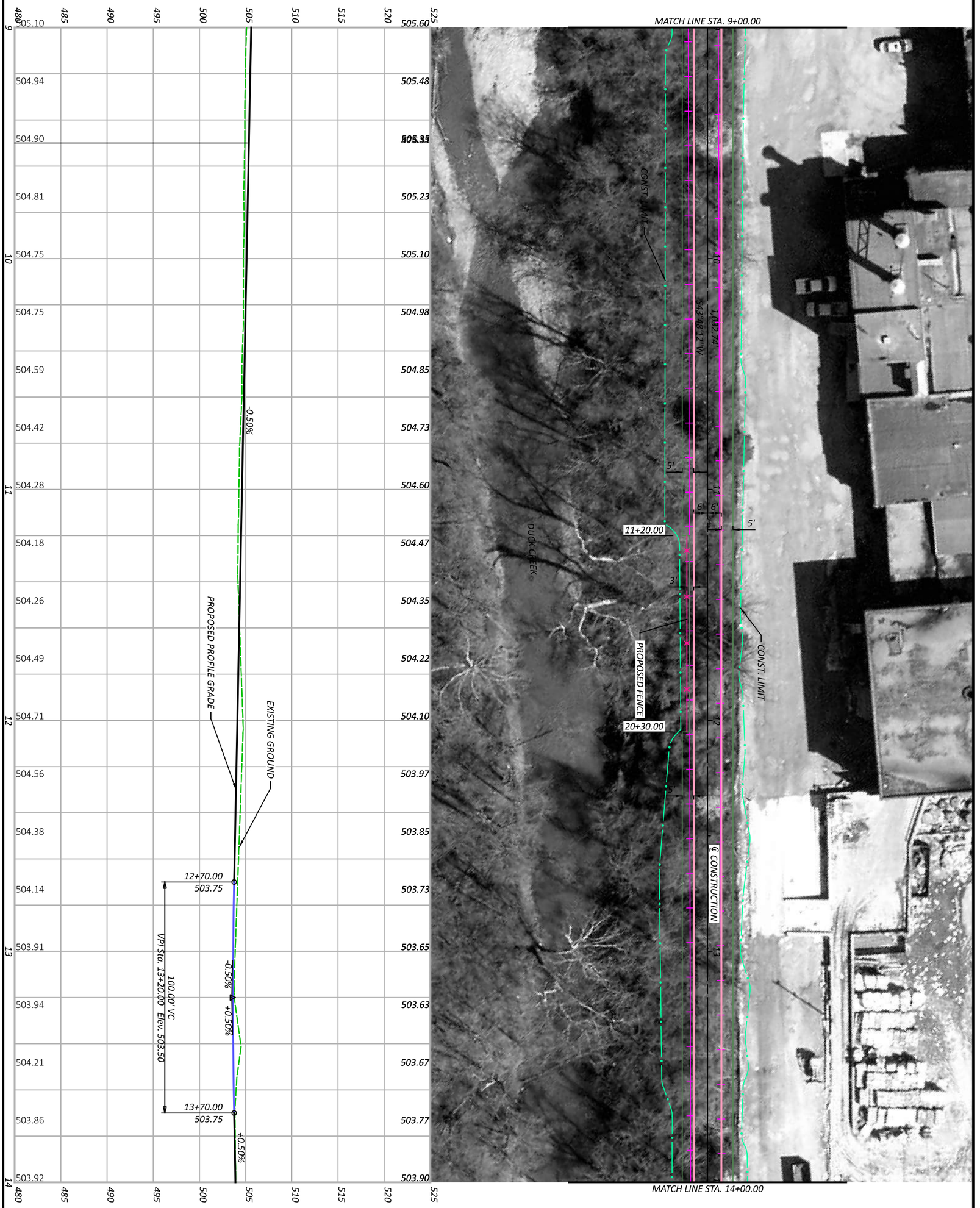
HORIZONTAL SCALE IN FEET
0 20
10 40

DESIGN AGENCY	PROJECT ID	REVIEWER	DESIGNER	SHEET	TOTAL
Stantec	113603	SNS 01-26-24	JGB	P.2	17

10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 9 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:52 PM USER: mmondlak
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DESIGN AGENCY
Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

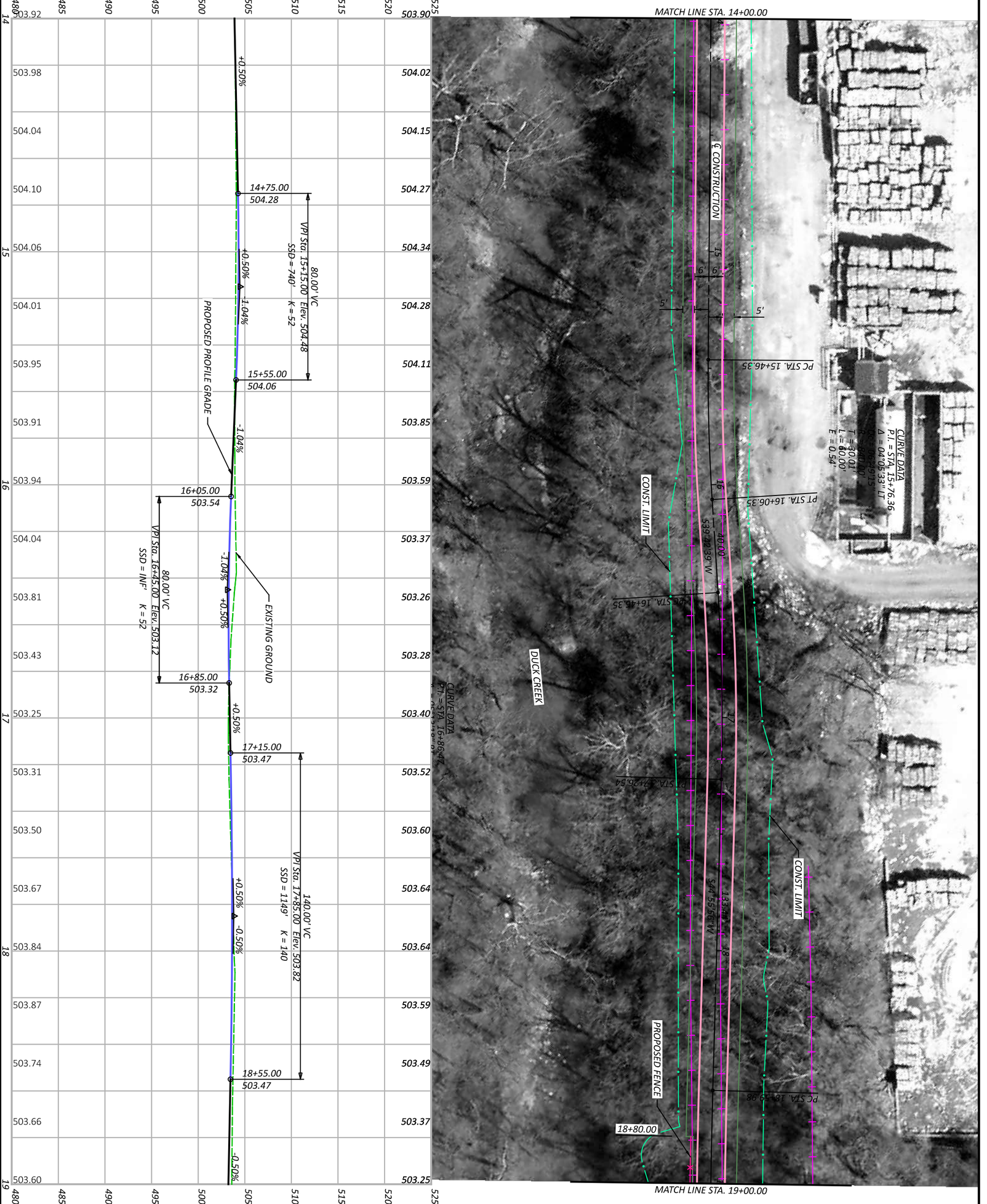
DESIGNER	REVIEWER	PROJECT ID	SHEET	TOTAL
JGB	SNS 01-26-24	113603	P.3	17

SEGMENT 3 - ALTERNATIVE C
STA. 9+00.00 TO STA. 14+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 10 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:54 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 14+00.00 TO STA. 19+00.00

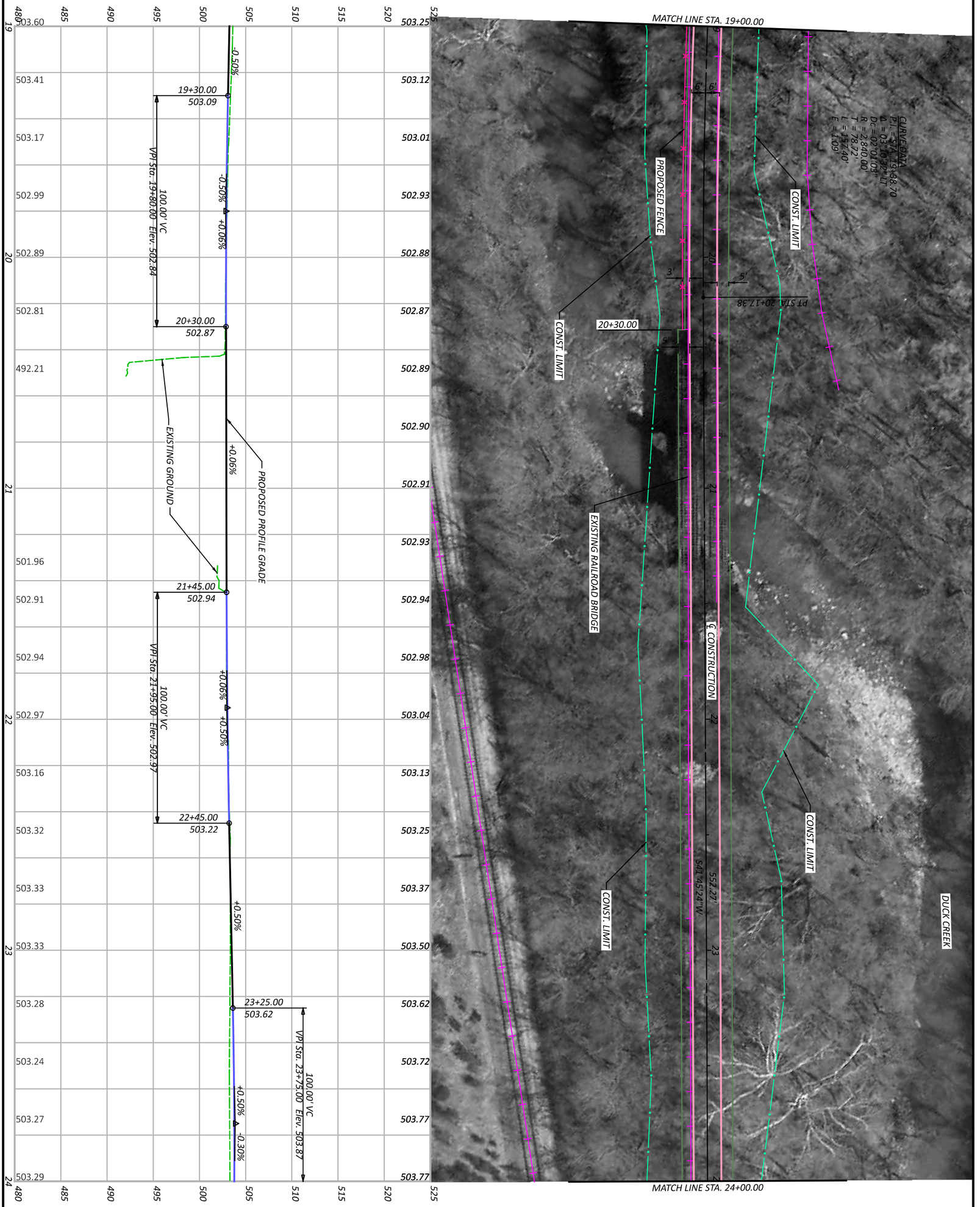
HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.4	17

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY: Stantec
10200 Alliance Road, Suite 200, Cincinnati, OH 45242 (513) 842-8200

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 11 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:56 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 19+00.00 TO STA. 24+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

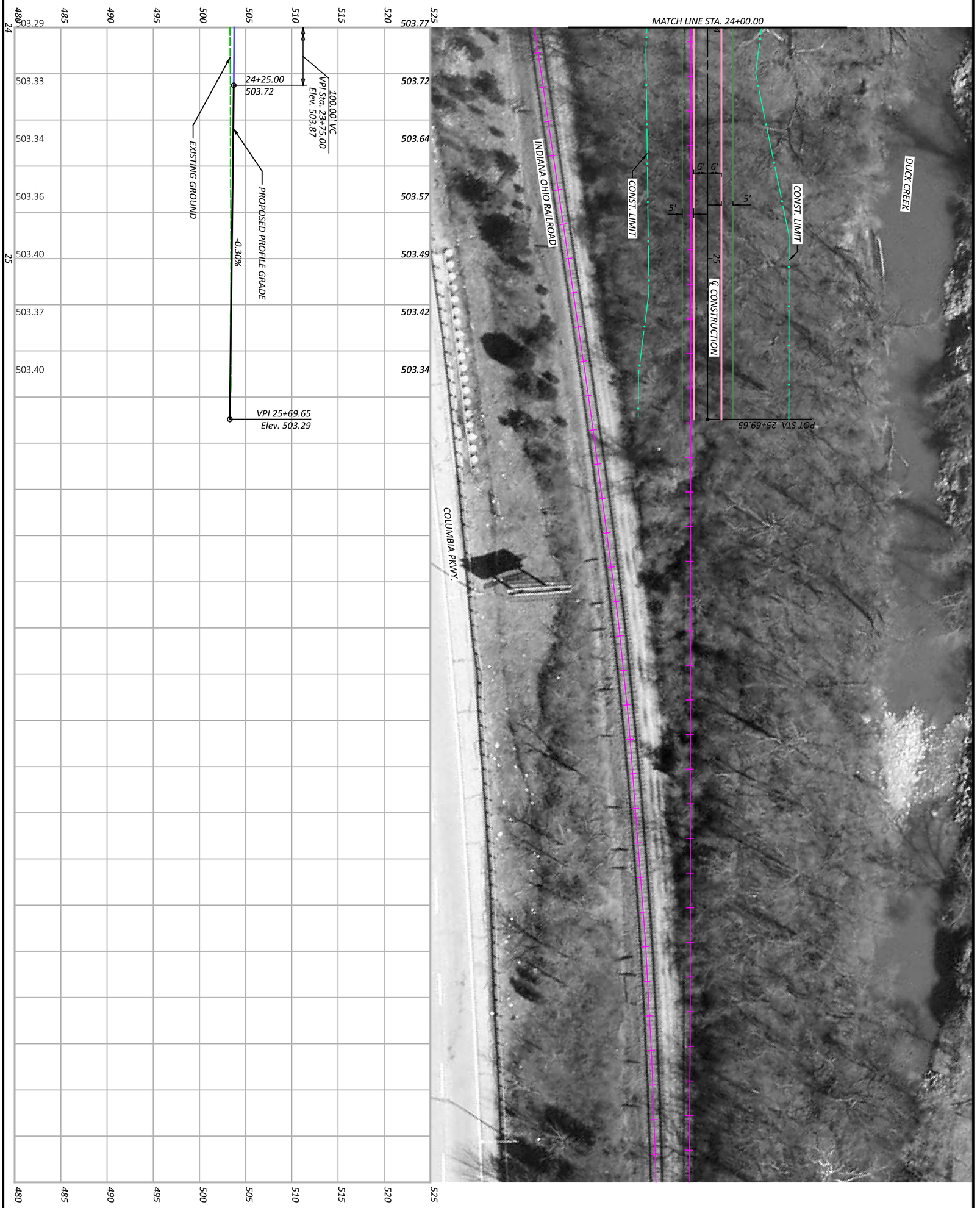
SHEET	TOTAL
P.5	17

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 12 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:36:58 PM USER: mmondlak
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DESIGN AGENCY
Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

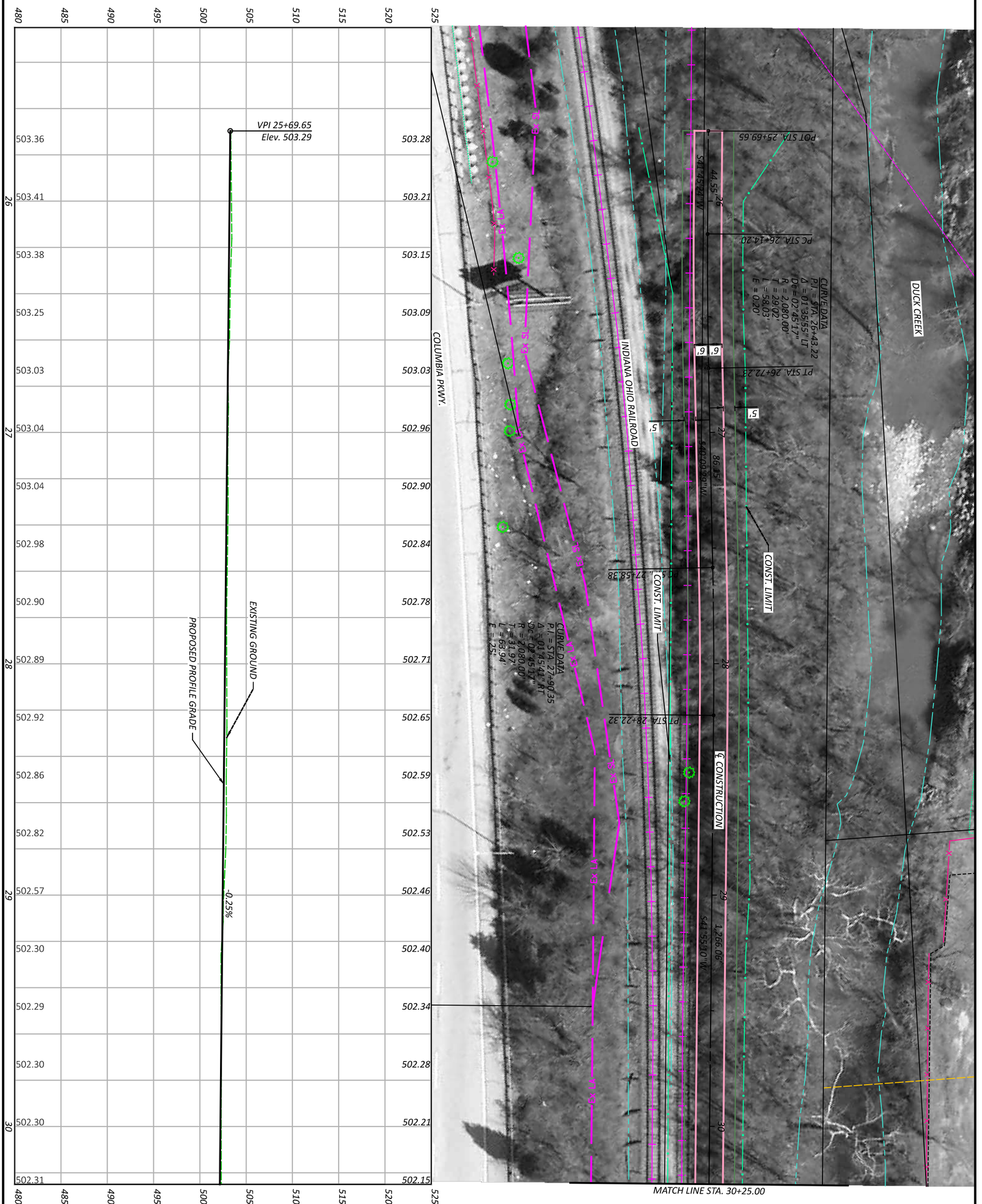
DESIGNER	REVIEWER	PROJECT ID	SHEET	TOTAL
JGB	SNS 01-26-24	113603	P.6	17

SEGMENT 3 - ALTERNATIVE C
STA. 19+00.00 TO STA. 25+69.65

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-C - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:06 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 25+69.65 TO STA. 30+25.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P-7	17

PROJECT ID: 113603
REVIEWER: SNS 02-02-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-3400

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-C - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:08 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-C.dgn

DUCK CREEK

CONST. LIMIT

5'

6'

6'

℄ CONSTRUCTION

5'

MATCH LINE STA. 30+25.00

MATCH LINE STA. 35+25.00

INDIANA OHIO RAILROAD

CONST. LIMIT

EX LA

EX LA

EX LA

EX LA

EX LA

COLUMBIA PKWY.

HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE C
STA. 30+25.00 TO STA. 35+25.00

520 515 510 505 500 495 490 485 480 475

502.15 502.09 502.03 501.96 501.90 501.84 501.78 501.71 501.65 501.59 501.56 501.55 501.57 501.61 501.68 501.75 501.83 501.90 501.97 502.04 502.11

502.31 502.56 502.44 502.32 502.16 502.28 502.26 502.32 502.35 502.27 502.20 502.17 502.15 502.14 502.15 502.15 502.11 502.07 502.05 502.12 502.12

31 32 33 34 35

EXISTING GROUND

PROPOSED PROFILE GRADE

-0.25%

-0.25%

+0.29%

+0.29%

32+37.50 501.62

33+62.50 501.64

125.00' VC
VPI Sta. 33+00.00 Elev. 501.46
SSD = INF' K = 232

DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER
JGB

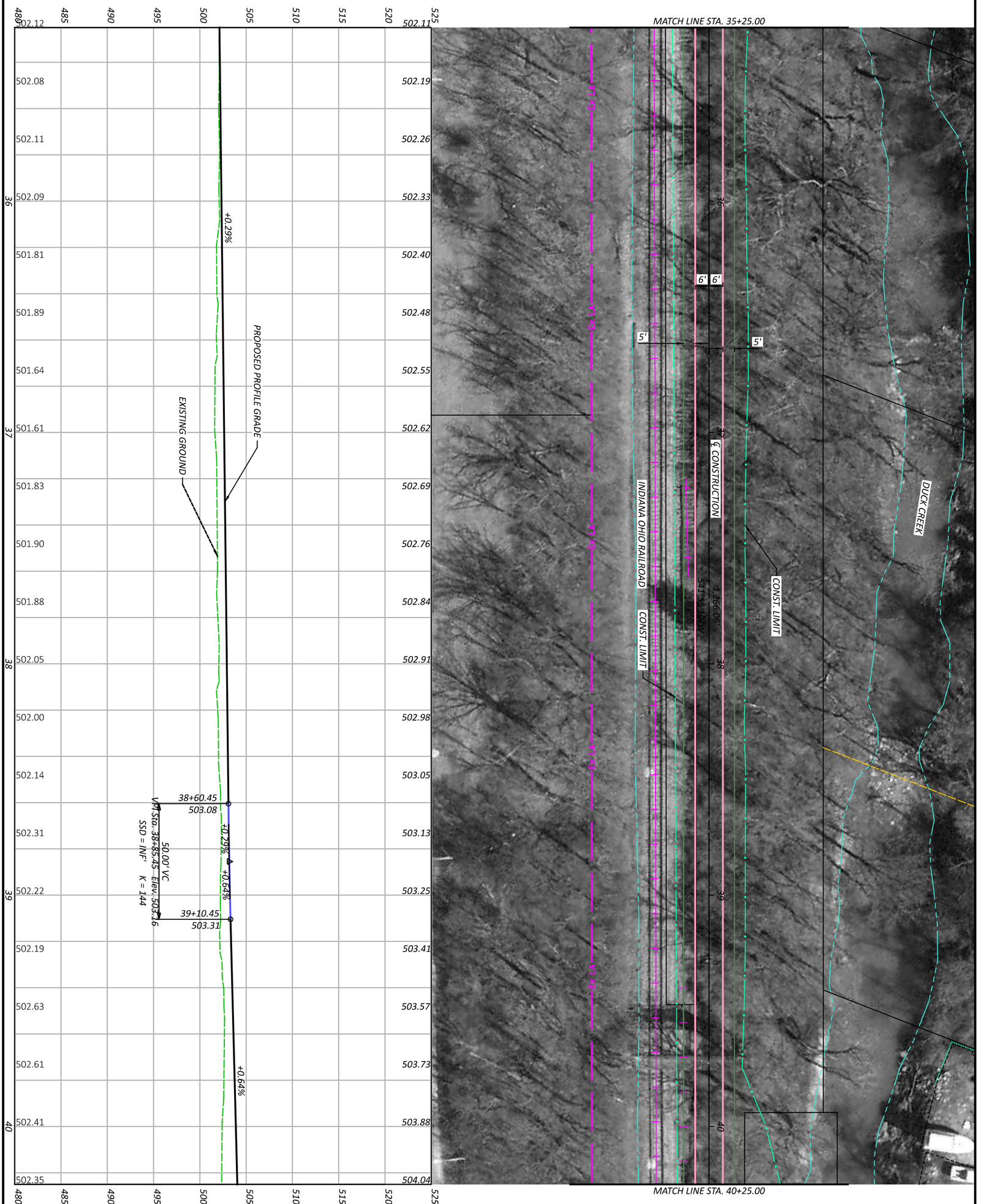
REVIEWER
SNS 02-02-24

PROJECT ID
113603

SHEET P.8 TOTAL 17

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-C - Plan 3 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:10 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-C.dgn



SEGMENT 3 - ALTERNATIVE C
STA. 35+25.00 TO STA. 40+25.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.9	17

PROJECT ID: 113603
REVIEWER: SNS 02-02-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300, Cincinnati, OH 45242
(513) 842-3400

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-C - Plan 4 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:11 PM USER: mmondlak
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HORIZONTAL SCALE IN FEET
0 0 0 0

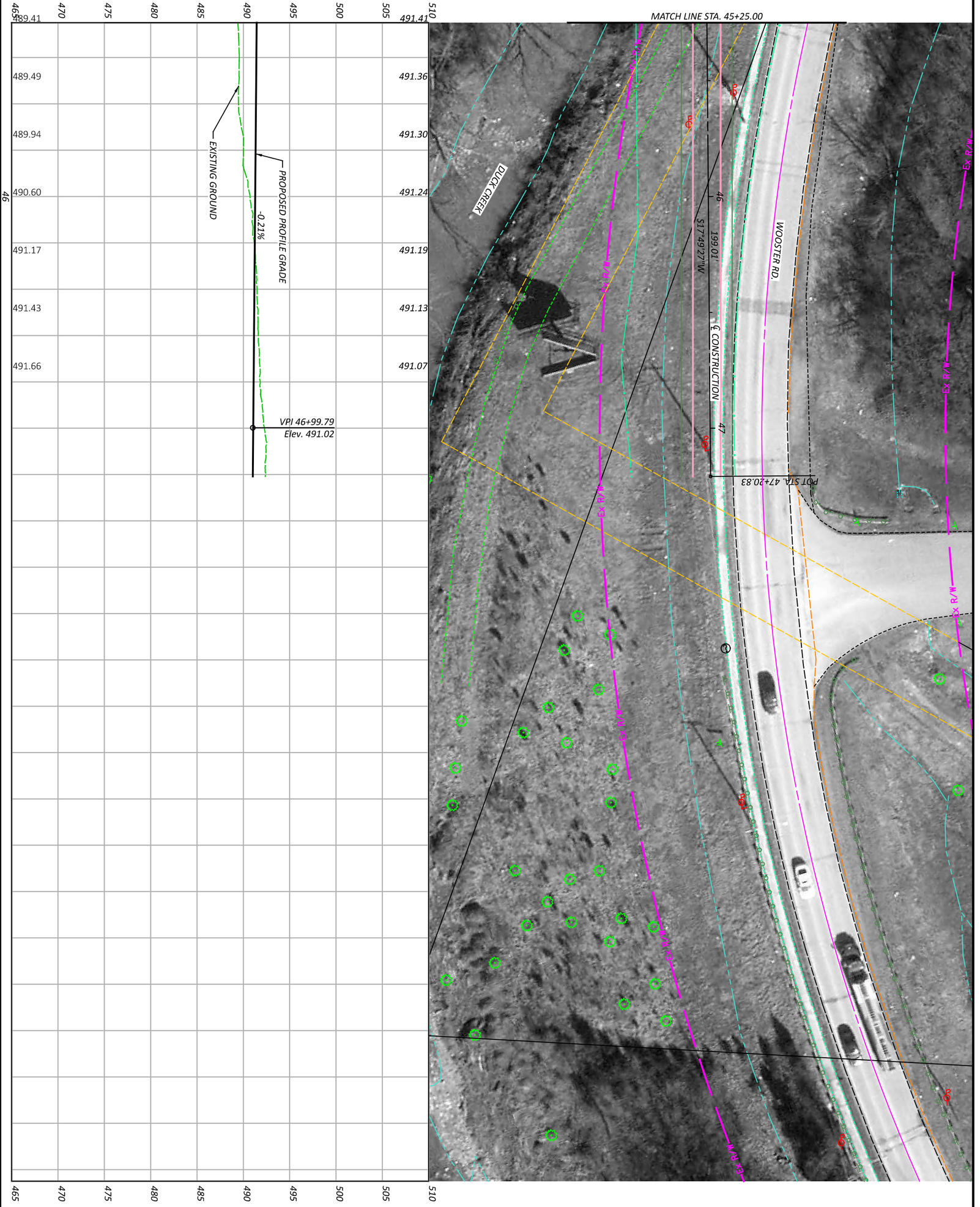
SEGMENT 3 - ALTERNATIVE C
STA. 40+25.00 TO STA. 45+25.00

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 02-02-24
PROJECT ID 113603
SHEET P.10 TOTAL 17

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-C - Plan 5 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:13 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-C.dgn



Stantec
Stantec Network Inc.
1500 Lake Shore Blvd.
Suite 300
Cincinnati, OH 45242
(513) 842-3400

DESIGN AGENCY

DESIGNER JGB

REVIEWER SNS 02-02-24

PROJECT ID 113603

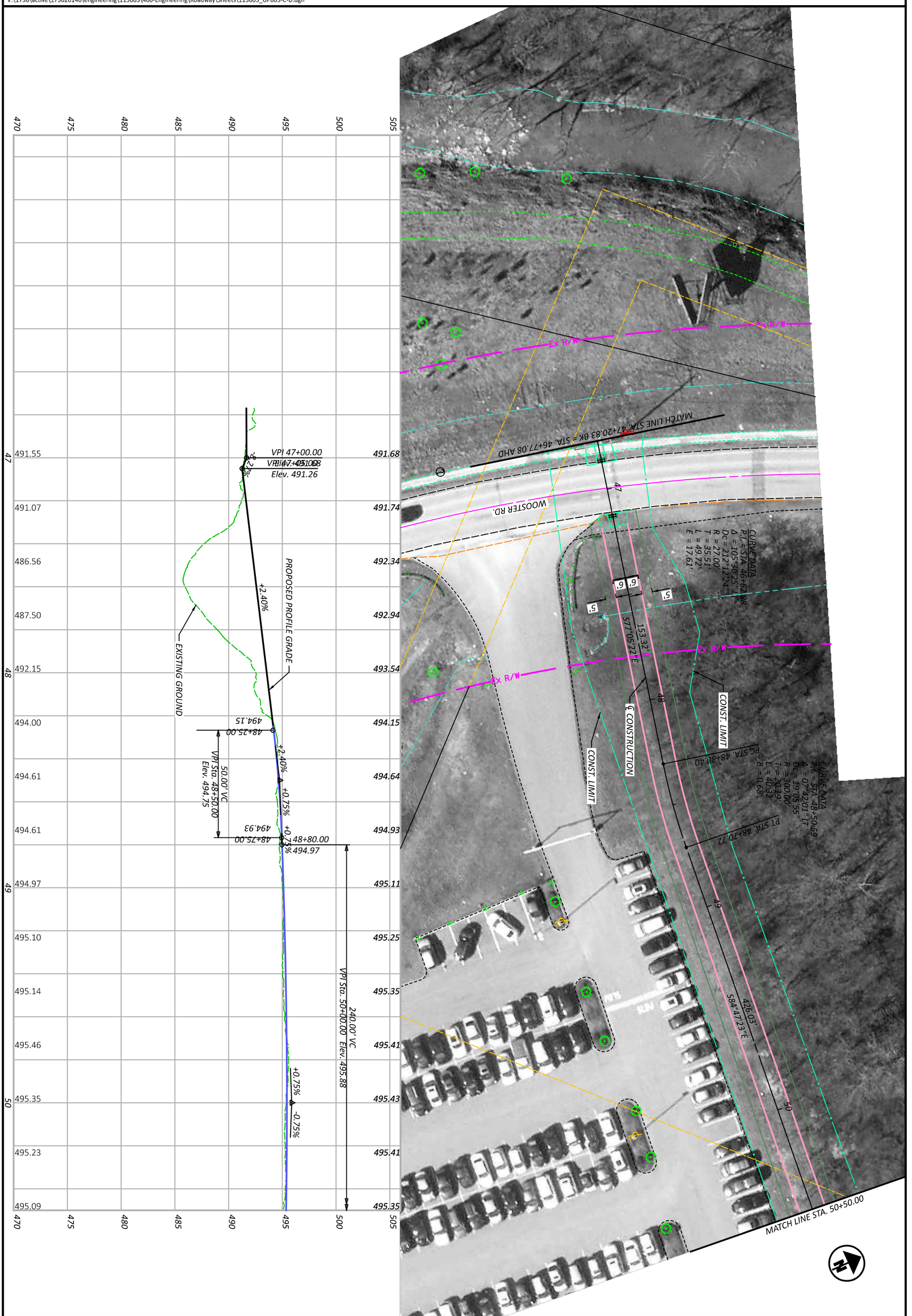
SHEET P.11 TOTAL 17

SEGMENT 3 - ALTERNATIVE C
STA. 45+25.00 TO STA. 47+20.83

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 5 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:21 PM USER: mmondlak
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SHEET P.12	TOTAL 17	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road Suite 200 Cincinnati, OH 45242 (513) 842-8200

SEGMENT 3 - ALTERNATIVE C
STA. 46+77.08 TO STA. 50+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE C
STA. 50+50.00 TO STA. 55+50.00

HAM-WASSON WAY TO OTTO ARMLEDER

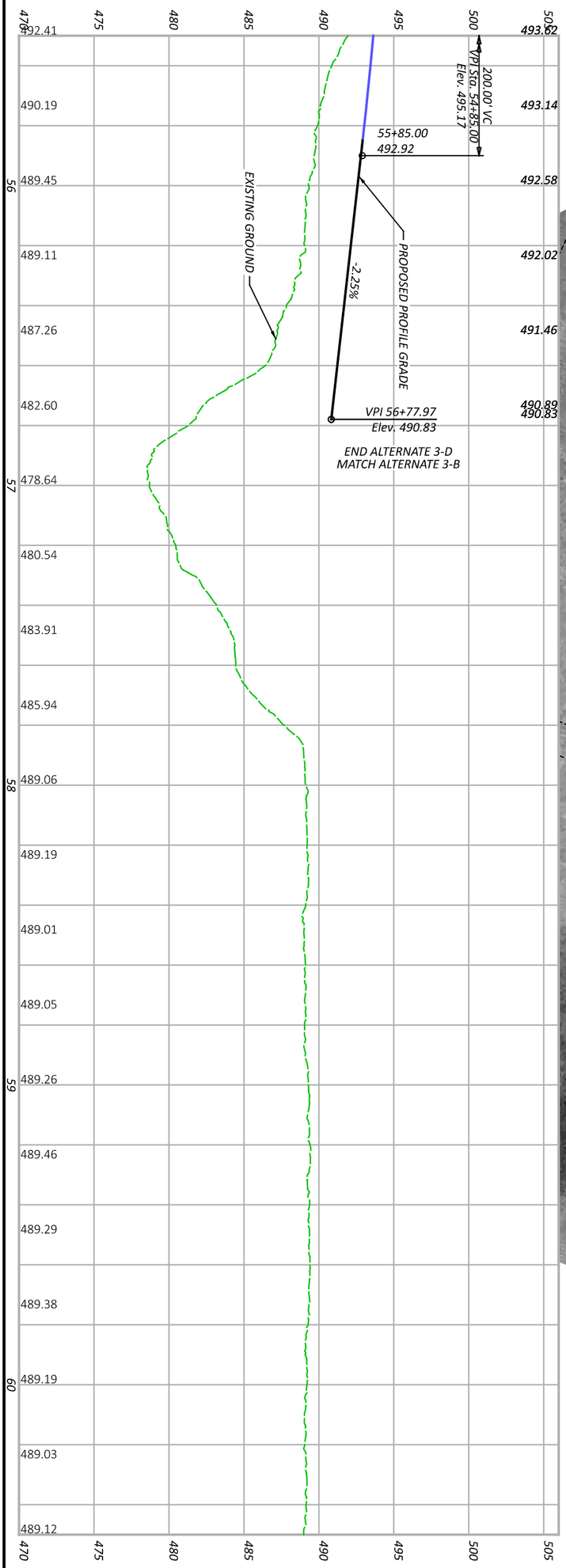
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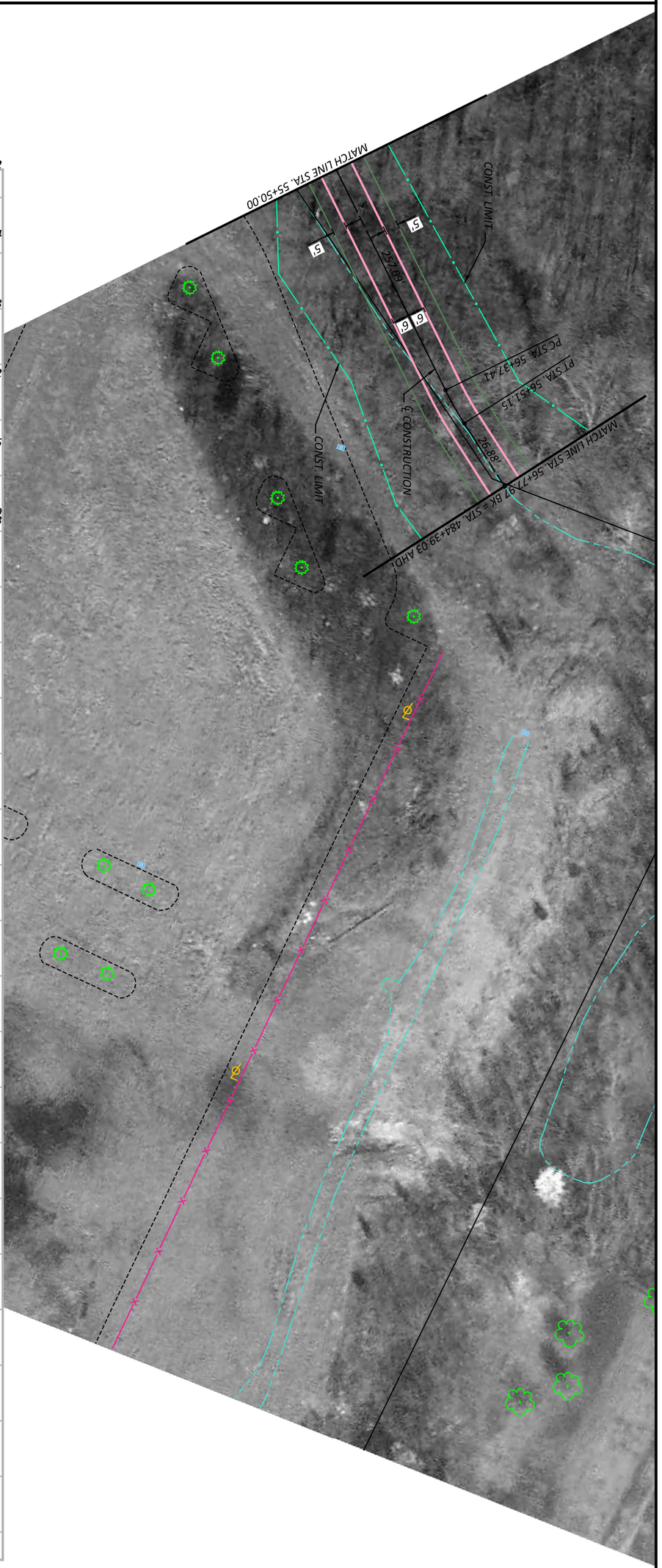
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.13 TOTAL 17

HAM-WASSON WAY TO OTTO ARMLEDER

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10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

DESIGN AGENCY

DESIGNER JGB

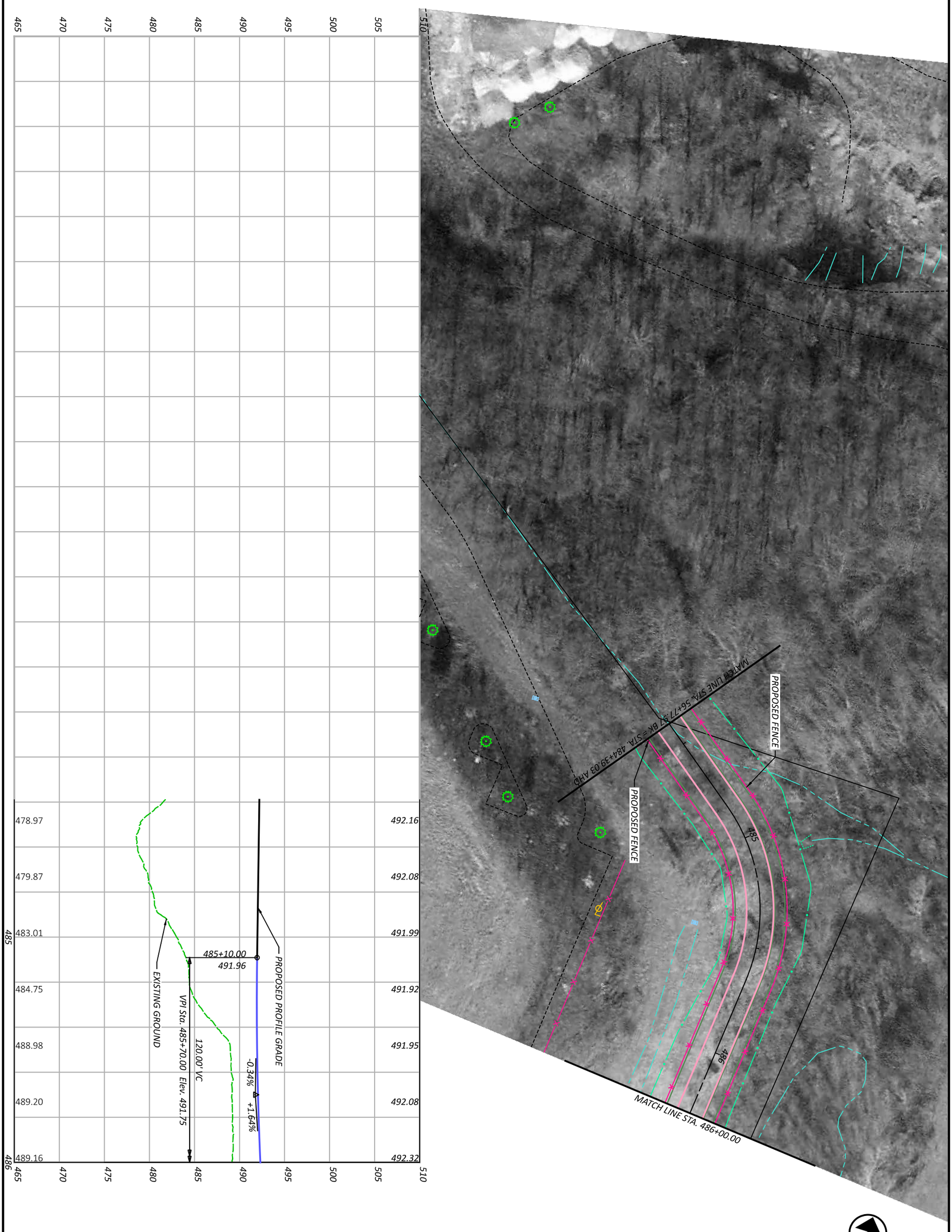
REVIEWER SNS 01-26-24

PROJECT ID 113603

SHEET P.14 TOTAL 17

SEGMENT 3 - ALTERNATIVE C
STA. 55+50.00 TO STA. 56+79.09

HORIZONTAL SCALE IN FEET
0 20
10 40



SHEET P.15	TOTAL 17	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10320 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

SEGMENT 3 - ALTERNATIVE C
STA. 484+39.03 TO STA. STA. 486+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 13 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:32 PM USER: mmondlak
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HORIZONTAL SCALE IN FEET
0 10 20 40

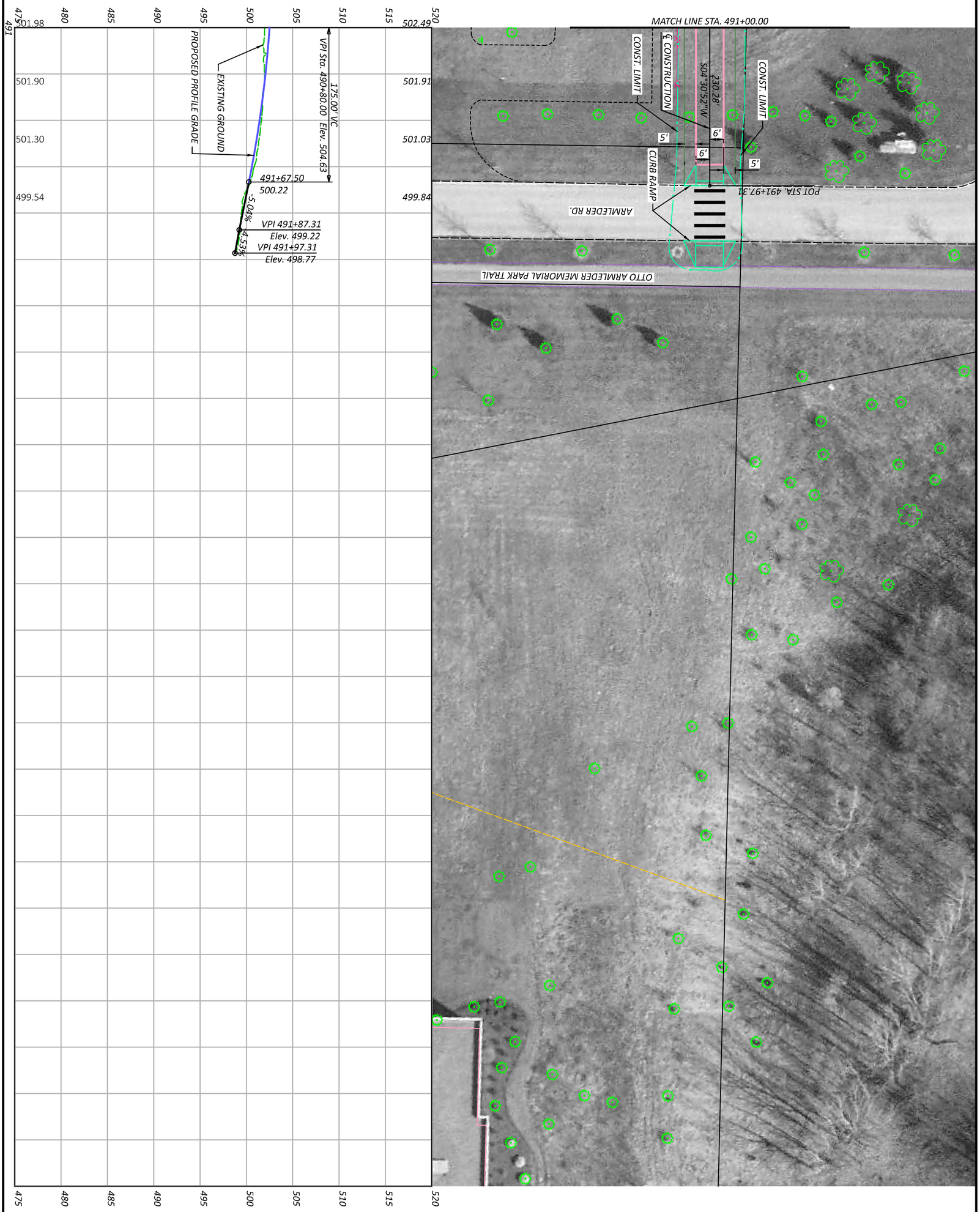
SEGMENT 3 - ALTERNATIVE C
STA. 486+00.00 TO STA. 491+00.00

DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.16 TOTAL 17

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 14 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 3/7/2024 TIME: 1:37:35 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE C
STA. 491+00.00 TO STA. 491+68.23

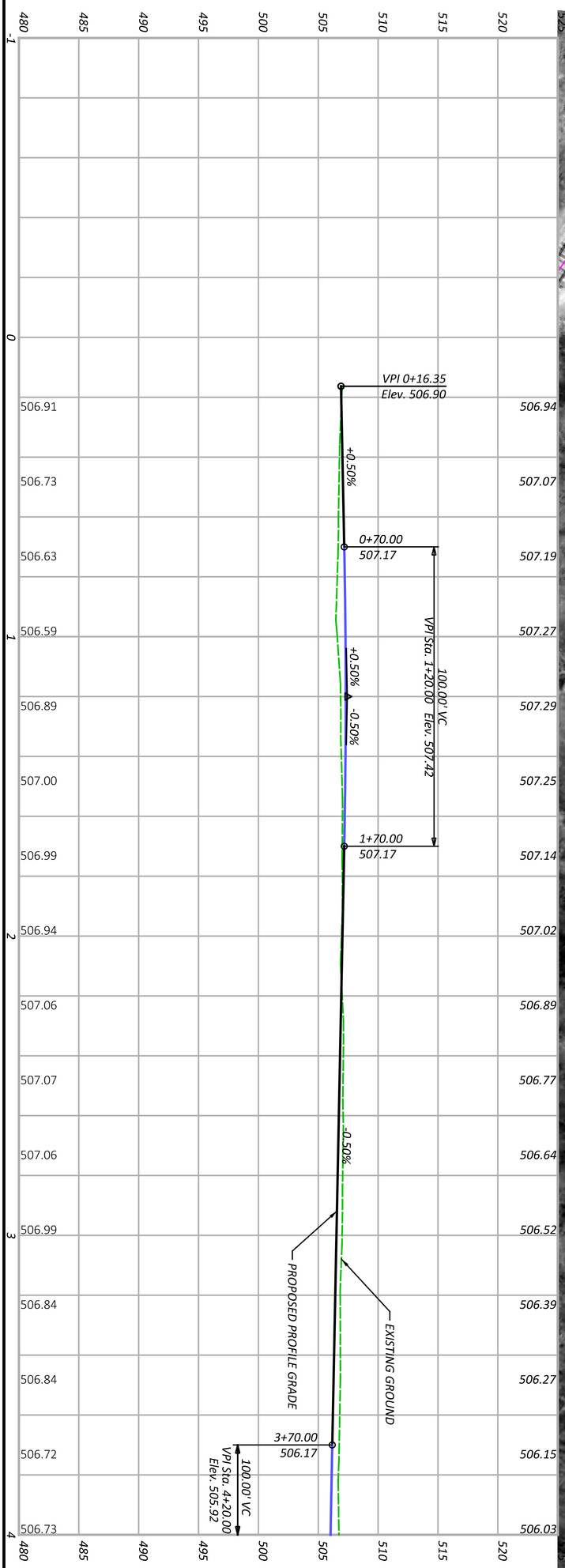
HORIZONTAL SCALE IN FEET
0 20
10 40

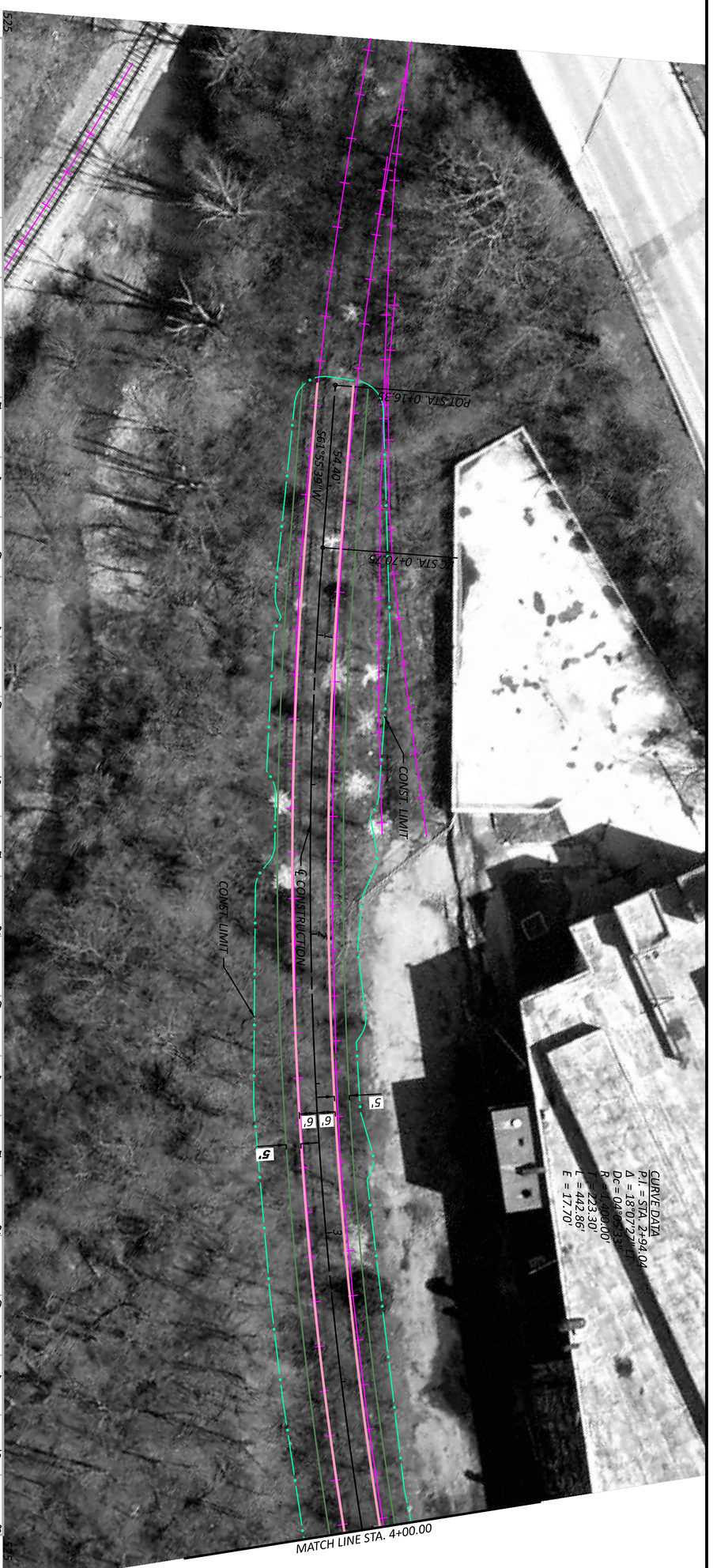
SHEET	TOTAL
P.17	17

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY: Stantec
10320 Alliance Road, Suite 300, Cincinnati, OH 45242, (513) 842-3400

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 7 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:52:01 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE D
STA. 00+06.35 TO STA. 4+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.1	16

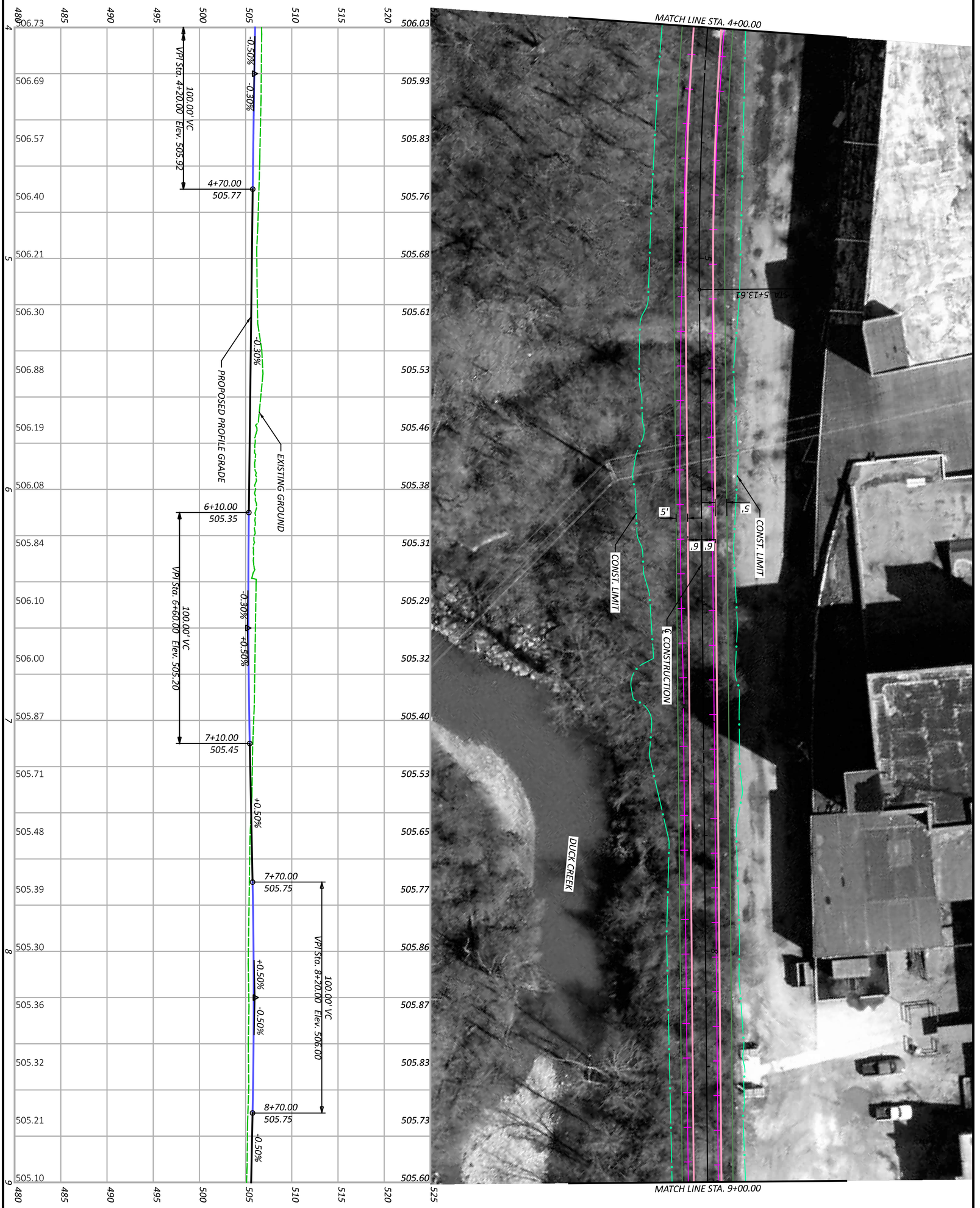
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road,
Suite 300
Cincinnati, OH 45242
(513) 842-3400

C-58

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 8 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:52:40 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE D
STA. 4+00.00 TO STA. 9+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

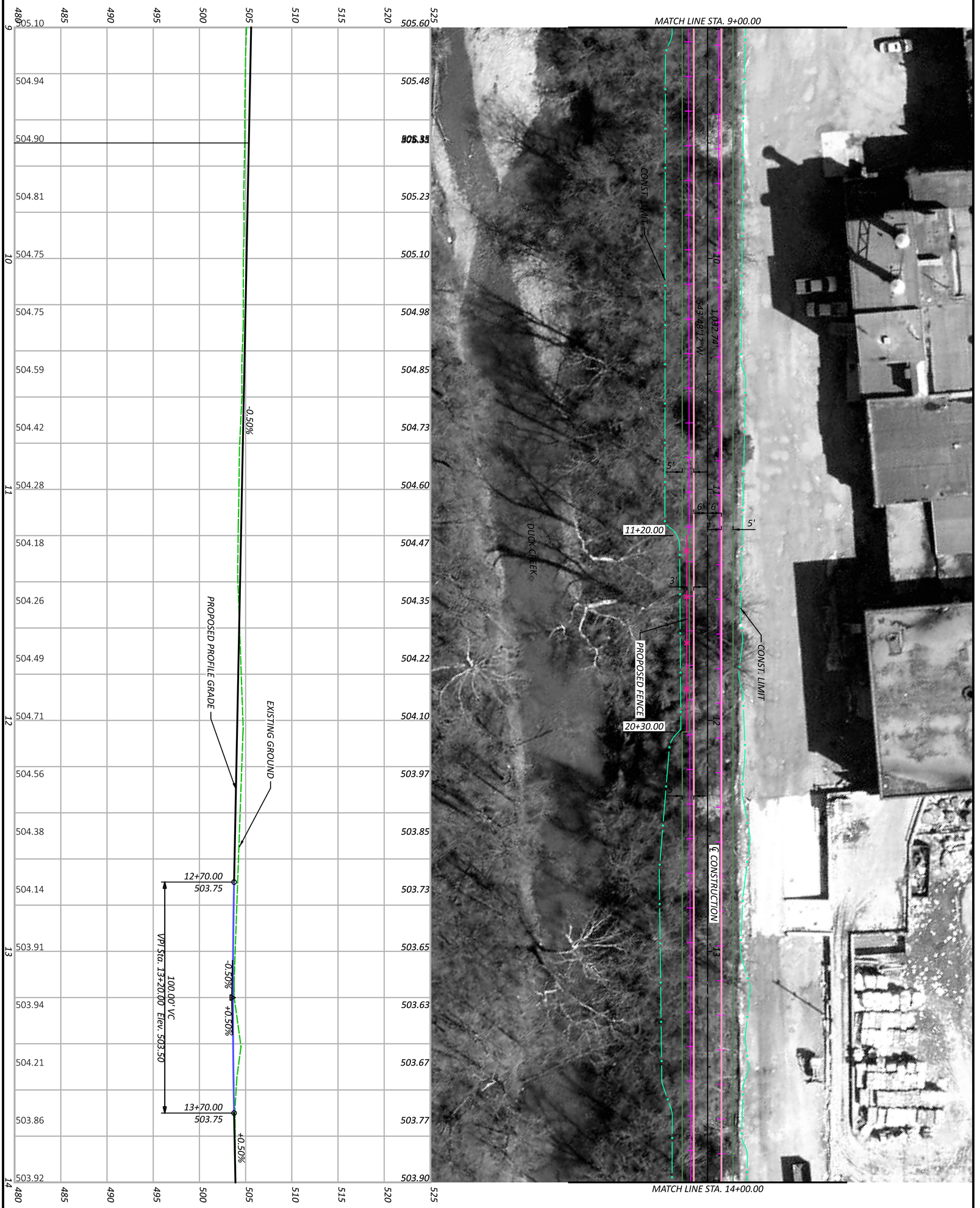
SHEET	TOTAL
P.2	16

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY

Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 9 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:52:45 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE D
STA. 9+00.00 TO STA. 14+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

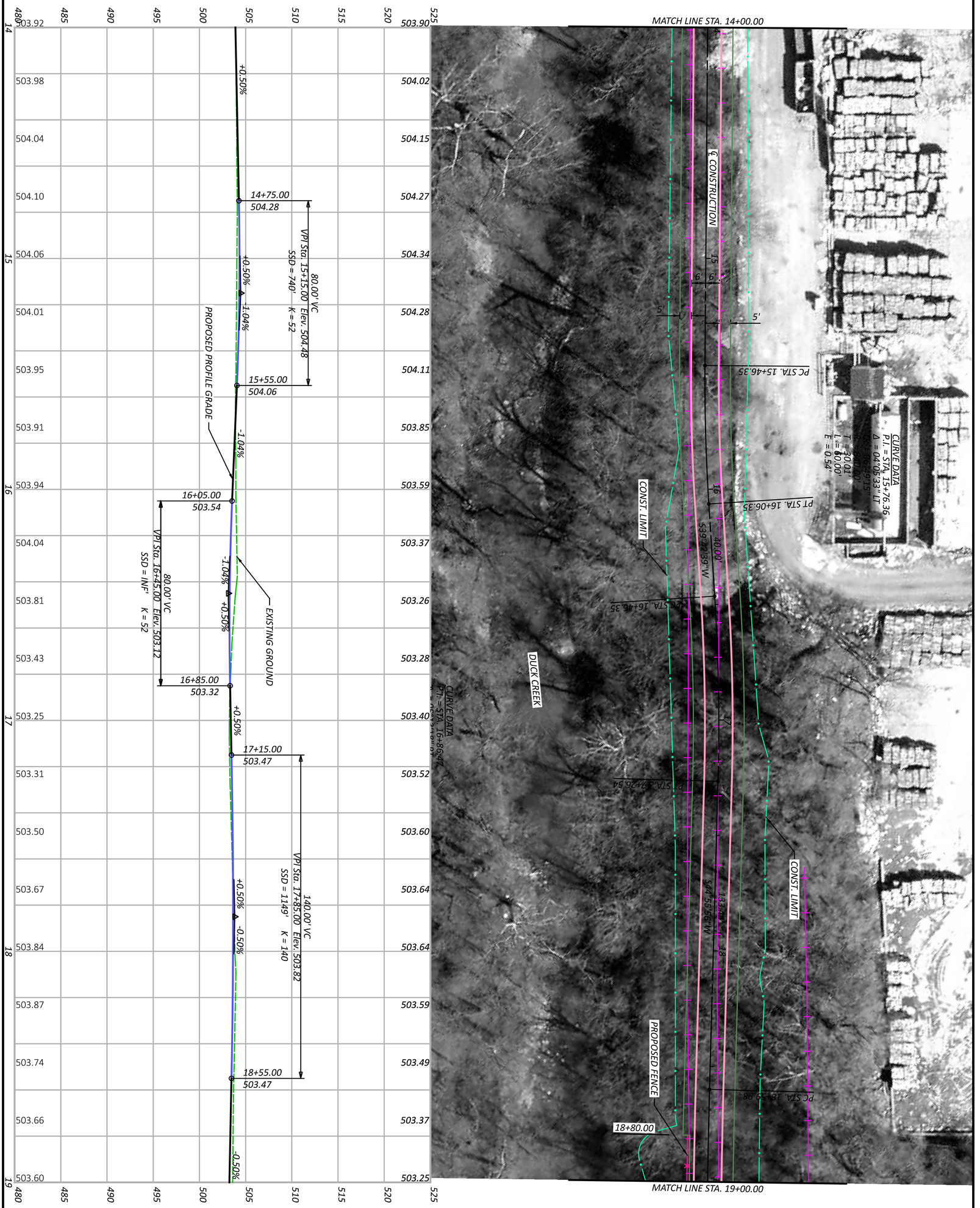
SHEET	P.3
TOTAL	16
PROJECT ID	113603
REVIEWER	SNS 01-26-24
DESIGNER	JGB

DESIGN AGENCY
Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

C-60

HAM-WASSON WAY TO OTTO ARMLEDER

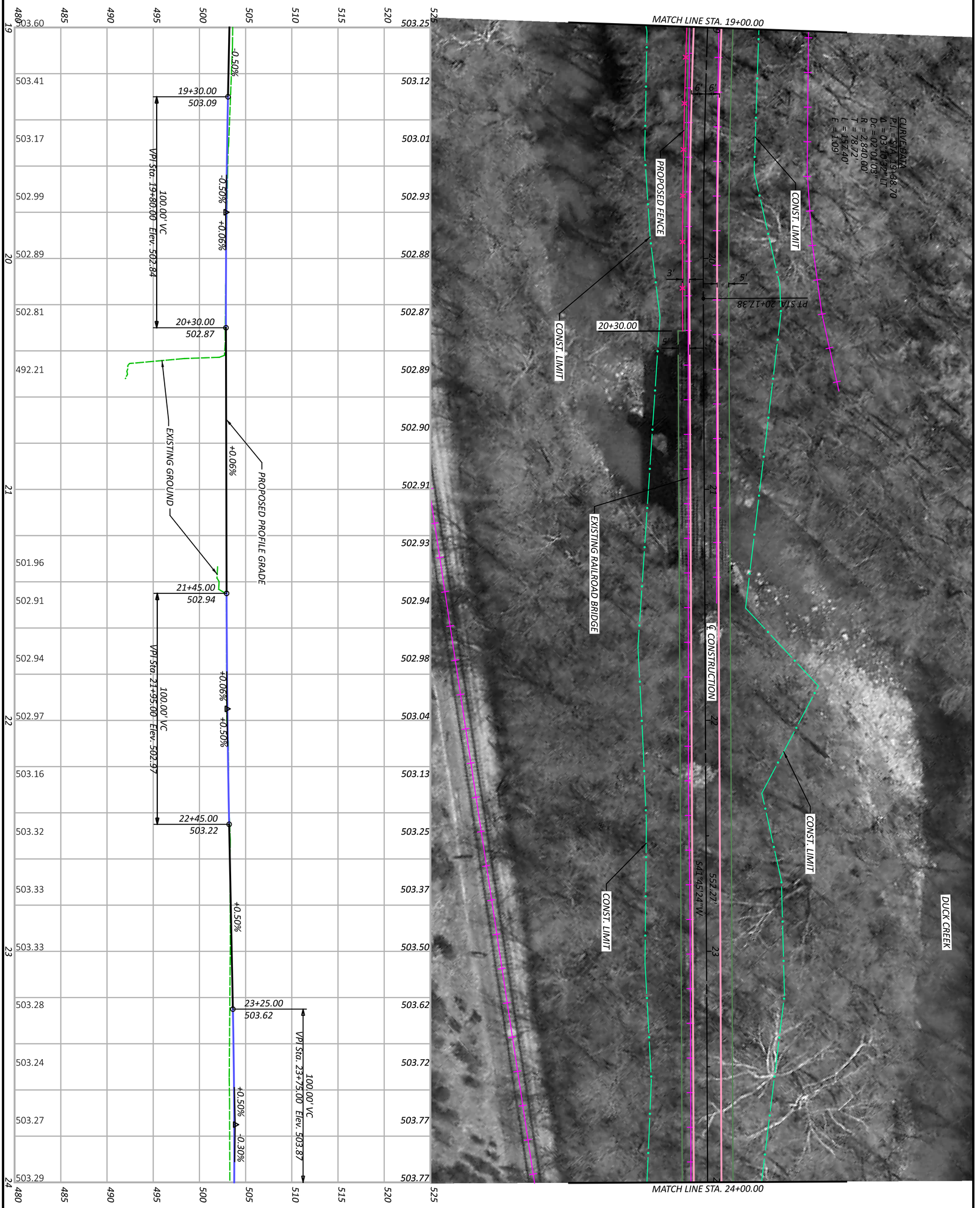
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| | | |

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 11 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:52:54 PM USER: mmondlak
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SHEET P.5	TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

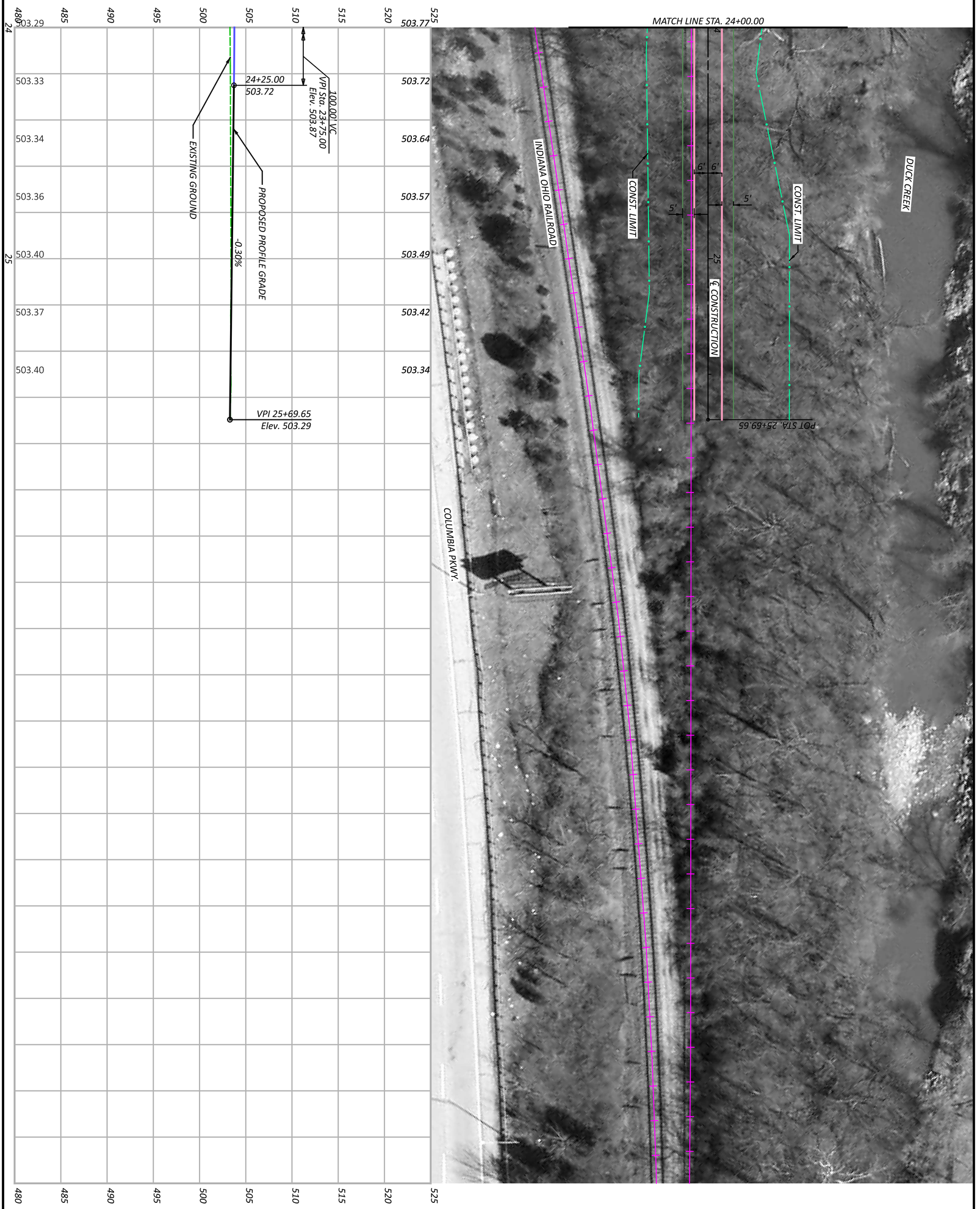
SEGMENT 3 - ALTERNATIVE D
STA. 19+00.00 TO STA. 24+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-62

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 12 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:52:58 PM USER: mmondlak
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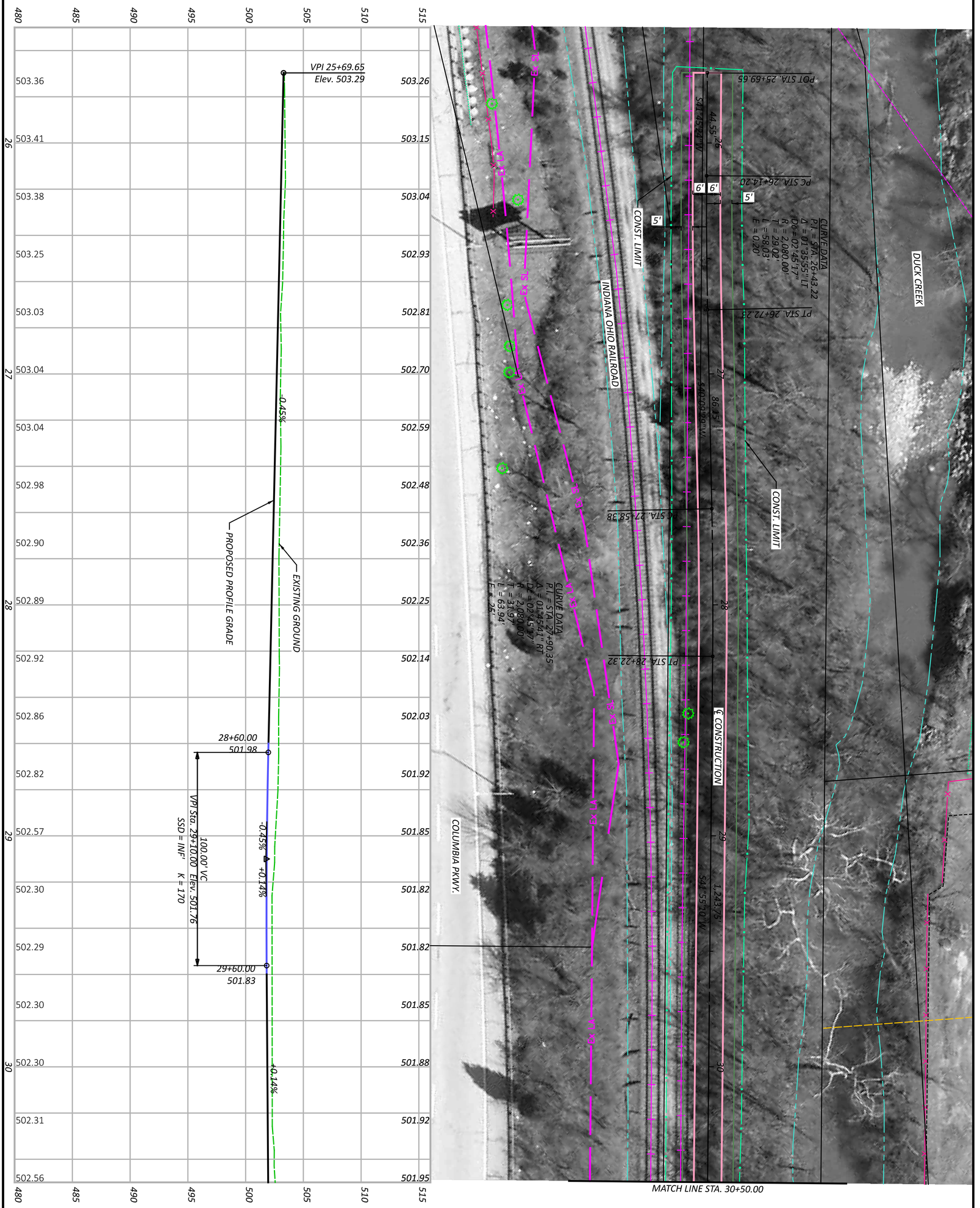
SHEET P.6	TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

SEGMENT 3 - ALTERNATIVE D
STA. 19+00.00 TO STA. 25+69.65

HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 1 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:17 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-D.dgn



SHEET P.7	TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

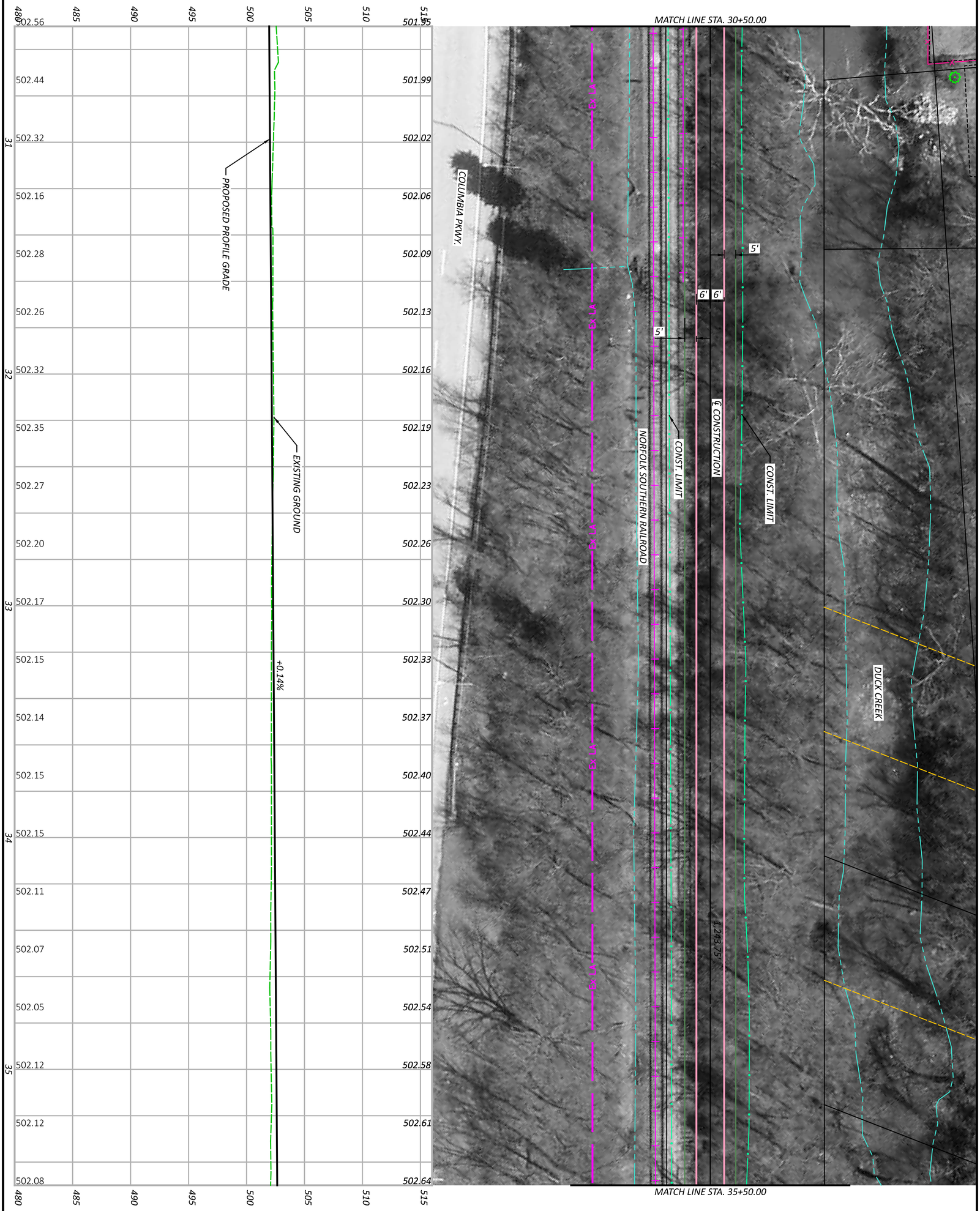
SEGMENT 3 - ALTERNATIVE D
STA. 25+69.65 TO STA. 30+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-64

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 2 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:21 PM USER: mmondlak
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SHEET P.8	TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

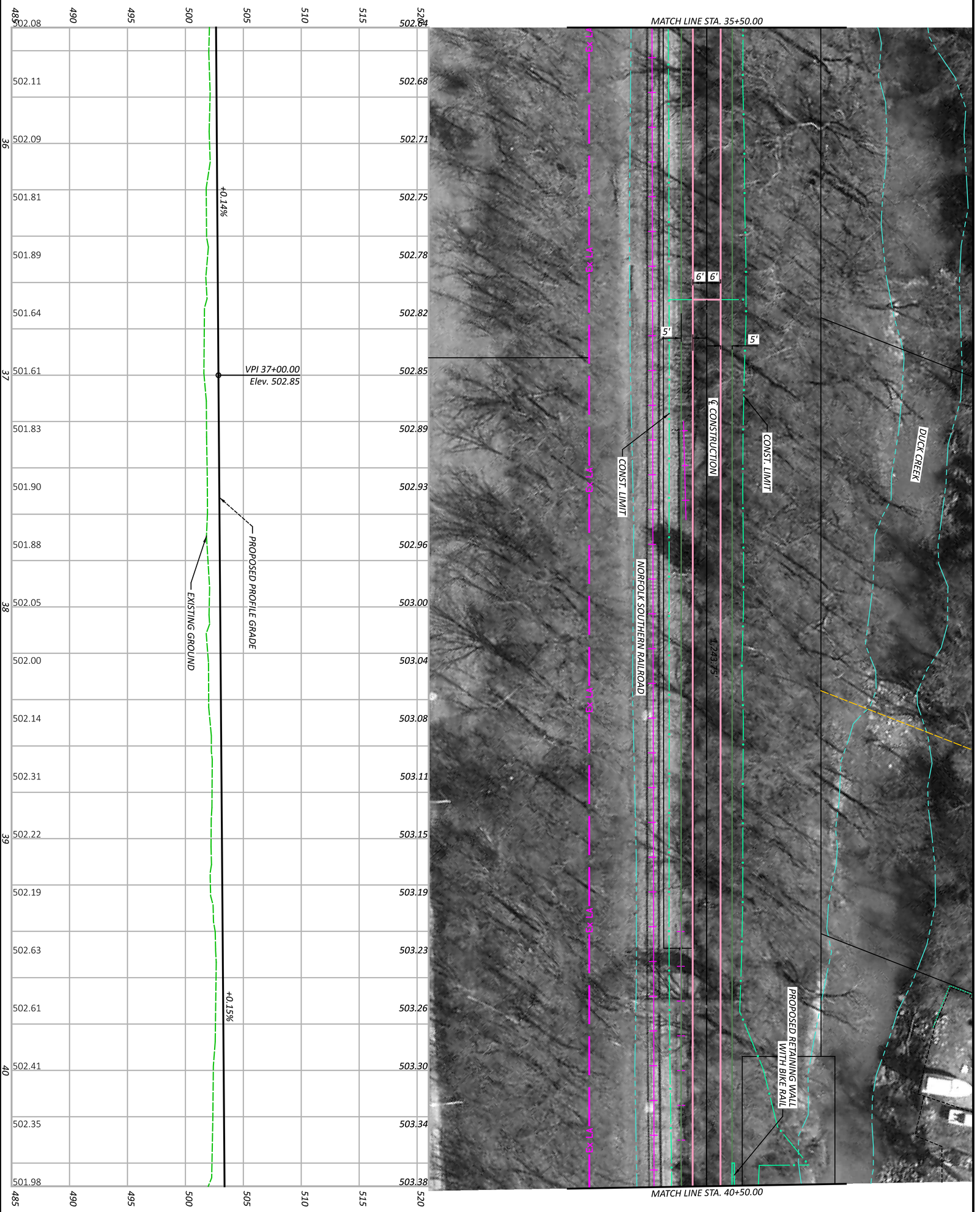
SEGMENT 3 - ALTERNATIVE D
STA. 30+50.00 TO STA. 35+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-65

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 3 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:26 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-D.dgn



SHEET	TOTAL
P.9	16

PROJECT ID: 113603

REVIEWER: SNS 01-26-24

DESIGNER: JGB

DESIGN AGENCY

Stantec

10200 Alliance Road, Suite 200
Cincinnati, OH 45242
(513) 842-8200

SEGMENT 3 - ALTERNATIVE D
STA. 35+50.00 TO STA. 40+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-66

CURVE DATA
P.I. = STA. 40+98.44
Δ = 07°24'23" LT
Dc = 11°27'33"
R = 500.00'
T = 32.36'
L = 64.63'
E = 1.05'

CURVE DATA
P.I. = STA. 42+36.17
Δ = 23°26'14" LT
Dc = 77°25'36"
R = 74.00'
T = 15.35'
L = 30.27'
E = 1.58'

WOOSTER RD.

DUCK CREEK

MATCH LINE STA. 40+50.00

MATCH LINE STA. 45+50.00

℄ CONSTRUCTION

PROPOSED RETAINING WALL WITH BIKE RAIL

PC STA. 40+66.01

PT STA. 41+30.71

PC STA. 42+20.82

PT STA. 42+51.09

CONST. LIMIT

CONST. LIMIT

90.11'
S34°30'47"W

1,243.75'
S41°55'10"W

307.37'
S11°04'34"W

NORFOLK SOUTHERN RAILROAD

Ex LA

Ex CP

Ex G

Ex W

Ex T

Ex OE

41 42 43 44 45

5' 6' 6' 5' 6' 6'

HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE D
STA. 40+50.00 TO STA. 45+50.00

HAM-WASSON WAY TO OTTO ARMLEDER

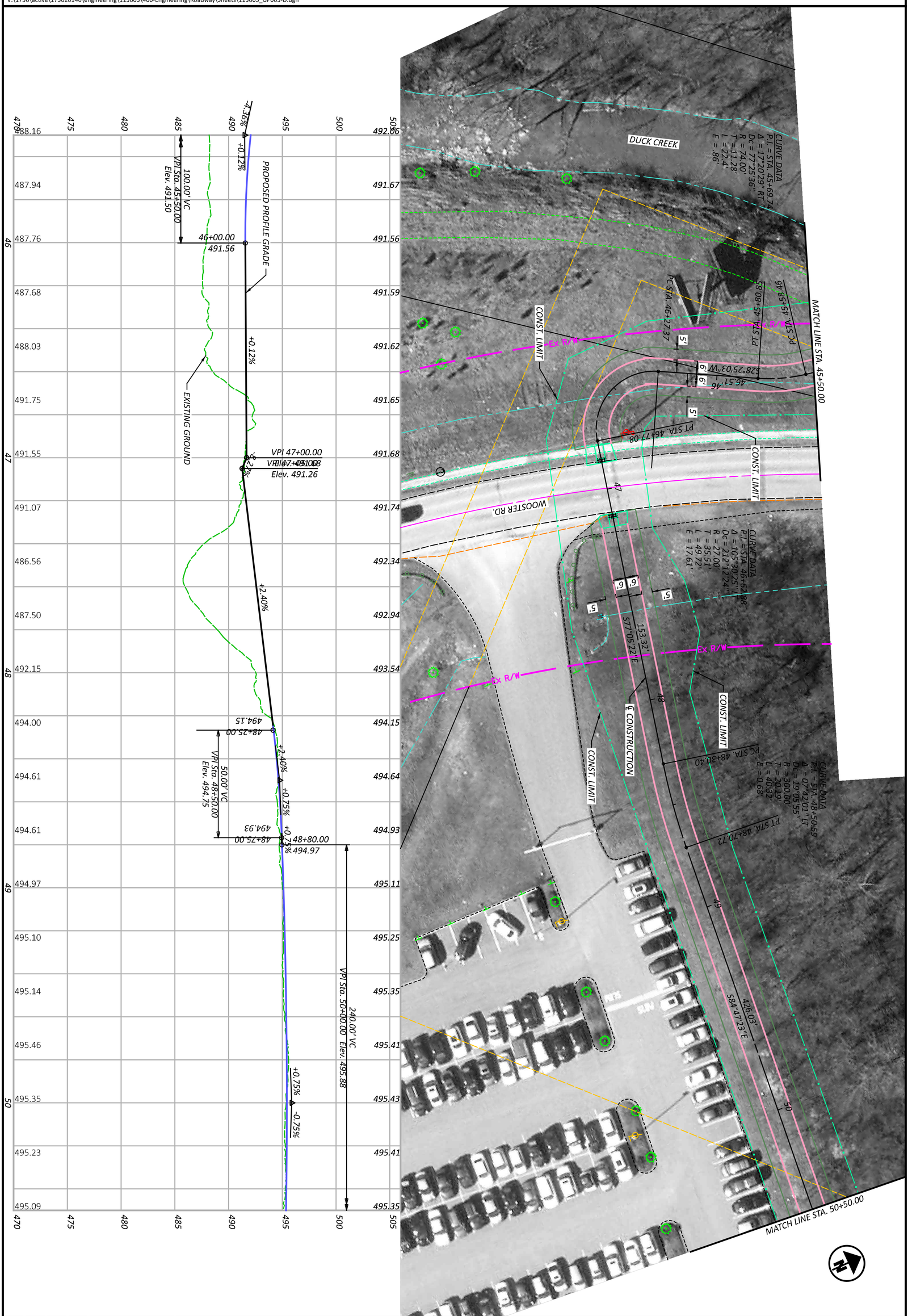
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DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.10 TOTAL 16

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 5 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:35 PM USER: mmondlak
V:\1736\active\173620146\engineering\113603\400-Engineering\Roadway\Sheets\113603_GP003-D.dgn



SEGMENT 3 - ALTERNATIVE D
STA. 45+50.00 TO STA. 50+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.11	16

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY: Stantec
10200 Alliance Road, Suite 200, Cincinnati, OH 45242 (513) 842-8200

C-69

HORIZONTAL SCALE IN FEET
0 10 20 40

SEGMENT 3 - ALTERNATIVE D
STA. 50+50.00 TO STA. 55+50.00

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 6 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:41 PM USER: mmondlak
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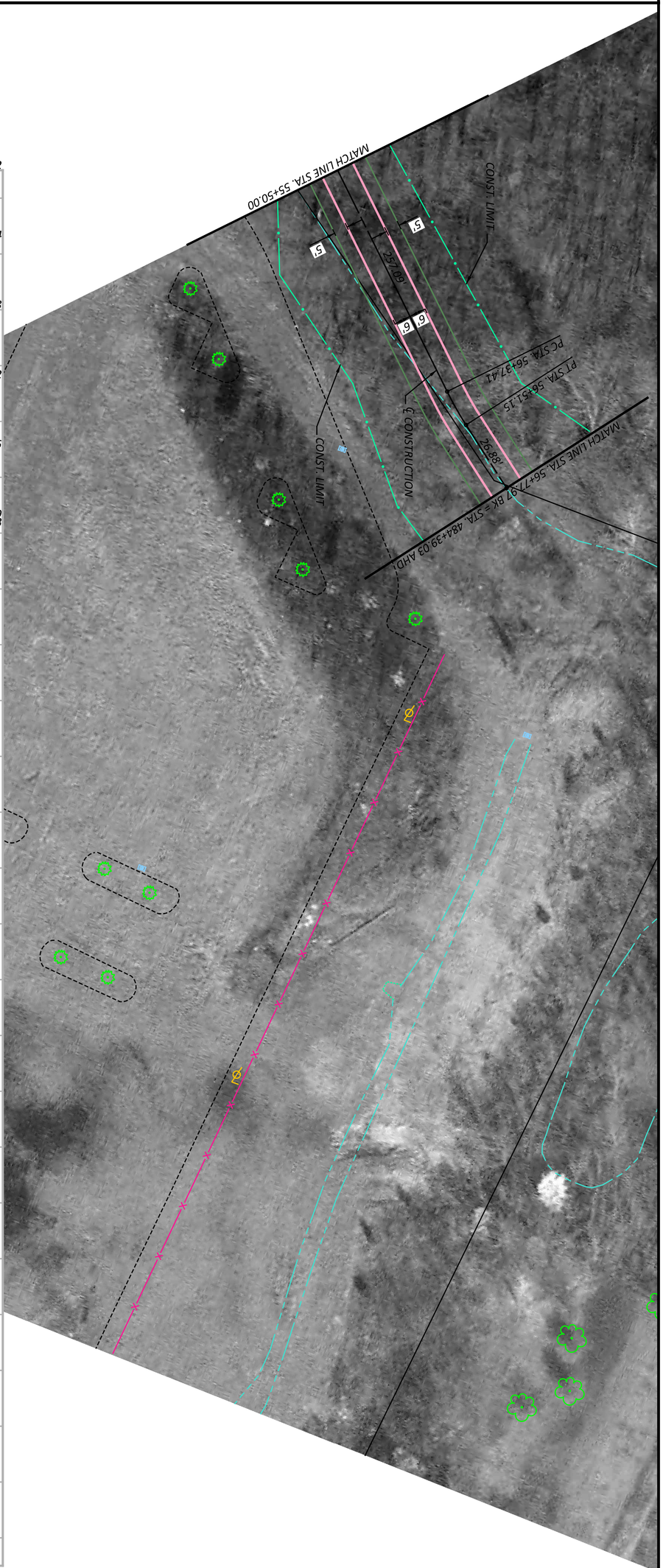
DESIGN AGENCY
Stantec
10200 Alliance Road, Suite 300
Cincinnati, OH 45242
(513) 842-8200

DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.12 TOTAL 16

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3D - Plan 7 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:53:46 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE D
STA. 55+50.00 TO STA. 56+79.09

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.13	16

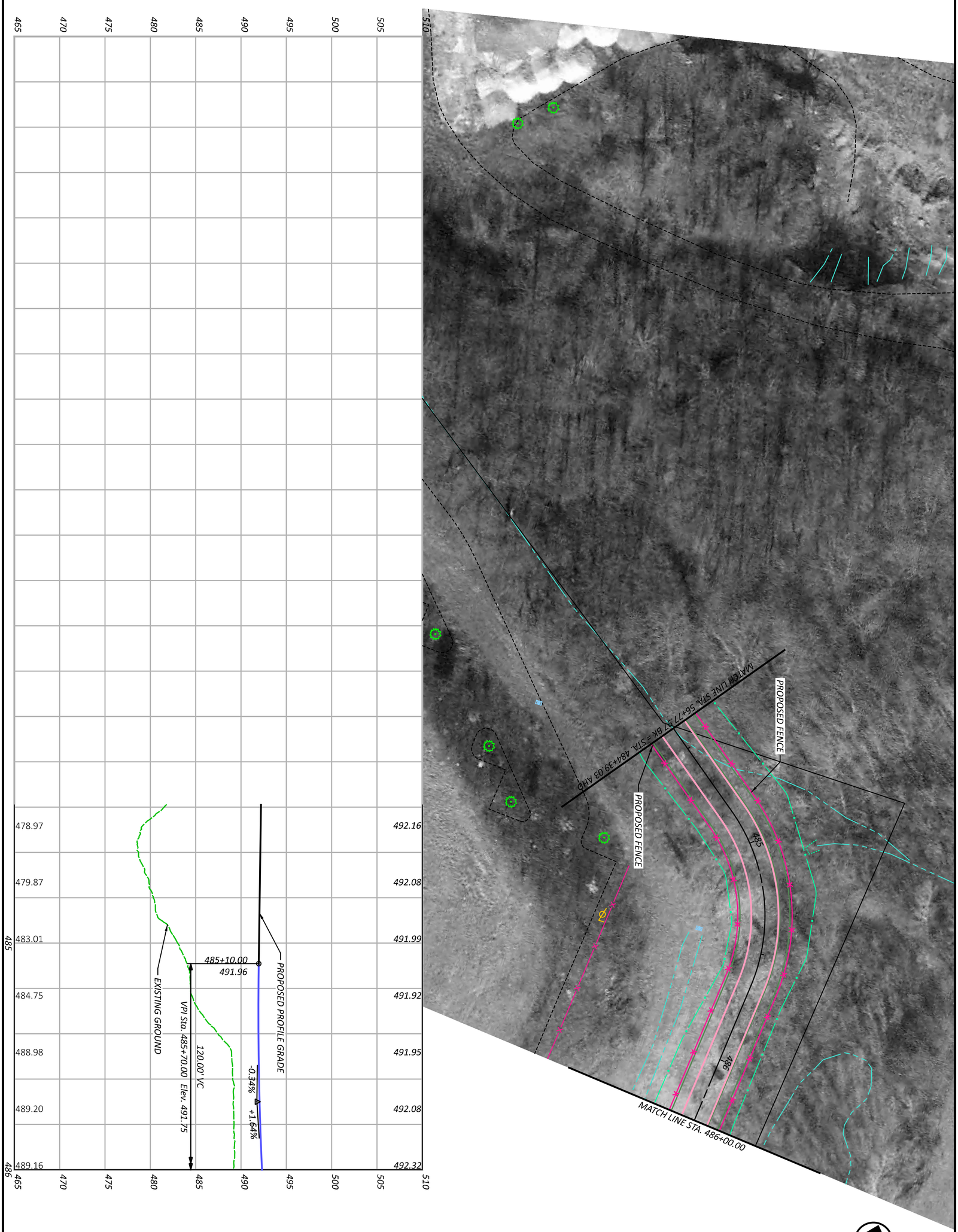
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
Stantec
10200 Alliance Road
Suite 200
Cincinnati, OH 45242
(513) 842-8200

C-70

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 12 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:54:02 PM USER: mmondlak
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SHEET P.14 TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400	DESIGN AGENCY

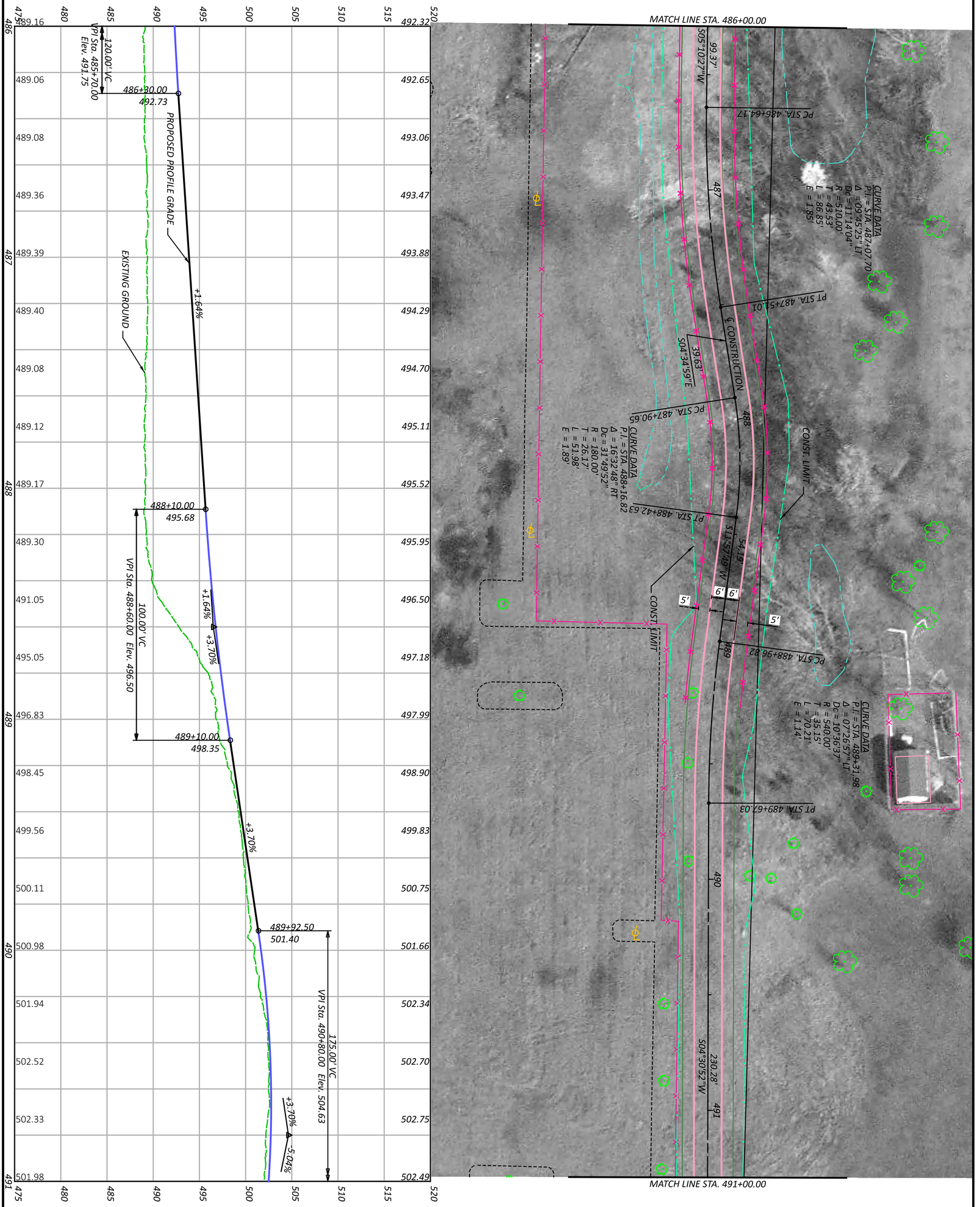
SEGMENT 3 - ALTERNATIVE D
STA. 484+39.03 TO STA. STA. 486+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-71

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 13 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:54:06 PM USER: mmondlak
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SHEET P.15	TOTAL 16	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 300 Cincinnati, OH 45242 (513) 842-3400

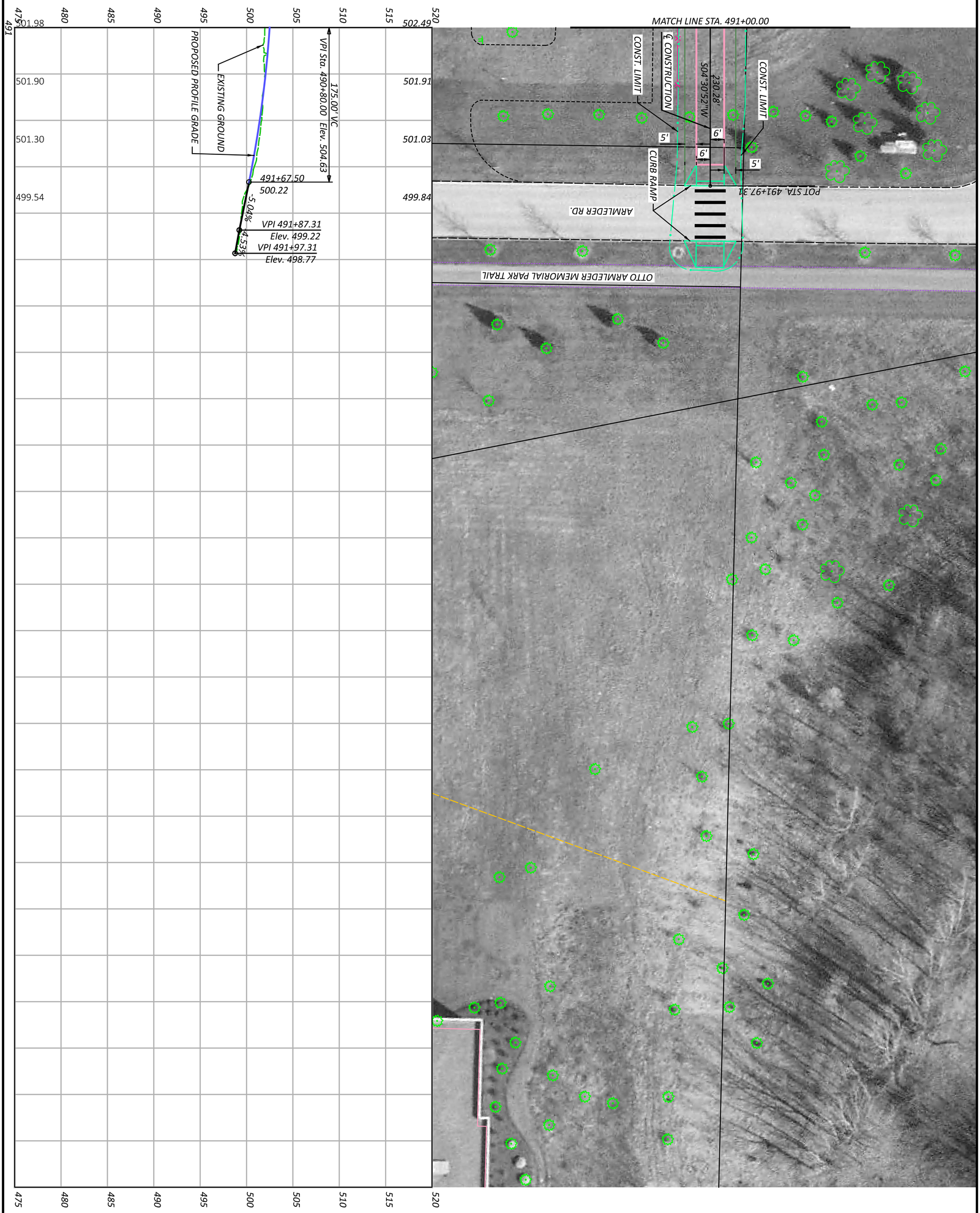
SEGMENT 3 - ALTERNATIVE D
STA. 486+00.00 TO STA. 491+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-72

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-B - Plan 14 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 1:54:10 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE D
STA. 491+00.00 TO STA. 491+68.23

HORIZONTAL SCALE IN FEET
0 20
10 40

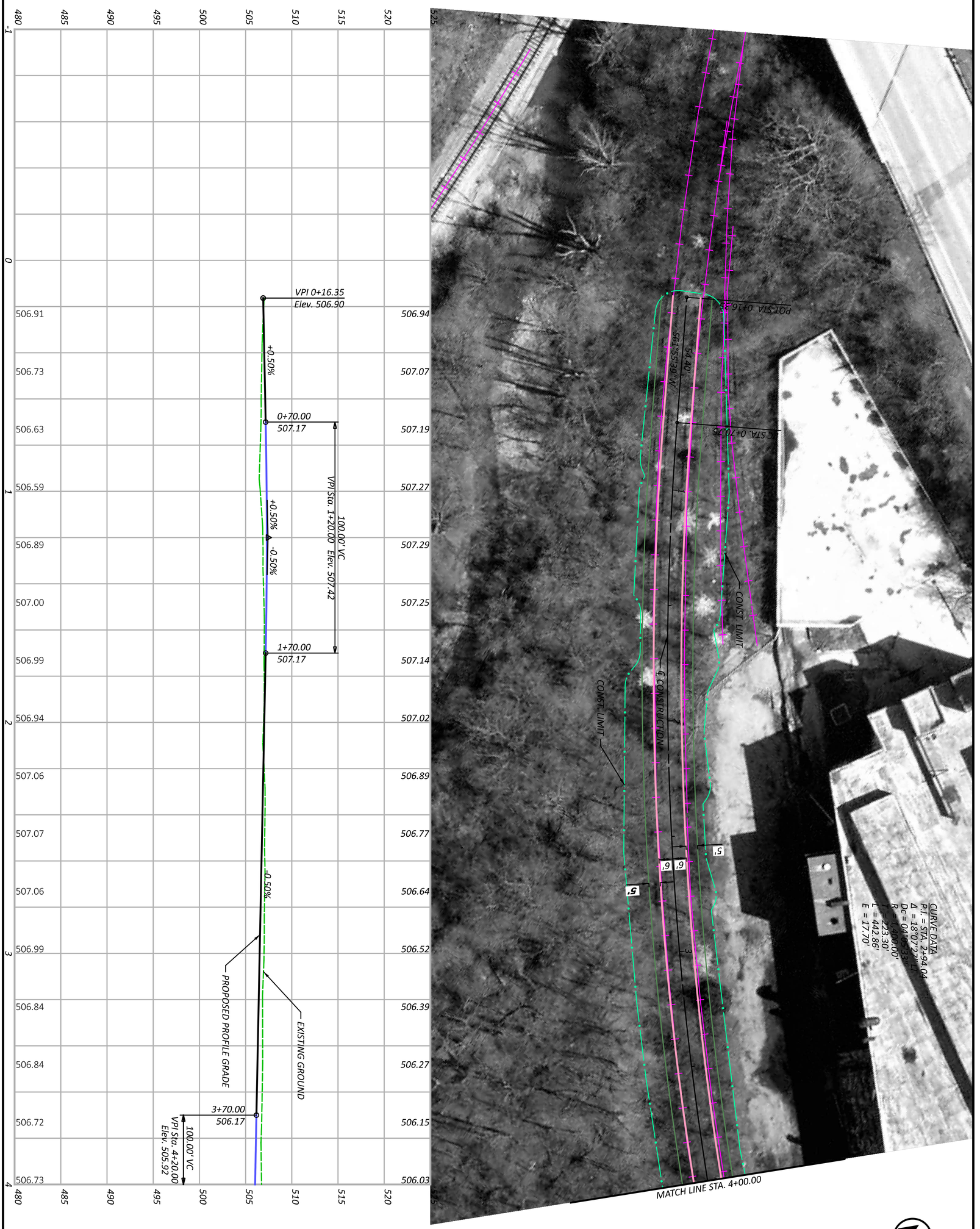
SHEET	TOTAL
P.16	16

PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB
DESIGN AGENCY: Stantec
10200 Alliance Road, Suite 300, Cincinnati, OH 45242, (513) 842-3400

C-73

HAM-WASSON WAY TO OTTO ARMLEDER

MODEL: CLP_3-AB - Plan 7 [Sheet] PAPERSIZE: 34x22 (in.) DATE: 3/7/2024 TIME: 2:25:05 PM USER: mmondlak
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SEGMENT 3 - ALTERNATIVE E
STA. 00+06.35 TO STA. 4+00.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.1	16

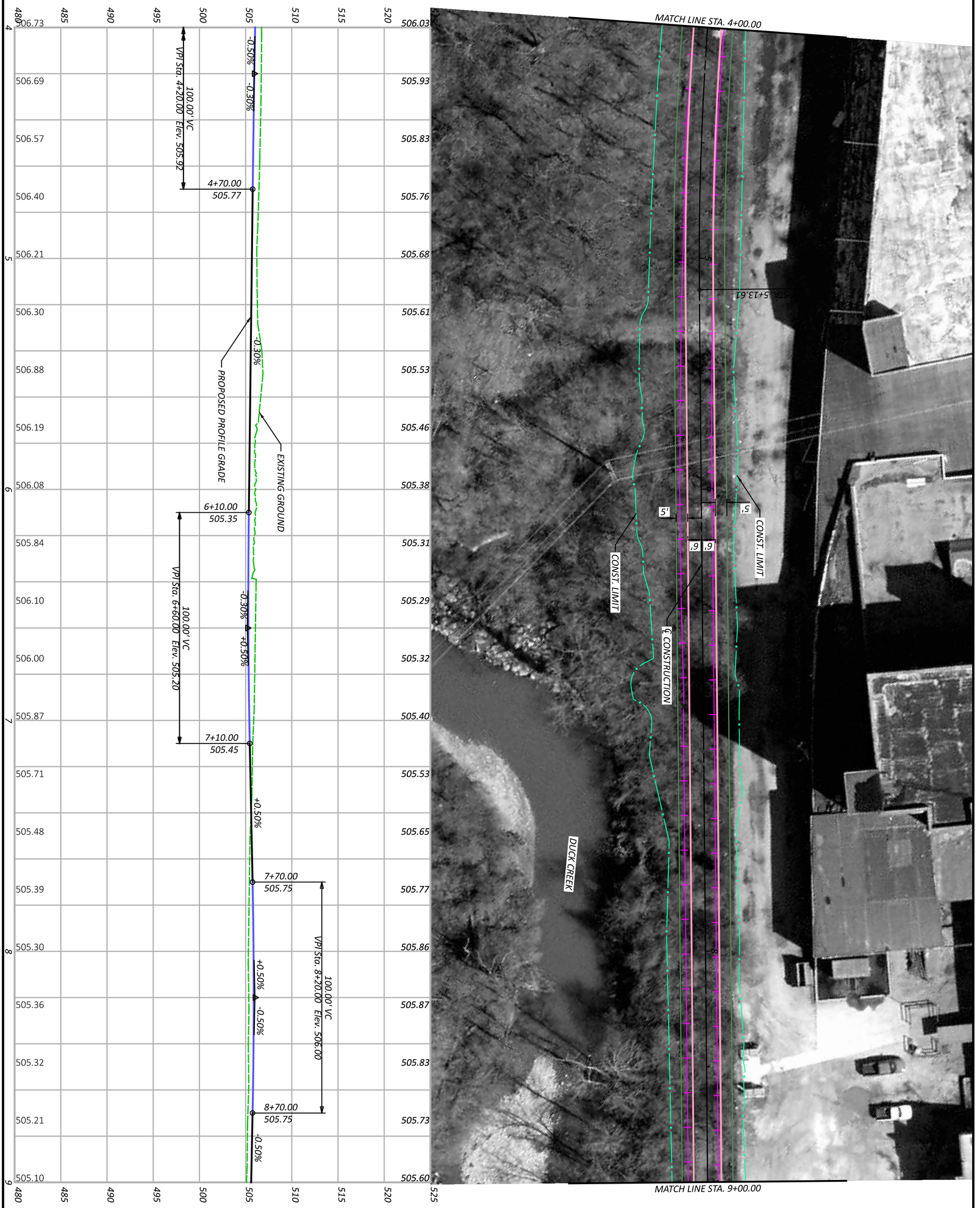
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

DESIGN AGENCY
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10200 Alliance Road,
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(513) 842-3400

C-74

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DESIGNER	REVIEWER	PROJECT ID	SHEET	TOTAL
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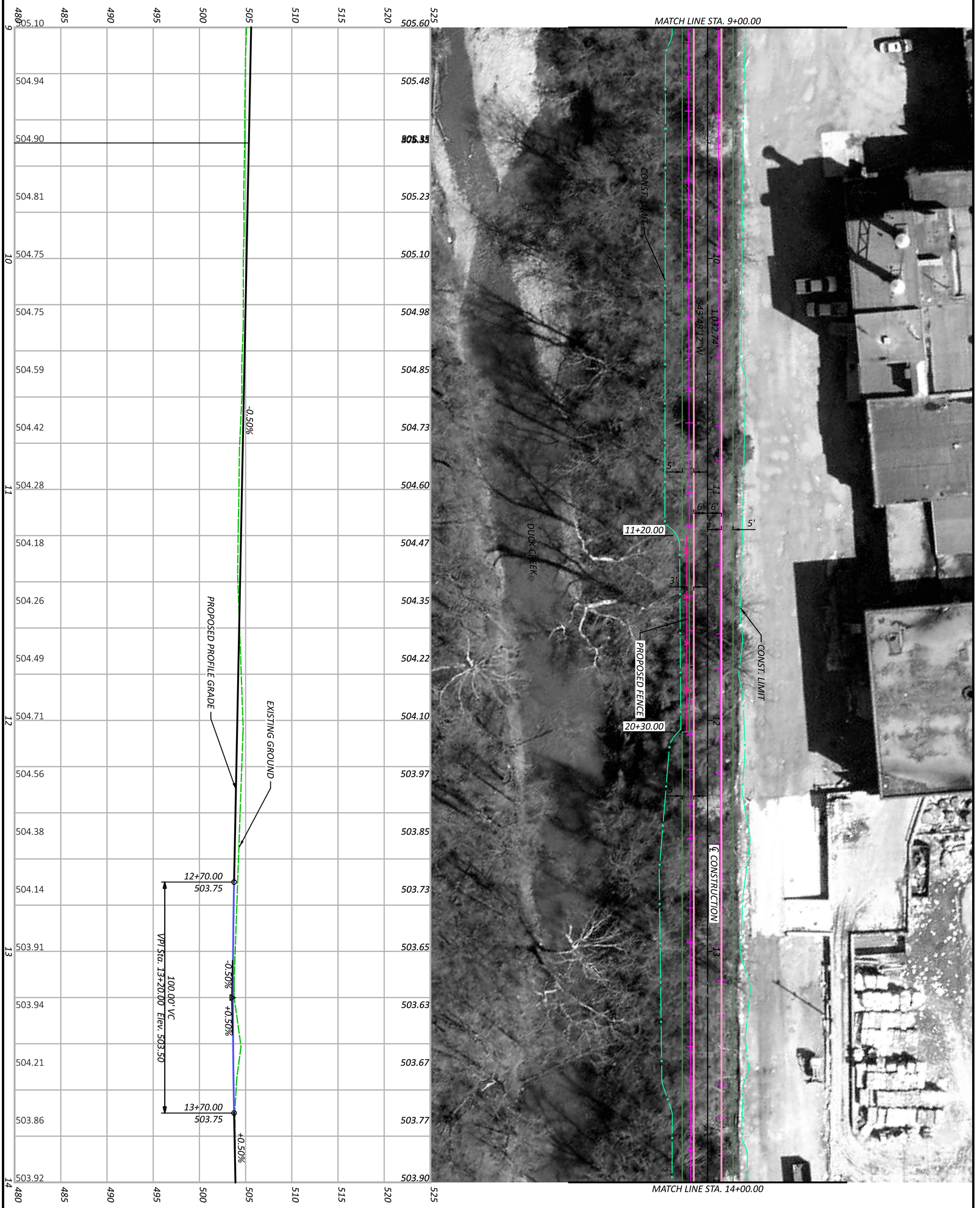
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(513) 842-8200

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SHEET	TOTAL
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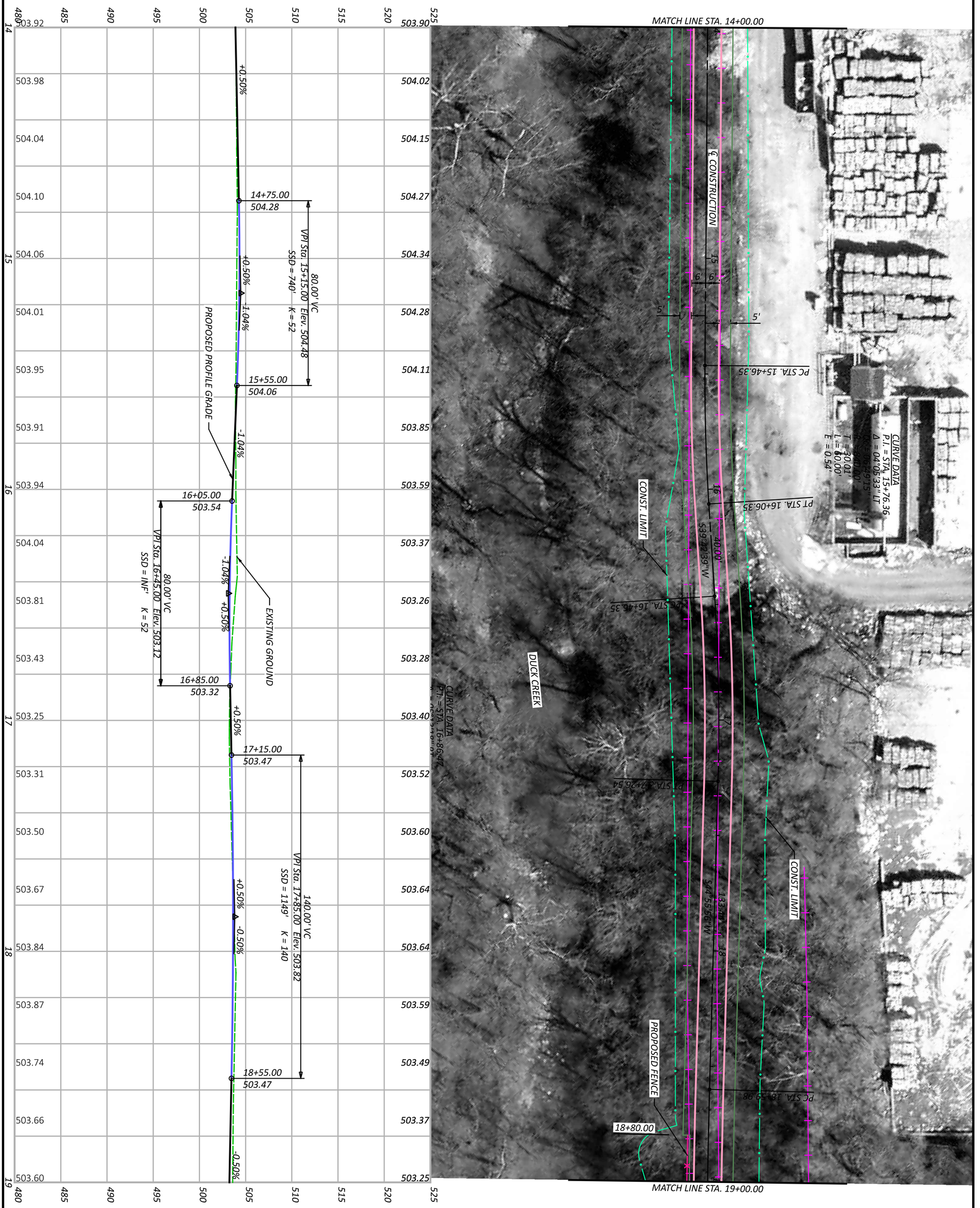
PROJECT ID: 113603
REVIEWER: SNS 01-26-24
DESIGNER: JGB

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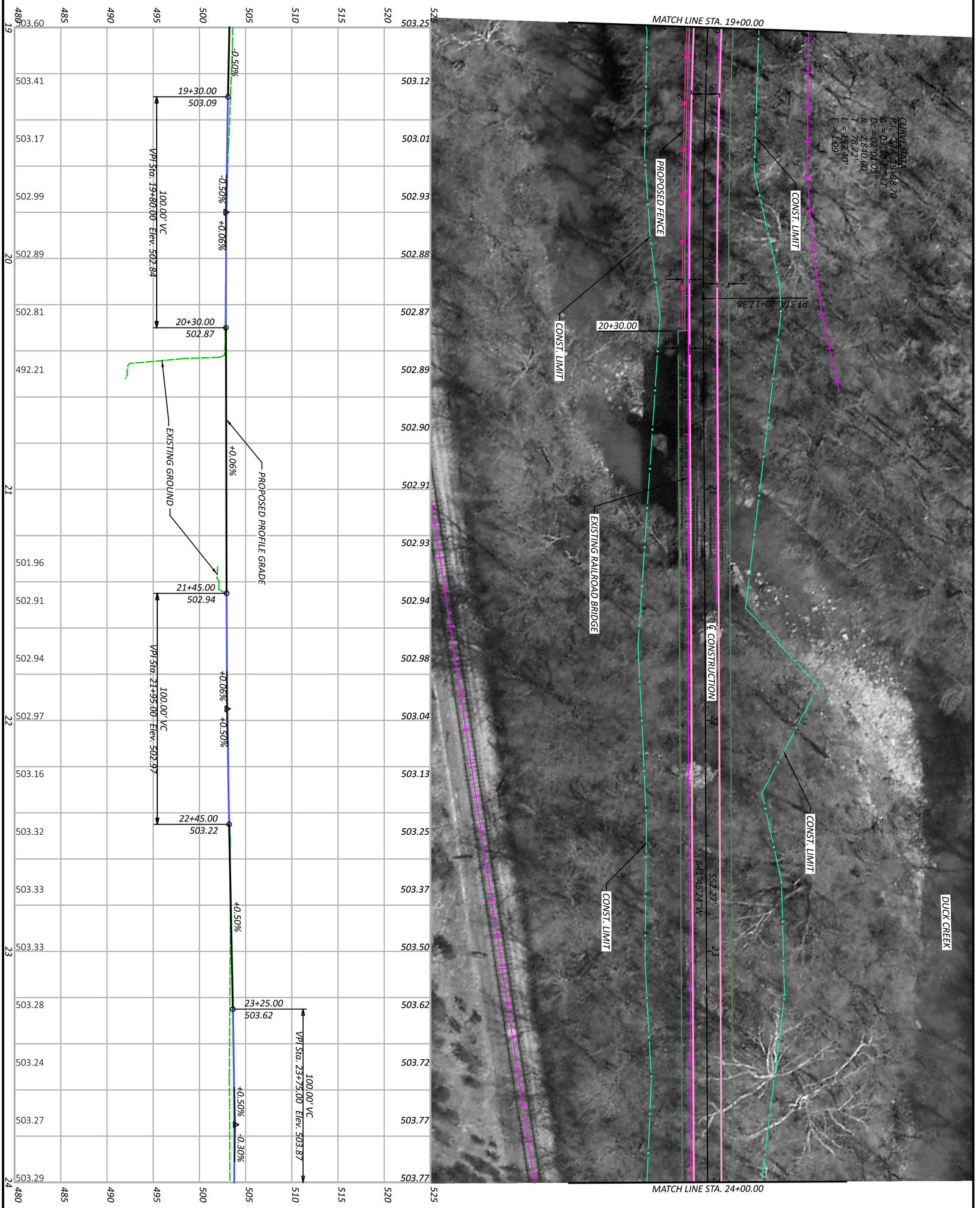
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STA. 14+00.00 TO STA. 19+00.00

HORIZONTAL SCALE IN FEET
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C-77

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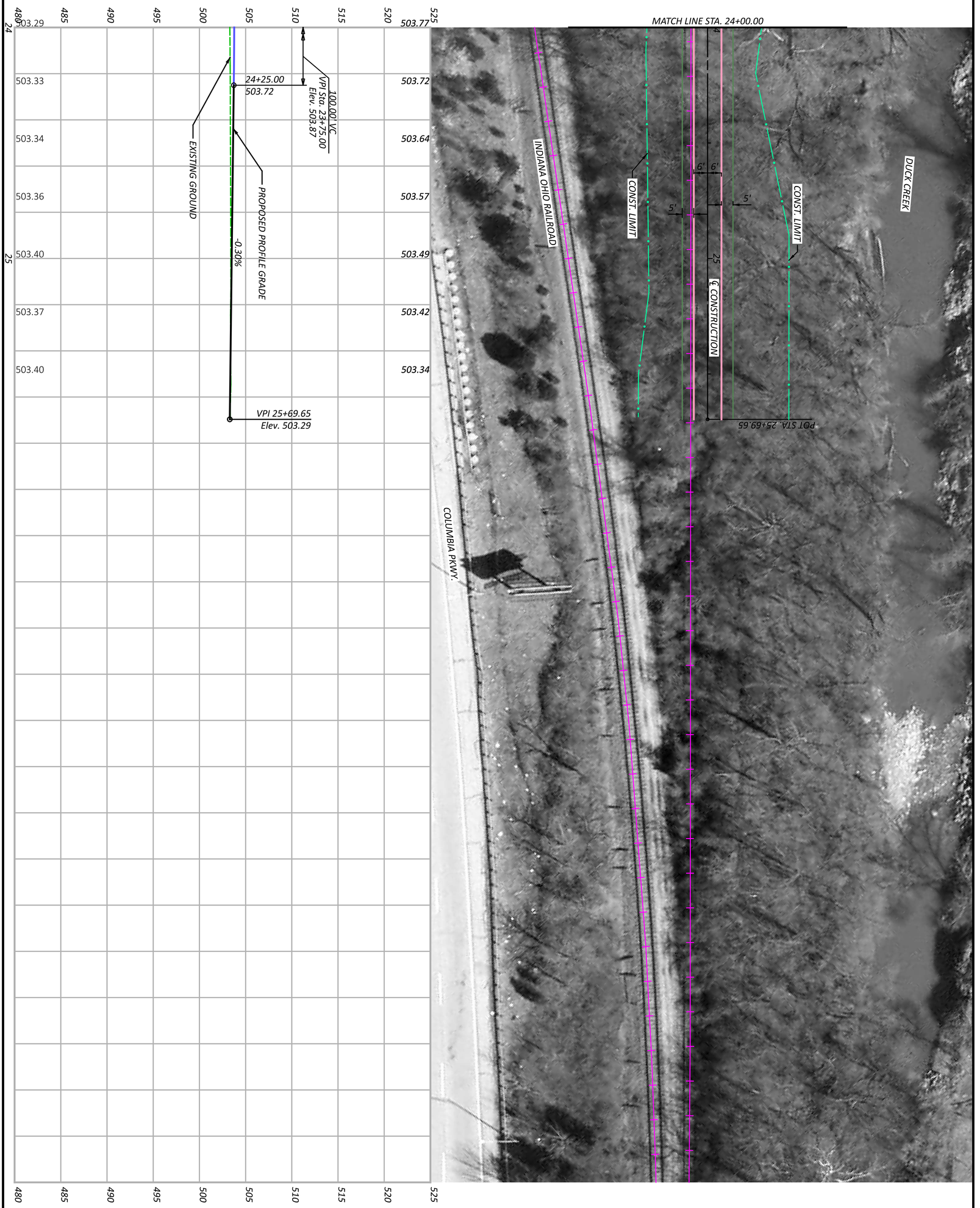
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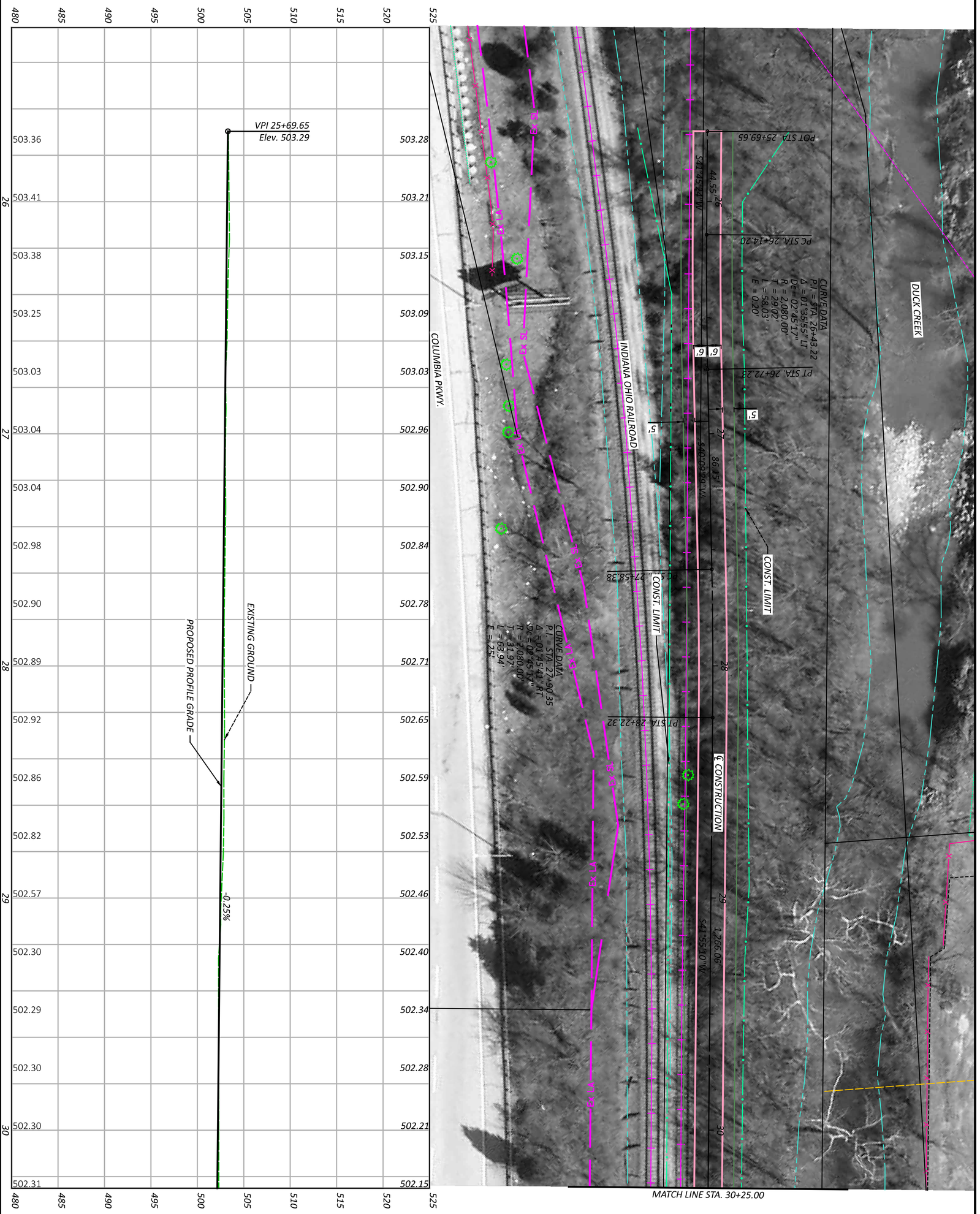
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SEGMENT 3 - ALTERNATIVE E
STA. 19+00.00 TO STA. 25+69.65

HORIZONTAL SCALE IN FEET
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SEGMENT 3 - ALTERNATIVE E
STA. 25+69.65 TO STA. 30+25.00

HORIZONTAL SCALE IN FEET
0 20
10 40

SHEET	TOTAL
P.7	16

PROJECT ID: 113603
REVIEWER: SNS 02-02-24
DESIGNER: JGB

DESIGN AGENCY
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C-80

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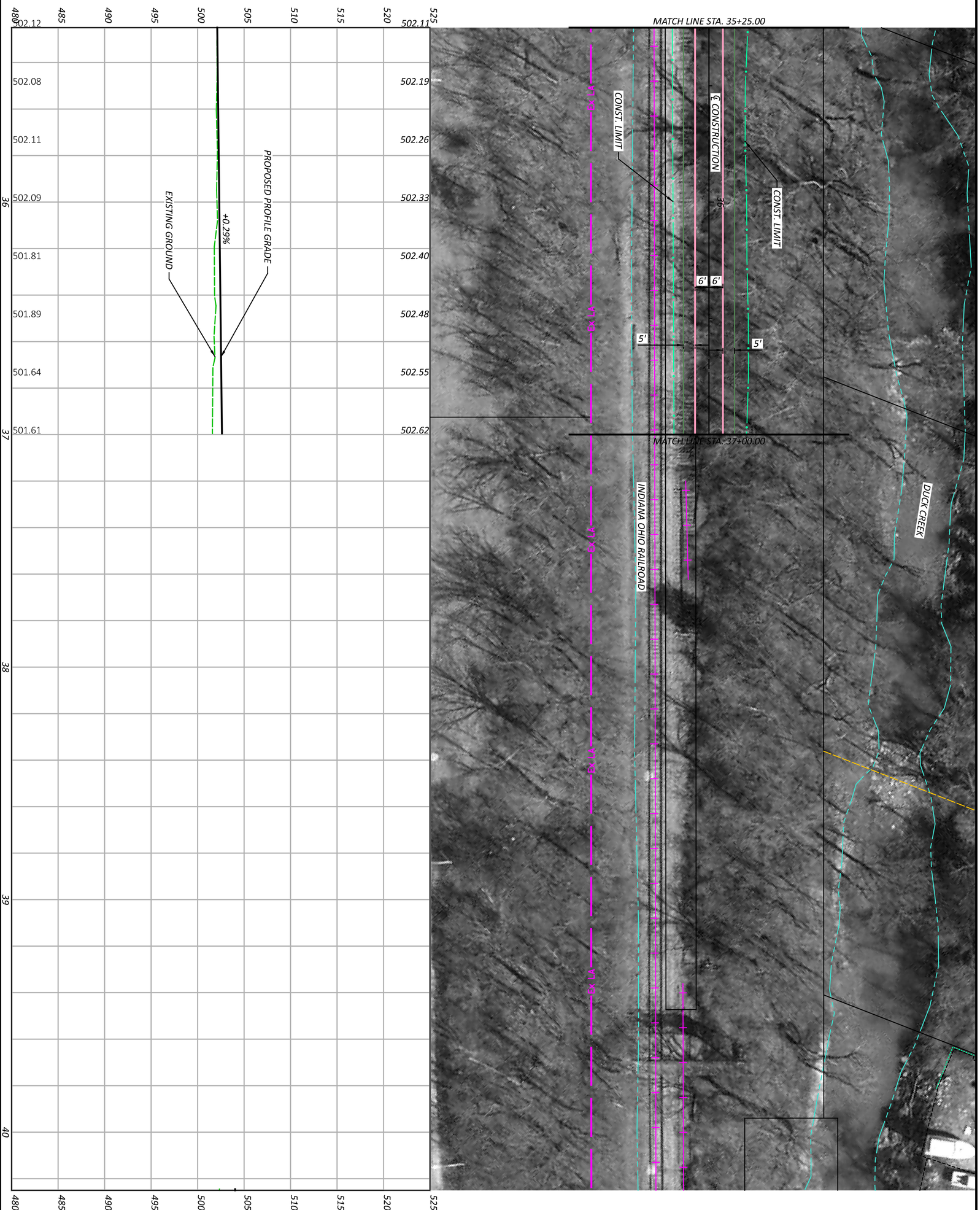
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DESIGNER JGB
REVIEWER SNS 02-02-24
PROJECT ID 113603
SHEET P.8 TOTAL 16

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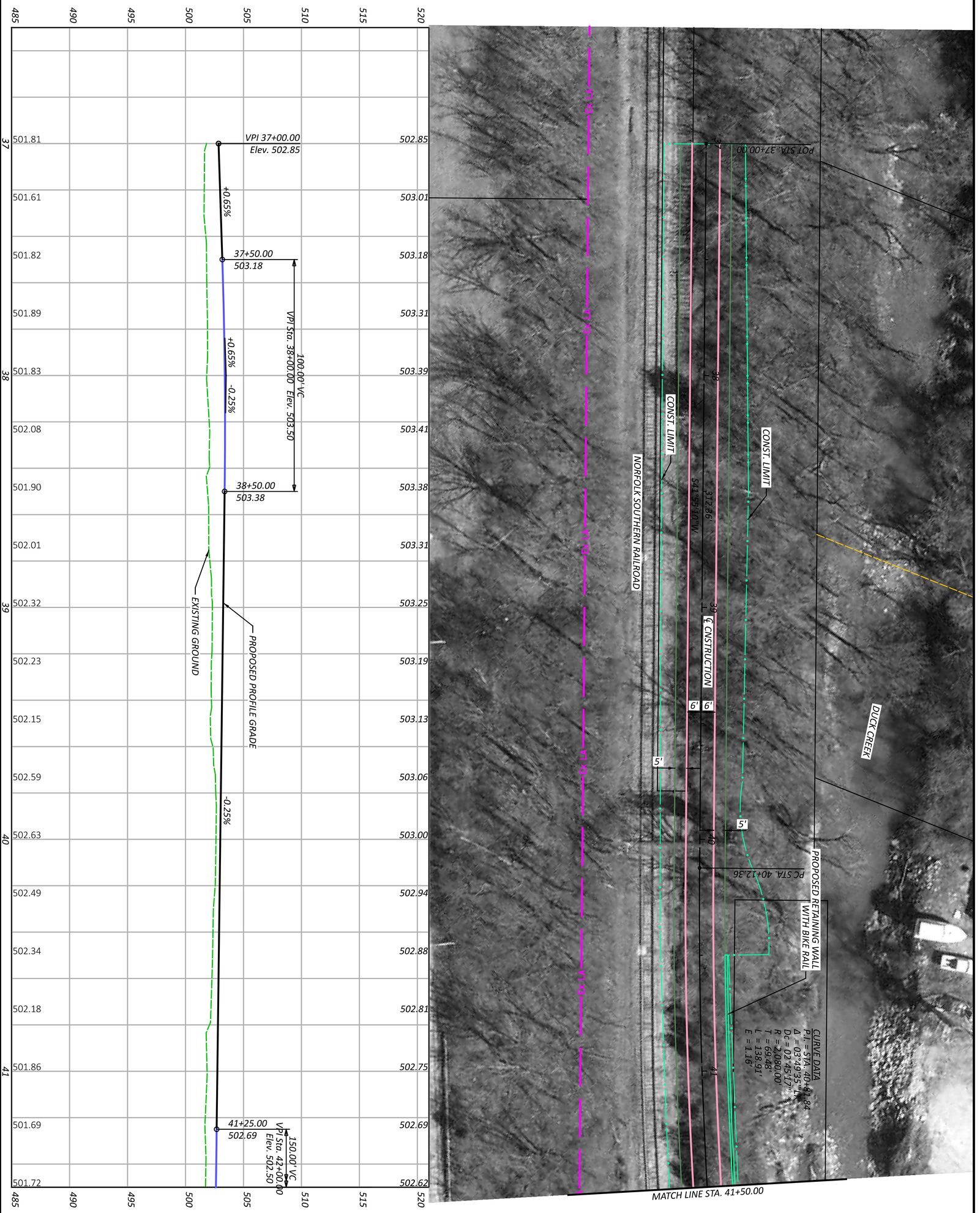


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HORIZONTAL SCALE IN FEET
0 20
10 40

HAM-WASSON WAY TO OTTO ARMLEDER

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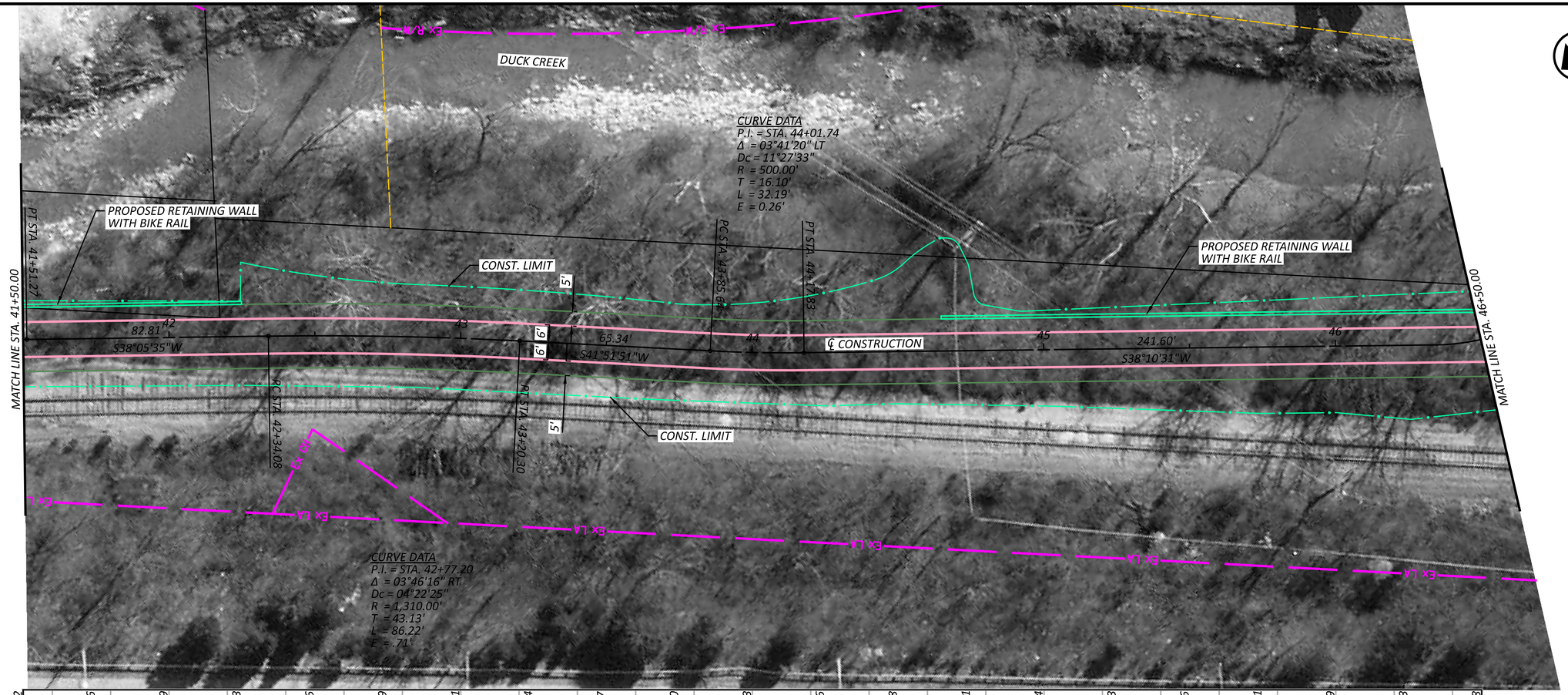
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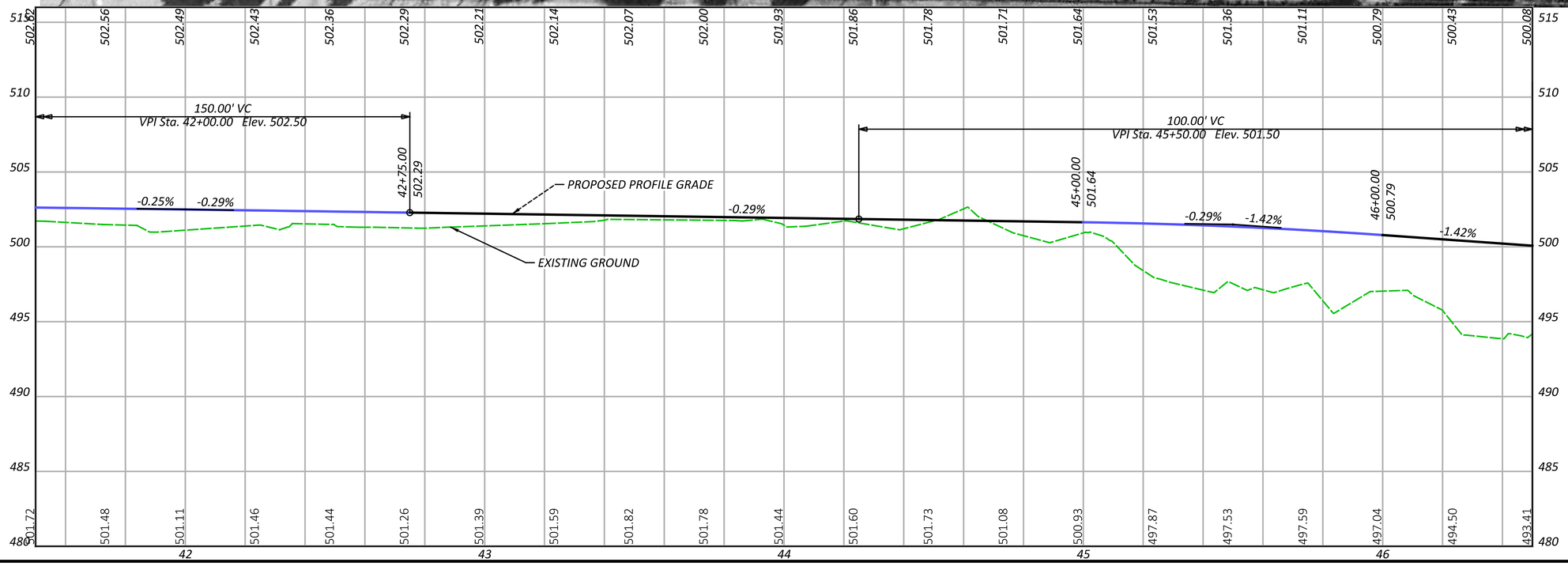
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C-83

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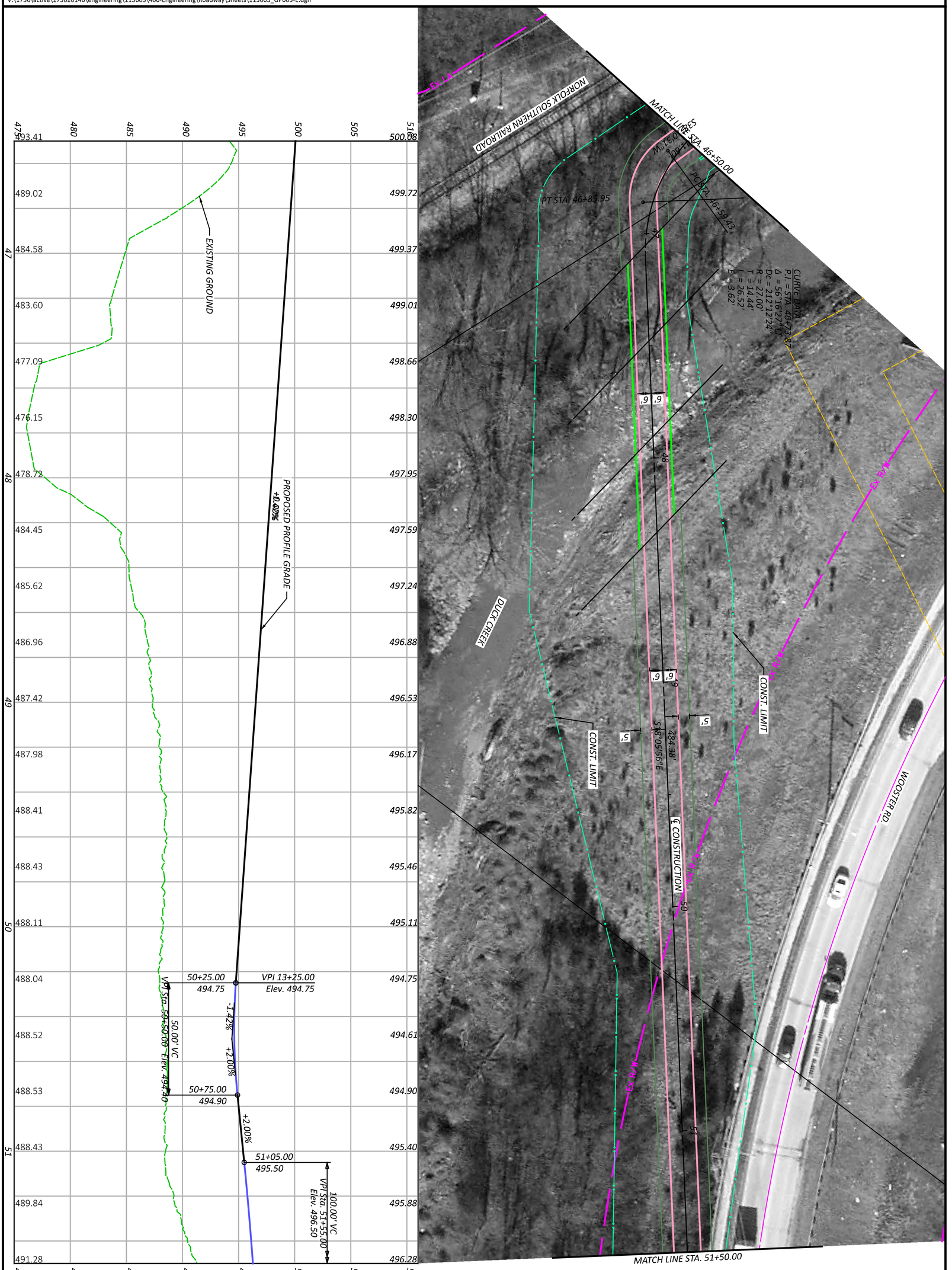
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STA. 41+50.00 TO STA. 46+50.00

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DESIGNER JGB
REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.11 TOTAL 15

HAM-WASSON WAY TO OTTO ARMLEDER

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SHEET P.12	TOTAL 15	PROJECT ID 113603	REVIEWER SNS 01-26-24	DESIGNER JGB	DESIGN AGENCY Stantec 10200 Alliance Road, Suite 200 Cincinnati, OH 45242 (513) 842-8200

SEGMENT 3 - ALTERNATIVE E
STA. 46+50.00 TO STA. 51+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-85

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WOOSTER RD.

CONST. LIMIT

℄ CONSTRUCTION

MATCH LINE STA. 51+50.00

MATCH LINE STA. 56+50.00

484.38'
S18°05'56"E

160.79'
S10°37'54"E

192.52'
S00°40'16"E

52

53

54

55

56

PC STA. 51+67.33

PT STA. 52+35.49

PC STA. 53+96.28

PT STA. 54+83.20

EX R/W

CONST. LIMIT

CURVE DATA
P.I. = STA. 52+02.96
Δ = 07°28'02" RT
Dc = 11°27'33"
R = 500.00'
T = 32.63'
L = 65.16'
E = 1.06'

CURVE DATA
P.I. = STA. 54+39.85
Δ = 09°57'38" RT
Dc = 11°27'33"
R = 500.00'
T = 43.57'
L = 86.92'
E = 1.89'

496.28 496.60 496.85 497.05 497.25 497.45 497.64 497.82 497.96 498.07 498.14 498.20 498.27 498.33 498.40 498.46 498.52 498.57 498.58 498.56 498.50

100.00' VC
VPI Sta. 51+55.00
Elev. 496.50

100.00' VC
VPI Sta. 53+45.00 Elev. 498.00

100.00' VC
VPI Sta. 56+00.00 Elev. 498.65

52+05.00
496.89

52+95.00
497.61

53+95.00
498.13

55+50.00
498.52

56+50.00
498.50

+2.00%
+0.79%
+0.79%
+0.79%
+0.26%
+0.26%
+0.26%
-0.31%
+0.00%

PROPOSED PROFILE GRADE

EXISTING GROUND

510 505 500 495 490 485 480 475

52 53 54 55 56

HORIZONTAL SCALE IN FEET
0 10 20 40

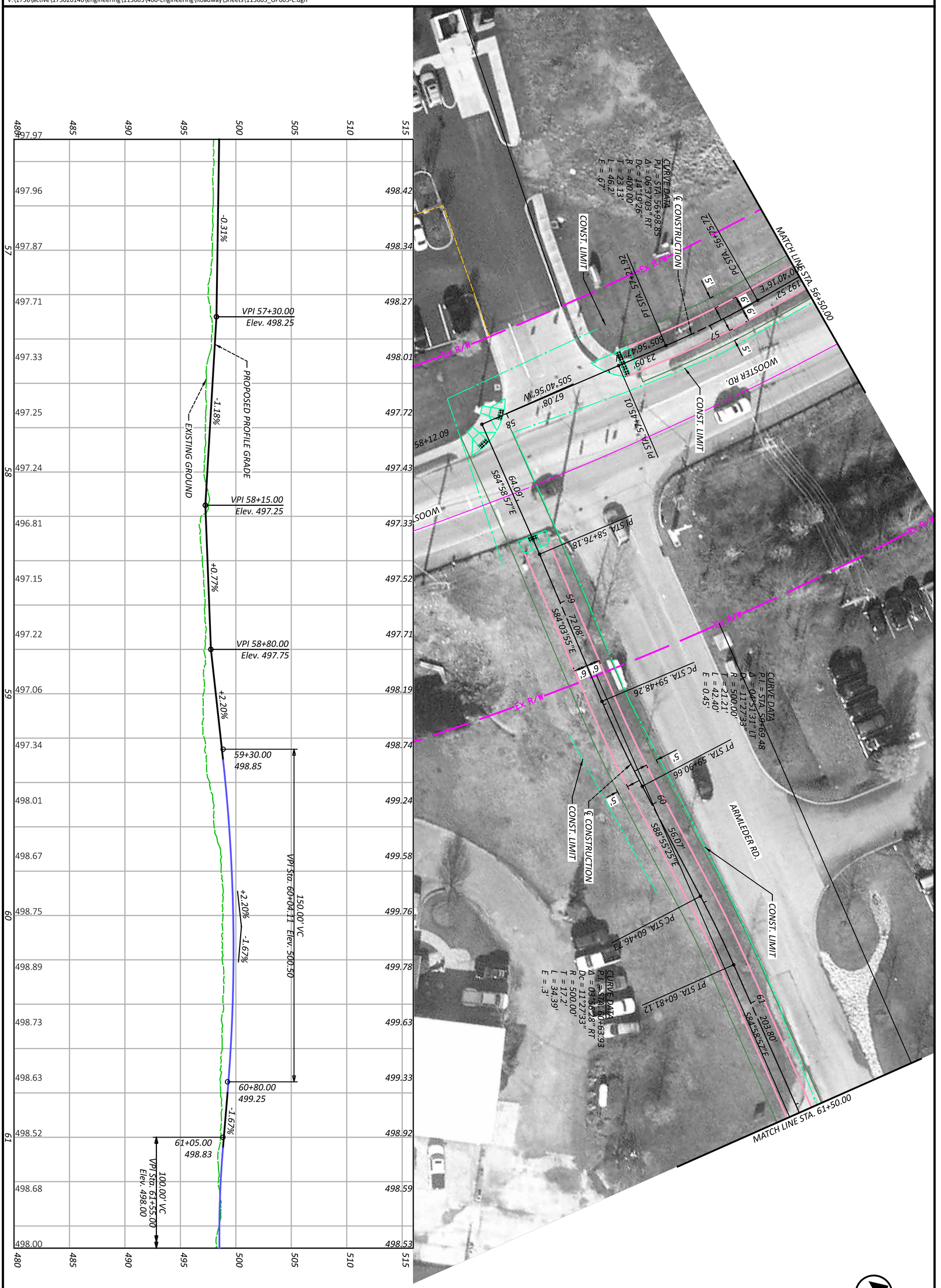
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REVIEWER SNS 01-26-24
PROJECT ID 113603
SHEET P.13 TOTAL 15

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SEGMENT 3 - ALTERNATIVE E
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HORIZONTAL SCALE IN FEET
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SHEET	TOTAL
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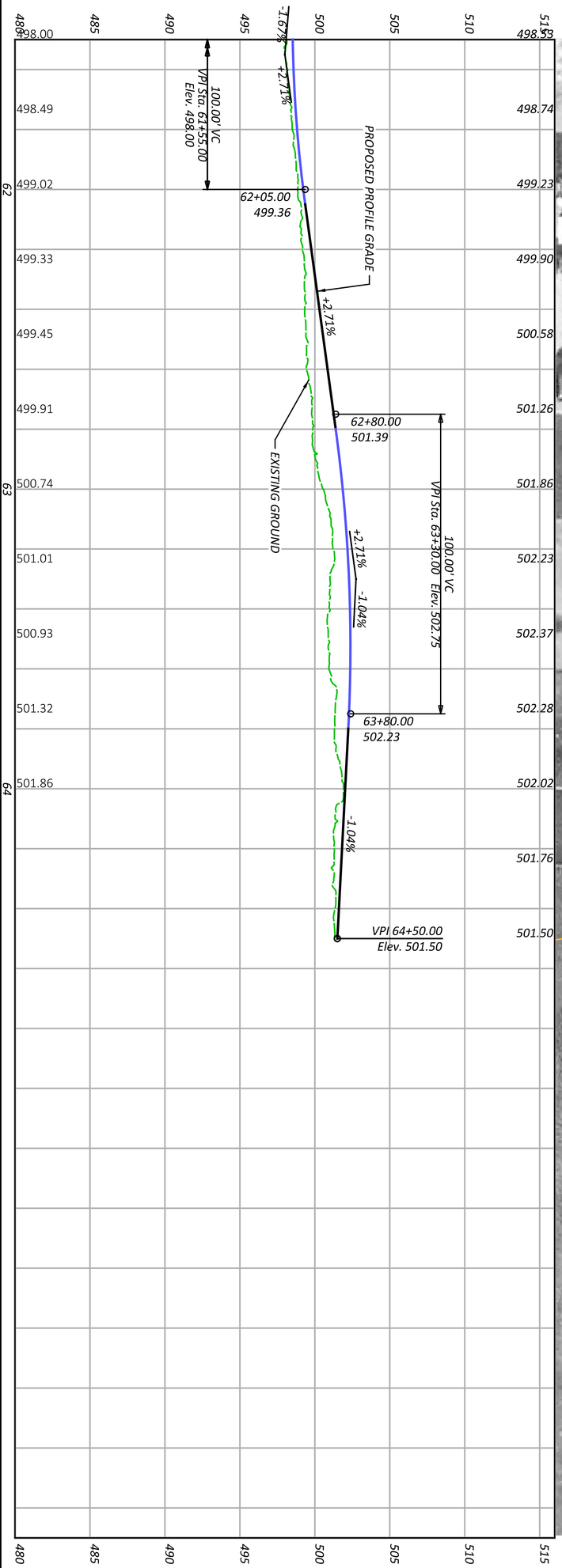
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REVIEWER: SNS 01-26-24
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DESIGN AGENCY

DESIGNER	REVIEWER	PROJECT ID	SHEET	TOTAL
JGB	SNS 01-26-24	113603	P.15	15

SEGMENT 3 - ALTERNATIVE E
STA. 61+50.00 TO STA. 66+50.00

HORIZONTAL SCALE IN FEET
0 20
10 40

C-88

Attachment D

Structures Type Study

Segment 1 Structure Type Study

STRUCTURE TYPE STUDY
Wasson-Armleder Trail
Bridges on Segment 1

February 27, 2024

Prepared for:
ODOT - District 8

Prepared by:
Stantec

Project Number:
173620146

The conclusions in the Report titled Structure Type Study are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by: _____
Signature

_____
Printed Name

Reviewed by: _____
Signature

_____
Printed Name

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1 INTRODUCTION.....1

2 DESIGN CONSIDERATIONS 1

2.1 Design Specifications 1
2.2 Bridge Design Criteria 1
2.3 Geotechnical..... 1
2.4 Hydraulics..... 1

3 STRUCTURES.....ERROR! BOOKMARK NOT DEFINED.

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3.2 Railroad Bridge over US 50..... 2
3.2.1 Existing Railroad bridge..... 2

4 COST ESTIMATES.....3

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A.2 Estimated Construction Cost..... 5
A.3 Estimated Quantities 5

1 Introduction

The purpose of this report is to determine and evaluate the estimated construction cost for each of the two structures on alignment A proposed for the Segment 1 portion of the trail. The evaluation is to aid in determining the preferred alignment with which to move forward.

The proposed paved shared-use path will be 12 feet wide with 5-foot shoulders on each side. Segment 1-A provides an extension of the existing Wasson Armleder trail. This segment commences from a point where the existing trail leaves the abandoned railroad bed to connect to Old Red Bank Road and extends the trail across Duck Creek, Red Bank Road, and US 50 following the abandoned railroad bed and utilizing the two existing railroad bridges. This segment of the trail terminates at a point just west of Wooster Road.

2 Design Considerations

2.1 Design Specifications

All proposed structures will be designed in accordance with the 2020 ODOT Bridge Design Manual, the ODOT Multimodal Design Guide (2023), the AASHTO LRFD Bridge Design Specifications, 9th Edition (2020) and the AASHTO Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition (2009).

2.2 Bridge Design Criteria

- Pedestrian Live Load of 90 psf
- H15-44 vehicle loading (Ambulance or maintenance vehicles) without dynamic load allowance
- No Future Wearing Surface
- The width of the bridges preferably should provide 16 feet face to face of the railings in accordance with the ODOT Mulitmodal Design Guide.

2.3 Geotechnical

No geotechnical borings will be performed for this segment since the trail utilizes existing structures. The structures appear to be stable without signs of settlement or movement in the substructures. The foundations supported railroad traffic for many years and the loadings from the proposed trail will not exceed the loadings from rail traffic.

2.4 Hydraulics

Hydraulics are not a consideration for these bridges since existing bridges will be utilized and none cross a body of water.

3 Alternatives

Alternatives have been considered for the utilization of the two abandoned railroad bridges on this segment. These alternatives are presented in this section.

3.1 Railroad Bridge over Duck Creek and Red Bank Road

3.1.1 EXISTING RAILROAD BRIDGE

The existing bridge is a steel plate girder structure with two steel girders spaced 6'-6" on center. Timber ties set directly on the steel stringers. The structure is 432'-8"± long with six spans, 65.75'± – 125.00'± – 76.58'± – 39.00'± – 63.00'± – 63.33'±. No protective coating is visible on any of the members. In general, the plate girders are 75.5"± deep except for Span 2 where the girders are 120.5" ± deep.

Piers 1 and 2 are concrete wall type piers. Span 4, and the end of Spans 3 and 5, is supported by a steel-framed trestle. The pier supporting Spans 5 and 6 is a steel A-frame. Both the trestle and the A-frame are supported on concrete foundations. All the steel members in both the superstructure and substructure appear to be in good condition with surface corrosion on all members.

3.1.1.1 Alternative 1

This alternative involves removing the timber ties and replacing them with a 9-inch± thick reinforced concrete deck supported on the steel stringers. The trail would be carried on top of the concrete slab with concrete barriers topped with steel tube railings. The height of the bridge from profile grade to the ground below varies from approximately 40 feet to 75 feet. Therefore, the railings will need to be taller than normal for the comfort and safety of cyclists and pedestrians.

The 2022 inspection report which was provided to us indicates the steel members of the superstructure are in fair condition with extensive surface corrosion. The concrete piers and abutments are in poor condition with significant amounts of cracking, efflorescence, and spalling. These will need to be cleaned and patched as part of this alternative.

3.1.1.2 Alternative 2

This alternative would involve the removal of the existing superstructure and providing a new superstructure with a length of approximately 432 feet. The existing abutments and piers would be modified to support the new superstructure. It is apparent this alternative would be much more expensive than Alternative 1 and will not be studied further at this time.

3.2 Railroad Bridge over US 50

3.2.1 EXISTING RAILROAD BRIDGE

The existing bridge is a two-span steel through-plate girder structure constructed in 1962 with spans of 67.00'± - 62.00'± and a total length of 129'±. All steel members are in good condition with the protective

coating intact. The concrete wall-type abutments and pier appear to be sound with no visible cracking or spalling.

Field measurements indicate the through-plate girders are spaced 15.5'± center to center with a clear distance between flanges of 12.5'±. The superstructure consists of steel floorbeams between the through-girders topped with a steel plate deck. The floorbeams are located approximately mid-height of the through-girders.

3.2.1.1 Alternative 1

This alternative utilizes the existing structure with minor modifications to accommodate the trail. The ballast and ties would be removed and the steel deck plate cleaned. An asphalt wearing surface would be placed on the steel deck plate to provide a wearing surface for the trail. Due to the geometry of the existing structure, the trail width would be reduced significantly while crossing the bridge. The existing structure provides only 12.5'± clear distance between the flanges of the girders. A rub rail would be required to protect cyclists from contacting the flanges, reducing the usable width to 11.5'±. This is less than the width of the trail off the bridge and well below the recommended minimum width of 14' for a 12' wide trail. A railing would be mounted on top of the flanges as fall protection for the riders.

3.2.1.2 Alternative 2

This alternative would involve the removal of the existing superstructure and providing a new superstructure with a width sufficient to accommodate the trail. The existing abutments would be modified to support the new superstructure. It is apparent this alternative would be much more expensive than Alternative 1 and will not be studied further at this time.

4 Cost Estimates

Preliminary construction cost estimates were developed for each proposed structure to aid in selecting a preferred trail alignment. Future maintenance costs are not included in these estimates, but will be significant over the life of the structures, particularly for the bridge over Duck Creek and Red Bank Road.

Alignment Segment	Estimated Construction Cost
1-A	
Bridge over Duck Creek/Red Bank Road	$935,500
RR Bridge over US 50	$151,200
Total Segment Cost	$1,086,700

APPENDIX A

Appendix A

A.1 Proposed Trail Alignments

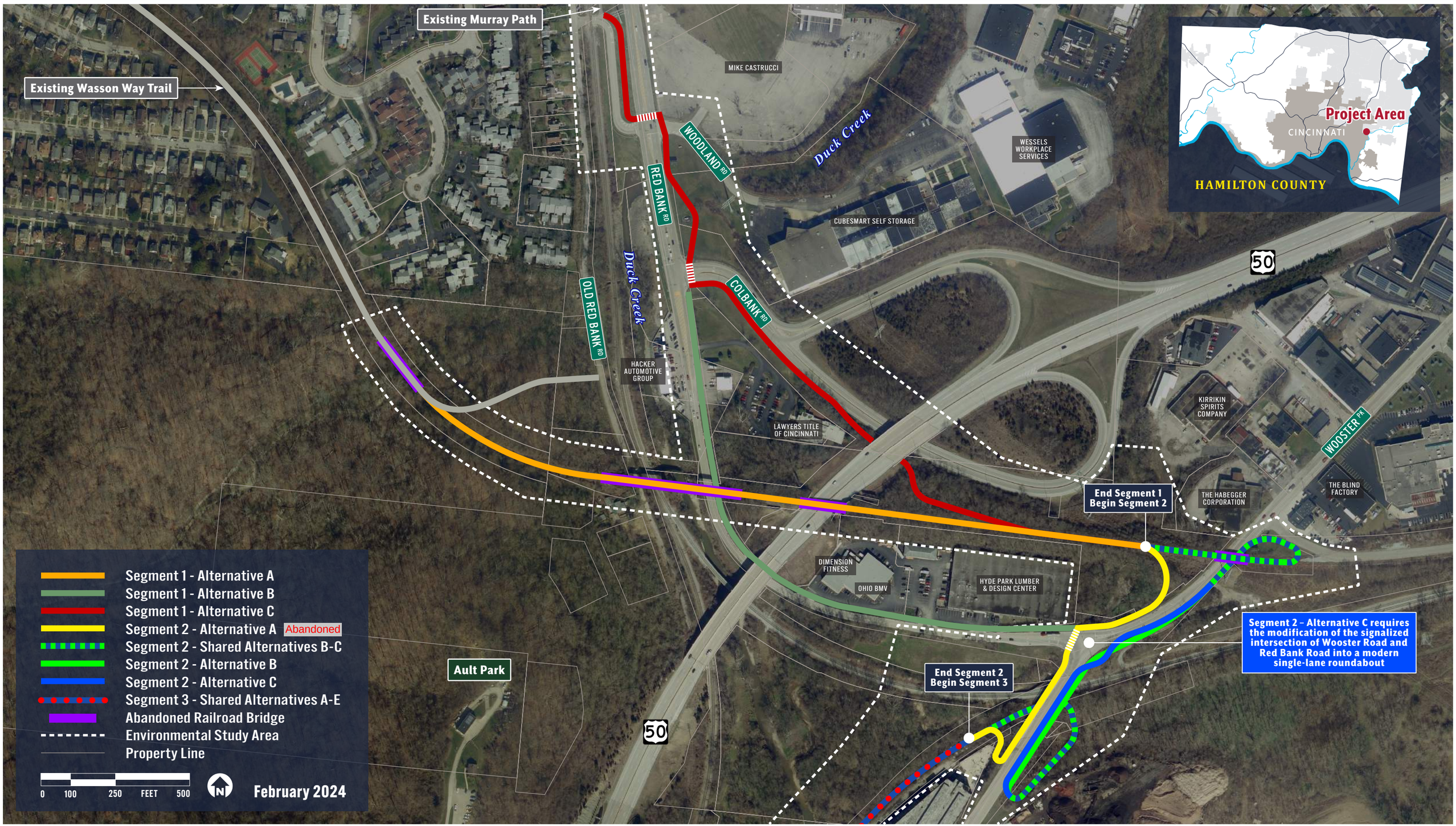
A.2 Estimated Construction Cost

A.3 Estimated Quantities

APPENDIX A.1

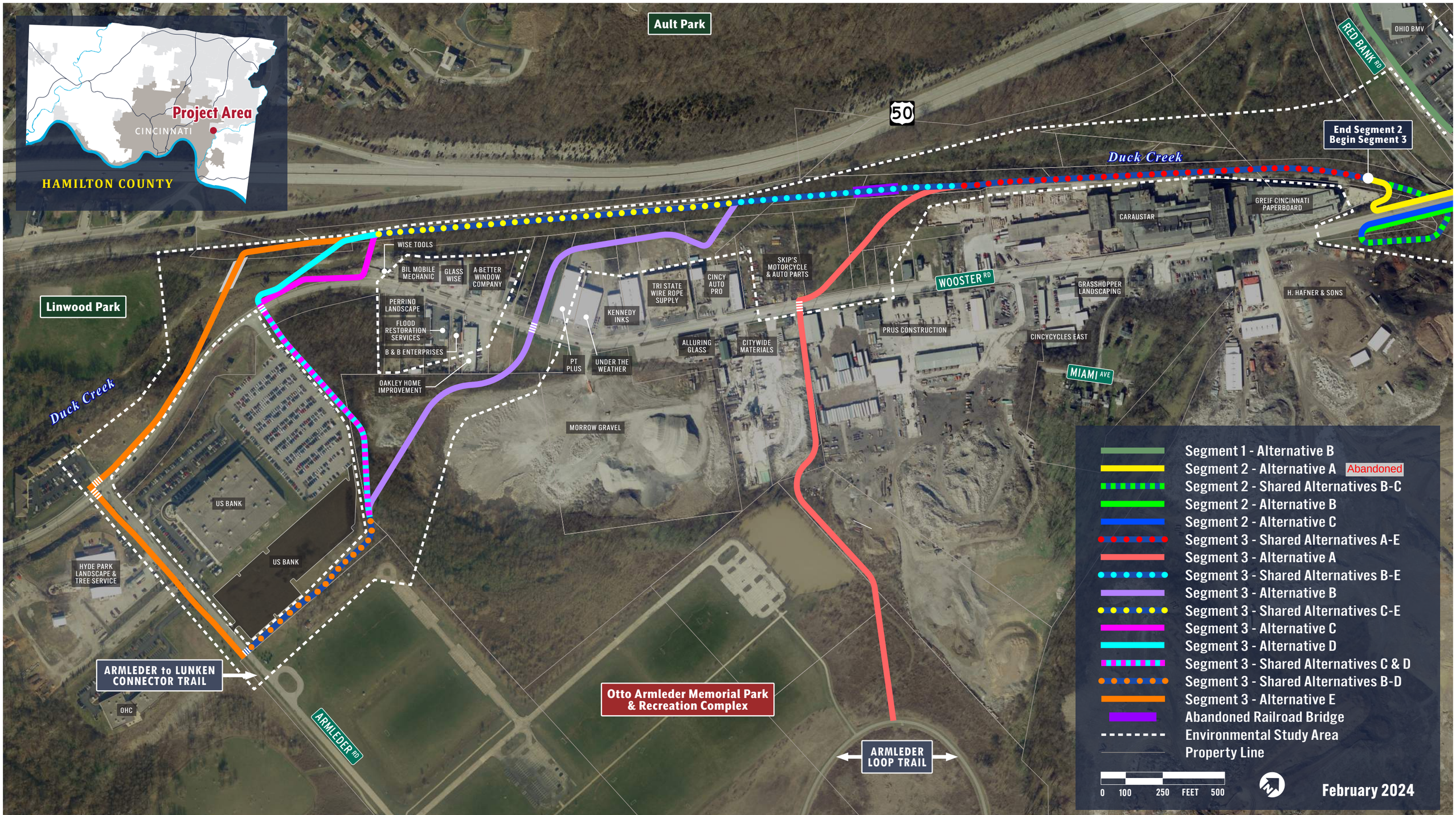
Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



APPENDIX A.2

Estimate Seg 1-A RB

Estimated Cost:$779,588.48

Contingency: 20.00%

Estimated Total: $935,506.18

Wasson Armleder
Structure Type Study
Segment 1-A, Railroad Bridge
over Duck Creek & Red Bank

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	202E11202	1.000	LS	$50,000.00000	$50,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0009	509E10000	60,100.000	LB	$1.92291	$115,566.89
	EPOXY COATED STEEL REINFORCEMENT				
0010	511E34446	219.000	CY	$1,103.92587	$241,759.77
	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK				
0012	511E44110	17.000	CY	$1,497.25943	$25,453.41
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E75120	864.000	FT	$224.98307	$194,385.37
	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)				
0016	518E21200	28.000	CY	$125.96998	$3,527.16
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0017	518E40000	50.000	FT	$10.49939	$524.97
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0018	518E40010	30.000	FT	$19.30129	$579.04
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				
0019	519E11100	1,000.000	SF	$97.79187	$97,791.87
	PATCHING CONCRETE STRUCTURE				
0020	519E12610	400.000	FT	$125.00000	$50,000.00
	SPECIAL - CONCRETE REPAIR BY EPOXY INJECTION INCLUDING SURFA CE PREPARATION				

Total for Group 0001:$779,588.48

Estimate Seg 1-A US 50

Estimated Cost:$125,969.65

Contingency: 20.00%

Estimated Total: $151,163.58

Wasson Armleder
Structure Type Study
Segment 1-A, Railroad Bridge
over US 50

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	202E11202	1.000	LS	$25,000.00000	$25,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0007	441E10100	9.000	CY	$300.00000	$2,700.00
	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M				
0008	441E10100	15.000	CY	$300.00000	$4,500.00
	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M				
0009	509E10000	2,200.000	LB	$2.56338	$5,639.44
	EPOXY COATED STEEL REINFORCEMENT				
0012	511E44110	17.000	CY	$1,497.25943	$25,453.41
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E75120	258.000	FT	$224.98307	$58,045.63
	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)				
0016	518E21200	28.000	CY	$125.96998	$3,527.16
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0017	518E40000	50.000	FT	$10.49939	$524.97
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0018	518E40010	30.000	FT	$19.30129	$579.04
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$125,969.65

APPENDIX A.3

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	0	0	LF
Pier	63.00	1.00	1.00	0	0	
	62.00	1.00	1.00	0	0	
					0	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	0	0	LF
Pier	68.00	1.00	1.00	0	0	
	67.00	1.00	1.00	0	0	
					0	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				2205	LB
Pier	Assume 2% steel				0	
Slab	Assume 2% steel				57859	
					60064	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	432.00	17.33	0.75	1	208	CY
Haunch	432.00	2.00	0.17	2	11	
					219	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	25.00	3.00	3.00	0	0	CY
Beam Seat	25.00	3.00	3.00	2	17	
Wingwalls	6.52	2.25	3.00	0	0	
					17	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	0	0	CY
					0	CY
Item 517, Twin Steel Tube Railing, modified.						
	432.00	1.00	1.00	2	864	LF
Item 518, Porous Backfill with Geotextile Fabric						
	25.00	2.00	7.50	2	28	CY
Item 518, 6" Perforated Plastic Pipe						
	25.00	1.00	1.00	2	50	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	15.00	1.00	1.00	2	30	LF

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 519, Patching Concrete Structures (Assume 25% of surface area)						
rear abutment	13.00	1.00	15.00	1	49	SF
	34.50	1.00	15.00	2	259	
pier 1	16.00	1.00	33.00	2	264	
pier 2	16.00	1.00	41.00	2	328	
forward abutment	21.00	1.00	10.00	1	53	
	12.00	1.00	10.00	2	60	
					1012	SF
Item 519, Epoxy Injection (Assume 10% of surface area)						
rear abutment	13.00	1.00	15.00	1	20	LF
	34.50	1.00	15.00	2	104	
pier 1	16.00	1.00	33.00	2	106	
pier 2	16.00	1.00	41.00	2	131	
forward abutment	21.00	1.00	10.00	1	21	
	12.00	1.00	10.00	2	24	
					405	LF

	Length	Width	Height	Number	Total	Units
Item 441 Asphalt Surface Course						
	129.00	15.50	0.13	1	9	CY
Item 445 Asphalt Intermediate Course						
	129.00	15.50	0.21	1	15	CY
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	134.00	1.00	1.00	0	0	LF
Pier	5.00	1.00	1.00	0	0	
	5.00	1.00	1.00	0	0	
					0	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				2205	LB
Pier	Assume 2% steel				0	
Slab	Assume 2% steel				0	
					2205	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	129.00	17.33	0.75	0	0	CY
Curb	129.00	0.50	0.50	0	0	
					0	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	25.00	3.00	3.00	0	0	CY
Beam Seat	25.00	3.00	3.00	2	17	
Wingwalls	6.52	2.25	3.00	0	0	
					17	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	0	0	CY
					0	CY
Item 517, Twin Steel Tube Railing, modified.						
	129.00	1.00	1.00	2	258	LF
Item 518, Porous Backfill with Geotextile Fabric						
	25.00	2.00	7.50	2	28	CY
Item 518, 6" Perforated Plastic Pipe						
	25.00	1.00	1.00	2	50	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	15.00	1.00	1.00	2	30	LF

Designed by:_____Checked by:_____

Segment 2 Structure Type Study

Stantec

STRUCTURE TYPE STUDY
Wasson-Armleder Trail
Bridges on Segment 2

February 27, 2024

Prepared for:
ODOT - District 8

Prepared by:
Stantec

Project Number:
173620146

The conclusions in the Report titled Structure Type Study are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by: _____
Signature

_____
Printed Name

Reviewed by: _____
Signature

_____
Printed Name

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1 Introduction

The purpose of this report is to determine and evaluate the estimated construction cost for each of the two alternative alignments (B and C) proposed for the Segment 2 portion of the trail. The evaluation is to aid in determining the preferred alignment with which to move forward. Segment 2 crosses the Wooster Road bridge over the Norfolk Southern tracks and this study will determine the recommended manner of accommodating the trail on the bridge and the cost of the proposed structure modification for each alternative.

The proposed paved shared-use path will be 12 feet wide with 5-foot shoulders on each side. Segment 2 begins at a point on the west side of Wooster Road, north of Red Bank Road and terminates on the west side of Wooster Road on the south side of the Norfolk Southern tracks. The trail will cross the existing railroad bridge over Wooster Road as well as the Wooster Road bridge over the Norfolk Southern tracks.

2 Design Considerations

2.1 Design Specifications

All proposed structures will be designed in accordance with the 2020 ODOT Bridge Design Manual, the ODOT Multimodal Design Guide (2023), the AASHTO LRFD Bridge Design Specifications, 9th Edition (2020) and the AASHTO Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition (2009).

2.2 Bridge Design Criteria

- Pedestrian Live Load of 90 psf
- H15-44 vehicle loading (Ambulance or maintenance vehicles) without dynamic load allowance
- No Future Wearing Surface
- The width of the bridges preferably should provide 16 feet face to face of the railings in accordance with the ODOT Mulitmodal Design Guide.

2.3 Geotechnical

A geotechnical investigation has not been performed at this stage of the project. Geotechnical information is based on historical borings in the vicinity of the bridges. The historical borings indicate the presence of sand, gravel, and clay to a depth of approximately 80 feet. Rock was not encountered in any of the borings. Therefore, the assumption for this is that new foundations for widening the Wooster Road bridge will be deep foundations using CIP piling.

No geotechnical investigation will be performed for the existing railroad bridge. The substructures appear to be stable without signs of settlement or movement. The foundations supported railroad traffic for many years and the loadings from the proposed trail will not exceed the loadings from rail traffic.

2.4 Hydraulics

Hydraulics are not a consideration for these bridges since existing bridges will be utilized and none cross a body of water.

3 Alternatives

Alternatives have been considered for the utilization of the abandoned railroad bridge over Wooster Road. These alternatives are presented in this section along with discussions for modifications to the Wooster Road bridge over the Norfolk Southern tracks which will be required in Segments 2-B or 2-C.

3.1 Segment 2-B

3.1.1 ALIGNMENT

For this alignment, the trail begins at a point on the west side of Wooster Road, crosses over Wooster Road on an abandoned railroad bridge, then descends and runs along the east side of Wooster Road, crossing the active Norfolk Southern railroad tracks by widening the existing roadway bridge over the railroad before descending and crossing under Wooster Road alongside the active railroad tracks. The segment terminates at a point on the west side of Wooster Road, south of the railroad tracks. This alignment requires modifications to two structures, the abandoned railroad bridge over Wooster Road and the highway bridge carrying Wooster Road over the Norfolk Southern railroad tracks.

3.1.2 ABANDONED RAILROAD BRIDGE

The existing bridge is a single-span steel through-plate girder structure with a length of 75’±. The superstructure consists of two steel stringers and five steel floorbeams spanning between the through-girders. All the steel members appear to be in good condition with surface corrosion on all members. No protective coating is visible on any of the members.

Knee braces on the inside of each girder stiffen the girders at the floorbeams. Timber ties span between the stringers and originally supported the tracks which were placed on longitudinal timber members. Field measurements indicate the through-girders are spaced 16’-4”± center-to-center with 14’-10”± clear between the flanges. The knee braces each extend into the deck 2’-6”± at the level of the timber ties and 5”± at the level of the top flange. The girders extend 4’-9”± above the timber ties.

3.1.2.1 Alternative 1

This alternative involves removing the timber ties and replacing them with a 9-inch thick reinforced concrete deck supported on the steel stringers and floorbeams. The trail would be carried on top of the

concrete slab with curbs to contain drainage on the deck away from the steel through-girders. This alternative would only provide a clear distance between the knee braces of 11'-4"±. This would be significantly less than the 16'-0" recommended by the ODOT Multimodal Design Guide for a 12'-0" trail and less than the width of the trail off the bridge. A rub rail would be required inside of the knee braces to protect cyclists from contacting the steel braces. This would further reduce the available clear width.

3.1.2.2 Alternative 2

This alternative also involves removing the timber ties and replacing them with a 9-inch thick reinforced concrete deck supported on the steel stringers and floorbeams. However, fill material would be placed on the deck to raise the elevation of the trail to a point where 14'-0" of clearance could be provided between the knee braces. This would involve raising the profile of the trail 3'-0"± across the bridge and would provide the minimum shy distance of 1'-0" recommended by the ODOT Multimodal Design Guide for a trail on a bridge. Raising the trail would put the trail profile grade 1'-9"± below the top of the through-girders, therefore, railings would be required on each side of the trail. The railings would be installed in the fill material to provide a railing 4'-6" above the trail.

Lightweight fill would be used to minimize the additional dead load on the structure with asphalt paving on top of the fill. Based on the existing plans, we've determined the capacity of the structure is more than adequate to support the loading from the shared-use path.

3.1.2.3 Alternative 3

This alternative would involve the removal of the existing superstructure and providing a new superstructure with a width sufficient to accommodate the trail with the preferred shy distances. The existing abutments would be modified to support the new superstructure. It is apparent this alternative would be much more expensive than Alternatives 1 and 2 and will not be studied further at this time.

3.1.3 WOOSTER ROAD HIGHWAY BRIDGE

This concept involves widening to the east the existing three-span Wooster Road bridge over the Norfolk Southern railroad tracks to accommodate the proposed shared-use path. The existing superstructure consists of rolled steel beams with a composite concrete deck. The deflector shaped parapet on the east side would remain in place to separate traffic from the shared-use path. The widening would be constructed outside of the barrier with the deck extended at the same cross slope. A 16'-0" clear trail would be provided with a bicycle railing on the outside, for an overall widened width of 17'-0". The widening would require three new W30x148 steel beams spaced at 5'-0" center-to-center, matching the beam size and spacing on the existing bridge. The existing hammerhead piers would be widened to support the new beams by filling in below the cantilevered cap on the east side and creating a wall-type pier on the east end. The wall-type abutment on the north end of the bridge and the spill-thru abutment on the south end would also be extended to support the new beams.

The existing vertical clearance over the Norfolk Southern tracks is shown as 23.3 feet on the Bridge Inventory and Appraisal sheet from ODOT. The required minimum clearance over the tracks is 23 feet. Extending the normal cross slope of 0.0156 ft/ft/ on the bridge across the proposed widening would

reduce the vertical clearance to 23.05± feet. Therefore, after the tracks have been surveyed to determine the actual clearance, it may be necessary to reduce the cross slope on the widened portion, or reverse the cross slope on the widened portion, to maintain the required minimum clearance.

3.2 Segment 2-C

3.2.1 ALIGNMENT

For this alignment, the trail begins at a point on the west side of Wooster Road, crosses over Wooster Road on an abandoned railroad bridge, then descends and runs along the east side of Wooster Road, crossing the active Norfolk Southern railroad tracks by means of the existing roadway bridge over the railroad before descending and crossing under Wooster Road alongside the active railroad tracks. The segment terminates at a point on the west side of Wooster Road, south of the railroad tracks. This alignment requires modifications to two structures, the abandoned railroad bridge over Wooster Road and the highway bridge carrying Wooster Road over the Norfolk Southern railroad tracks.

3.2.2 ABANDONED RAILROAD BRIDGE

The existing bridge is a single-span steel through-plate girder structure with a length of 75'±. The superstructure consists of two steel stringers and five steel floorbeams spanning between the through-girders. All the steel members appear to be in good condition with surface corrosion on all members. No protective coating is visible on any of the members.

Knee braces on the inside of each girder stiffen the girders at the floorbeams. Timber ties span between the stringers and originally supported the tracks which were placed on longitudinal timber members. Field measurements indicate the through-girders are spaced 16'-4"± center-to-center with 14'-10"± clear between the flanges. The knee braces each extend into the deck 2'-6"± at the level of the timber ties and 5"± at the level of the top flange. The girders extend 4'-9"± above the timber ties.

3.2.2.1 Alternative 1

This alternative involves removing the timber ties and replacing them with a 9-inch thick reinforced concrete deck supported on the steel stringers and floorbeams. The trail would be carried on top of the concrete slab with curbs to contain drainage on the deck away from the steel through-girders. This alternative would only provide a clear distance between the knee braces of 11'-4"±. This would be significantly less than the 16'-0" recommended by the ODOT Multimodal Design Guide for a 12'-0" trail and less than the width of the trail off the bridge. A rub rail would be required inside of the knee braces to protect cyclists from contacting the steel braces. This would further reduce the available clear width.

3.2.2.2 Alternative 2

This alternative also involves removing the timber ties and replacing them with a 9-inch thick reinforced concrete deck supported on the steel stringers and floorbeams. However, fill material would be placed on the deck to raise the elevation of the trail to a point where 14'-0" of clearance could be provided between the knee braces. This would involve raising the profile of the trail 3'-0"± across the bridge and would

provide the minimum shy distance of 1'-0" recommended by the ODOT Multimodal Design Guide for a trail on a bridge. Raising the trail would put the trail profile grade 1'-9"± below the top of the through-girders, therefore, railings would be required on each side of the trail. The railings would be installed in the fill material to provide a railing 4'-6" above the trail.

Lightweight fill would be used to minimize the additional dead load on the structure with asphalt paving on top of the fill. Based on the existing plans, we've determined the capacity of the structure is more than adequate to support the loading from the shared-use path.

3.2.3 WOOSTER ROAD HIGHWAY BRIDGE

This concept involves utilizing the existing three-span Wooster Road bridge over the Norfolk Southern railroad tracks without widening the bridge to accommodate the proposed shared-use path. The existing superstructure consists of rolled steel beams with a composite concrete deck. A raised 5'-0" sidewalk is provided on the west side of the bridge with a deflector shaped parapet on the east side. This alternative proposes to remove the existing sidewalk, reduce the number of traffic lanes on Wooster Road across the bridge from three to two, and provide the shared-use path on the east side of the bridge. A new traffic barrier would be required on the west side of the bridge. A traffic barrier would also be provided on the east side of the two traffic lanes to separate the shared-use path from traffic. A new bicycle railing would be provided on the east side of the shared-use path. Both edges of the deck would be replaced to accommodate the new barriers, but no structural changes to the existing bridge are required.

4 Cost Estimates

Preliminary construction cost estimates were developed for each proposed structure on each alignment. Since all structure types are of similar material, future maintenance costs will be similar for each alternative and thus do not impact the selection of the preferred alternative.

Alignment Segment	Estimated Construction Cost
2-B	
Alternative 1 – CIP concrete slab	$252,231
Alternative 2 - CIP concrete slab with fill	$271,635 (recommended)
Wooster Road Bridge Widening	$1,640,272
Total Segment Cost using Alternative 2	$1,911,907

Alignment Segment	Estimated Construction Cost
2-C	
Alternative 1 – CIP concrete slab	$252,231
Alternative 2 - CIP concrete slab with fill	$271,635 (recommended)
Wooster Road Bridge Modification	$585,400
Total Segment Cost using Alternative 2	$857,035

5 Recommendation

This recommendation is only for the alternatives considered for rehabilitation of the railroad bridge. The costs for the Wooster Road bridge modifications will be used to determine the preferred trail alignment.

Based on the estimated initial construction cost, Alternative 1 is the less expensive alternative for each alignment. However, as noted above, it does not provide sufficient width to carry the trail across the bridge without significant reduction in the width of the trail. Considering that Alternative 2 is only 7.7% more expensive than Alternative 1, we recommend Alternative 2 be utilized in the rehabilitation of the railroad bridge for each alignment. The Total Segment Cost will be utilized for each alignment to determine the preferred trail alignment.

APPENDIX A

Appendix A

A.1 Proposed Trail Alignments

A.2 Segment 2-B Estimated Construction Costs and Quantities

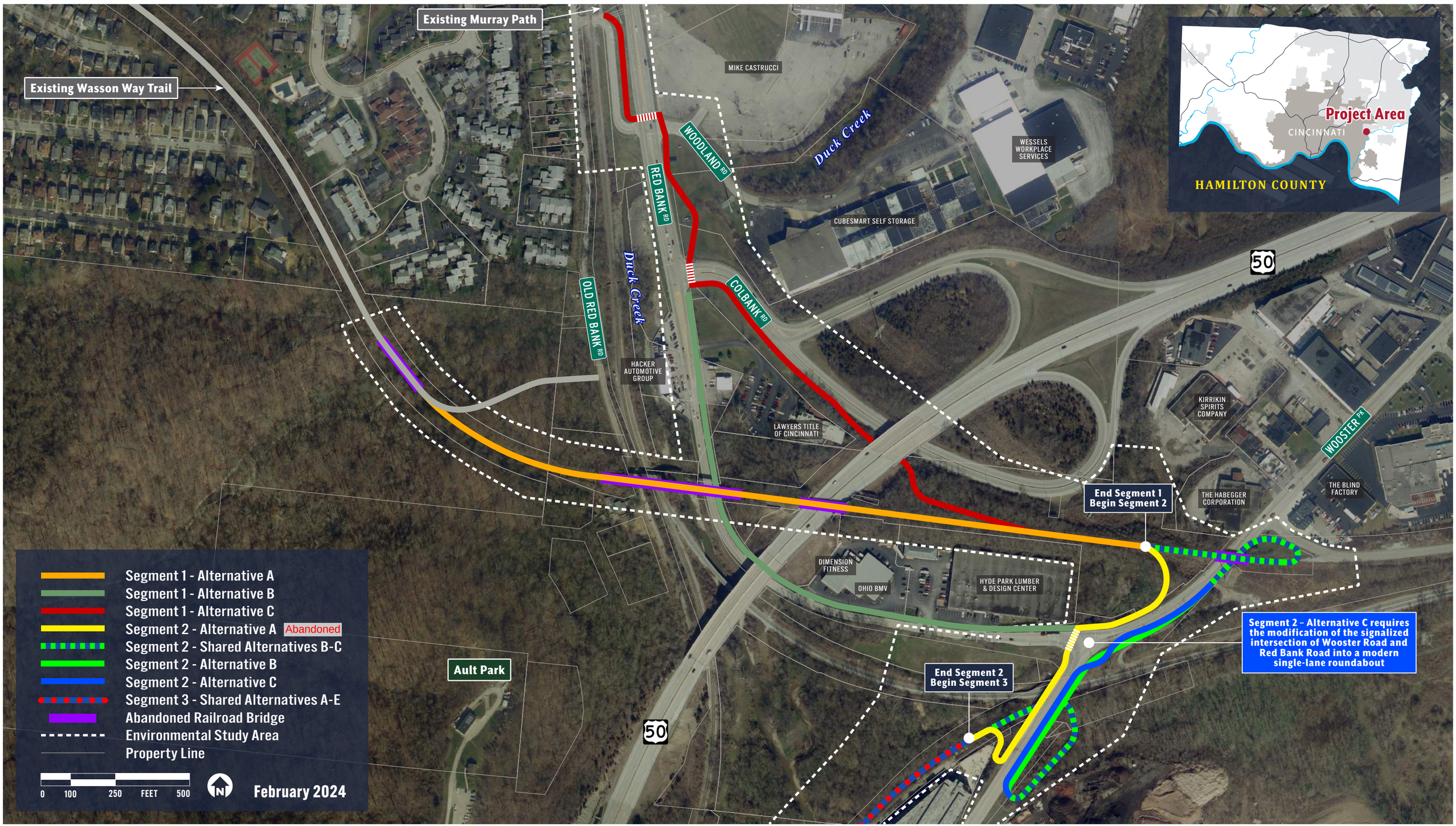
A.3 Segment 2-C Estimated Construction Costs and Quantities



APPENDIX A.1

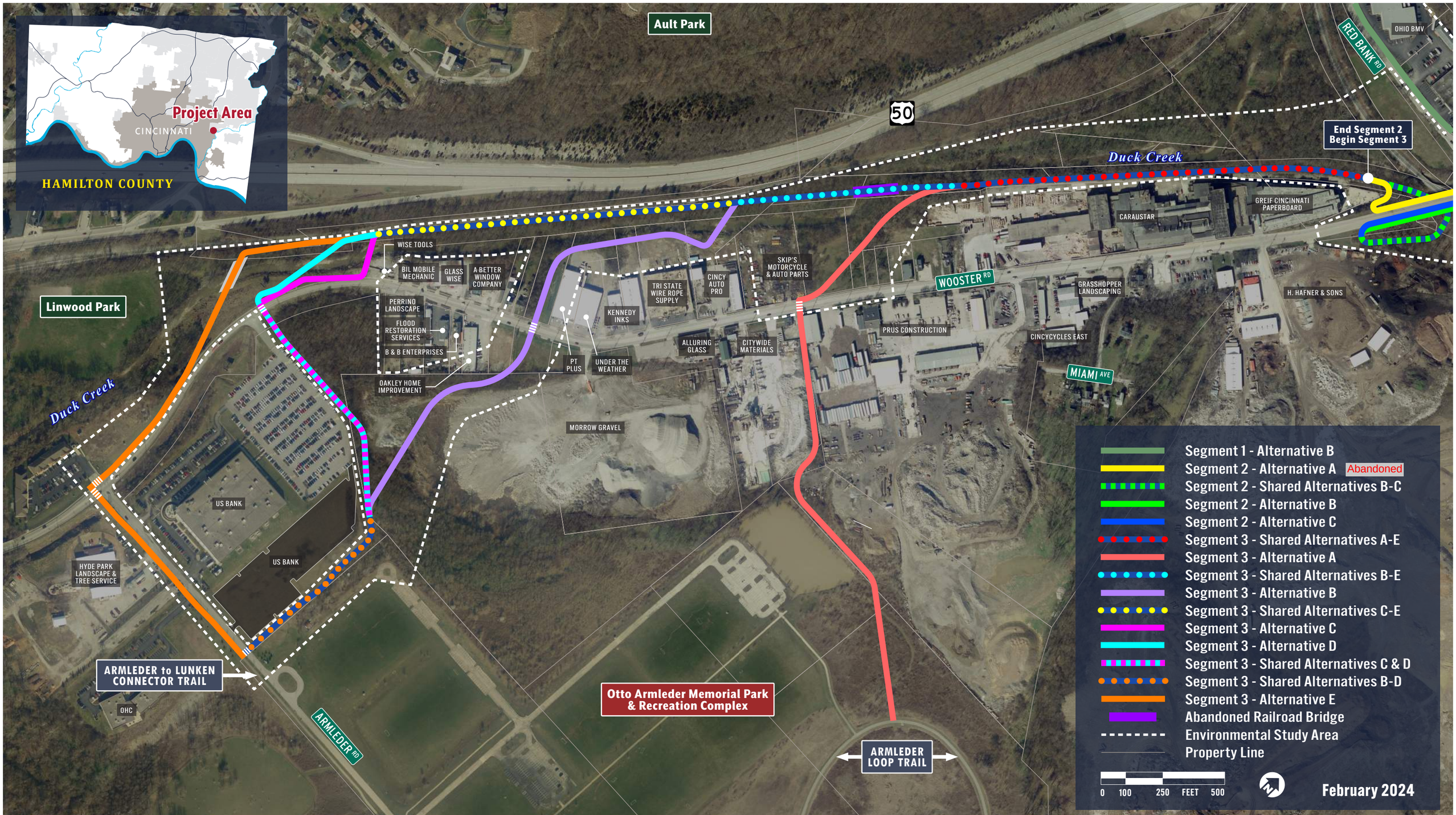
Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



APPENDIX A.2

Estimate Seg 2-B, RR 1

Estimated Cost:$210,192.21

Contingency: 20.00%

Estimated Total: $252,230.65

Wasson Armleder
Structure Type Study
Segment 2-B, RR Bridge Rehab
Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

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	EPOXY COATED STEEL REINFORCEMENT				
0010	511E34444	34.000	CY	$2,872.91304	$97,679.04
	CLASS QC2 CONCRETE, BRIDGE DECK				
0012	511E44110	17.000	CY	$1,497.25943	$25,453.41
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E75120	150.000	FT	$224.98307	$33,747.46
	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)				
0017	518E21200	19.000	CY	$129.47872	$2,460.10
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	50.000	FT	$10.49939	$524.97
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	20.000	FT	$20.22156	$404.43
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$210,192.21

Estimate Seg 2-B, RR 2

Estimated Cost:$226,363.03

Contingency: 20.00%

Estimated Total: $271,635.64

Wasson Armleder
Structure Type Study
Segment 2-B, RR Bridge Rehab
Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
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0005	202E11202 PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN	1.000	LS	$25,000.00000	$25,000.00
0007	441E10100 ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M	6.000	CY	$300.00000	$1,800.00
0008	441E10100 ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M	9.000	CY	$300.00000	$2,700.00
0009	509E10000 EPOXY COATED STEEL REINFORCEMENT	11,200.000	LB	$2.22525	$24,922.80
0010	511E34444 CLASS QC2 CONCRETE, BRIDGE DECK	34.000	CY	$2,872.91304	$97,679.04
0012	511E44110 CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING	17.000	CY	$1,497.25943	$25,453.41
0015	517E75120 RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	150.000	FT	$224.98307	$33,747.46
0017	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	19.000	CY	$129.47872	$2,460.10
0018	518E40000 6" PERFORATED CORRUGATED PLASTIC PIPE	50.000	FT	$10.49939	$524.97
0019	518E40010 6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S	20.000	FT	$20.22156	$404.43
0020	613E41200 LOW STRENGTH MORTAR BACKFILL	136.000	CY	$85.81483	$11,670.82

Total for Group 0001:$226,363.03

Estimate Seg 2-B Wstr

Estimated Cost:$1,366,893.32

Contingency: 20.00%

Estimated Total: $1,640,271.98

Wasson Armleder
Structure Type Study
Segment 2-B, Wooster Bridge

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	202E11202	1.000	LS	$50,000.00000	$50,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0006	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0007	507E00500	760.000	FT	$14.46205	$10,991.16
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0008	507E00550	830.000	FT	$48.61848	$40,353.34
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0009	509E10000	100,800.000	LB	$1.83839	$185,309.71
	EPOXY COATED STEEL REINFORCEMENT				
0010	511E32212	113.000	CY	$992.10438	$112,107.79
	CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE				
0011	511E40512	239.000	CY	$820.93787	$196,204.15
	CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS				
0012	511E44112	305.000	CY	$764.21792	$233,086.47
	CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTIN G				
0013	511E46512	120.000	CY	$558.59356	$67,031.23
	CLASS QC1 CONCRETE WITH QC/QA, FOOTING				
0014	513E10240	121,400.000	LB	$2.29268	$278,331.35
	STRUCTURAL STEEL MEMBERS, LEVEL 2				
0015	516E44100	12.000	EACH	$1,398.56222	$16,782.75
	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)				
0016	517E70100	241.000	FT	$482.03582	$116,170.63
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0017	518E21200	256.000	CY	$107.68990	$27,568.61
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	157.000	FT	$10.04178	$1,576.56
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	80.000	FT	$17.24461	$1,379.57
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$1,366,893.32

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	0	0	LF
Pier	63.00	1.00	1.00	0	0	
	62.00	1.00	1.00	0	0	
					0	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	0	0	LF
Pier	68.00	1.00	1.00	0	0	
	67.00	1.00	1.00	0	0	
					0	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				2205	LB
Pier	Assume 2% steel				0	
Slab	Assume 2% steel				9004	
					11209	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	75.00	16.33	0.75	1	34	CY
Curb	75.00	0.50	0.50	0	0	
					34	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	25.00	3.00	3.00	0	0	CY
Beam Seat	25.00	3.00	3.00	2	17	
Wingwalls	6.52	2.25	3.00	0	0	
					17	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	0	0	CY
					0	CY
Item 517, Twin Steel Tube Railing, modified.						
	75.00	1.00	1.00	2	150	LF
Item 518, Porous Backfill with Geotextile Fabric						
	25.00	2.00	5.00	2	19	CY
Item 518, 6" Perforated Plastic Pipe						
	25.00	1.00	1.00	2	50	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	10.00	1.00	1.00	2	20	LF

Designed by:_____Checked by:_____

		Length	Width	Height	Number	Total	Units
Item 441 Asphalt Surface Course							
		75.00	16.33	0.13	1	6	CY
Item 445 Asphalt Intermediate Course							
		75.00	16.33	0.21	1	9	CY
Item 507, 12" CIP Reinforced Piles, Furnished							
	Abutment	80.00	1.00	1.00	0	0	LF
	Pier	5.00	1.00	1.00	0	0	
		5.00	1.00	1.00	0	0	
						0	LF
Item 509, Epoxy Coated Reinforcing Steel							
	Abutment	Assume 1% steel				2205	LB
	Pier	Assume 2% steel				0	
	Slab	Assume 2% steel				9004	
						11209	LB
Item 511, Class QC2 Concrete, Superstructure							
	Slab	75.00	16.33	0.75	1	34	CY
	Curb	75.00	0.50	0.50	0	0	
						34	CY
Item 511, Class QC1 Concrete, Abutment Including Footing							
	Footing	25.00	3.00	3.00	0	0	CY
	Beam Seat	25.00	3.00	3.00	2	17	
	Wingwalls	6.52	2.25	3.00	0	0	
						17	CY
Item 511, Class QC1 Concrete, Pier above Footing							
		16.47	3.00	2.00	0	0	CY
						0	CY
Item 517, Twin Steel Tube Railing, modified.							
		75.00	1.00	1.00	2	150	LF
Item 518, Porous Backfill with Geotextile Fabric							
		25.00	2.00	5.00	2	19	CY
Item 518, 6" Perforated Plastic Pipe							
		25.00	1.00	1.00	2	50	LF
Item 613, Low Strength Mortar Backfill							
		75.00	16.33	3.00	1	136	CY

Designed by:_____Checked by:_____

		Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven							
	Rear Abutment	50.00	1.00	1.00	4	200	LF
	Foward Abutment	65.00	1.00	1.00	4	260	
	Pier	50.00	1.00	1.00	3	150	
		50.00	1.00	1.00	3	150	
						760	LF
Item 507, 12" CIP Reinforced Piles, Furnished							
	Abutment	55.00	1.00	1.00	4	220	LF
		70.00	1.00	1.00	4	280	
	Pier	55.00	1.00	1.00	3	165	
		55.00	1.00	1.00	3	165	
						830	LF
Item 509, Epoxy Coated Reinforcing Steel							
	Abutment	Assume 1% steel				8090	LB
	Pier	Assume 2% steel				63195	
	Slab	Assume 2% steel				29473	
						100759	LB
Item 511, Class QC2 Concrete, Superstructure							
	Slab	241.00	17.00	0.71	1	107	CY
	Haunch	241.00	0.88	0.17	3	4	
						111	CY
Item 511, Class QC1 Concrete, Abutment Including Footing							
Fwd	Footing	23.25	6.50	3.00	1	17	CY
	Beam Seat	23.25	4.75	5.50	1	22	
	Wingwalls	15.00	1.50	9.50	2	16	
	Backwall	23.25	1.75	4.00	1	6	
						61	CY
Item 511, Class QC1 Concrete, Abutment not Including Footing							
Rear	Beam Seat	23.25	3.00	23.00	1	59	CY
	Wingwalls	40.00	3.00	27.00	2	240	
	Backwall	23.25	1.75	4.00	1	6	
						305	CY
Item 511, Class QC1 Concrete, Pier above Footing							
		15.00	3.00	18.00	4	120	CY
		23.25	3.00	23.00	2	119	
						239	CY
Item 511, Class QC1 Concrete, Footing							
	Rear Abutment	23.25	20.00	3.00	1	52	CY
	Piers	38.25	8.00	3.00	2	68	
						120	CY

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 513, Structural Steel - Rolled beams						
Beams	241.00	148 lb/ft	1.00	3.00	107004	LB
Diaphragms	5.00	34 lb/ft	1.00	20.00	3390	
Miscellaneous (10%)					11039	
					121433	LB
Item 516, Elastomeric Bearings						
	1.00	1.00	1.00	12	12	EA
Item 517, Twin Steel Tube Railing, modified.						
	241.00	1.00	1.00	1	241	LF
Item 518, Porous Backfill with Geotextile Fabric						
Rear Abutment	23.25	2.00	27.00	1	47	CY
	40.00	2.00	27.00	2	160	
Forward Abutment	23.25	2.00	12.50	1	22	
	15.00	2.00	12.50	2	28	
					256	CY
Item 518, 6" Perforated Plastic Pipe						
Rear Abutment	23.25	1.00	1.00	1	23	LF
	40.00	1.00	1.00	2	80	
Forward Abutment	23.25	1.00	1.00	1	23	
	15.00	1.00	1.00	2	30	
					157	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	20.00	1.00	1.00	4	80	LF

Designed by:_____Checked by:_____

APPENDIX A.3

Estimate Seg 2-C, RR 1

Estimated Cost:$210,192.21

Contingency: 20.00%

Estimated Total: $252,230.65

Wasson Armleder
Structure Type Study
Segment 2-B, RR Bridge Rehab
Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	202E11202	1.000	LS	$25,000.00000	$25,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0009	509E10000	11,200.000	LB	$2.22525	$24,922.80
	EPOXY COATED STEEL REINFORCEMENT				
0010	511E34444	34.000	CY	$2,872.91304	$97,679.04
	CLASS QC2 CONCRETE, BRIDGE DECK				
0012	511E44110	17.000	CY	$1,497.25943	$25,453.41
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E75120	150.000	FT	$224.98307	$33,747.46
	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)				
0017	518E21200	19.000	CY	$129.47872	$2,460.10
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	50.000	FT	$10.49939	$524.97
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	20.000	FT	$20.22156	$404.43
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$210,192.21

Estimate Seg 2-C, RR 2

Estimated Cost:$226,363.03

Contingency: 20.00%

Estimated Total: $271,635.64

Wasson Armleder
Structure Type Study
Segment 2-B, RR Bridge Rehab
Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	202E11202	1.000	LS	$25,000.00000	$25,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0007	441E10100	6.000	CY	$300.00000	$1,800.00
	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M				
0008	441E10100	9.000	CY	$300.00000	$2,700.00
	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (446), PG70-22M				
0009	509E10000	11,200.000	LB	$2.22525	$24,922.80
	EPOXY COATED STEEL REINFORCEMENT				
0010	511E34444	34.000	CY	$2,872.91304	$97,679.04
	CLASS QC2 CONCRETE, BRIDGE DECK				
0012	511E44110	17.000	CY	$1,497.25943	$25,453.41
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E75120	150.000	FT	$224.98307	$33,747.46
	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)				
0017	518E21200	19.000	CY	$129.47872	$2,460.10
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	50.000	FT	$10.49939	$524.97
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	20.000	FT	$20.22156	$404.43
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				
0020	613E41200	136.000	CY	$85.81483	$11,670.82
	LOW STRENGTH MORTAR BACKFILL				

Total for Group 0001:$226,363.03

Estimate Seg 2-C Wstr

Estimated Cost:$487,869.63

Contingency: 20.00%

Estimated Total: $585,443.56

Wasson Armleder
Structure Type Study
Segment 2-C, Wooster Bridge

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				
Group 0001: Initial Group					
0005	202E11202	1.000	LS	$75,000.00000	$75,000.00
	PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN				
0009	509E10000	26,400.000	LB	$2.06544	$54,527.62
	EPOXY COATED STEEL REINFORCEMENT				
0010	511E34444	100.000	CY	$2,381.71379	$238,171.38
	CLASS QC2 CONCRETE, BRIDGE DECK				
0015	517E70100	241.000	FT	$482.03582	$116,170.63
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0016	847E10100	20.000	SY	$200.00000	$4,000.00
	LATEX MODIFIED CONCRETE OVERLAY				

Total for Group 0001:$487,869.63

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	0	0	LF
Pier	63.00	1.00	1.00	0	0	
	62.00	1.00	1.00	0	0	
					0	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	0	0	LF
Pier	68.00	1.00	1.00	0	0	
	67.00	1.00	1.00	0	0	
					0	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				2205	LB
Pier	Assume 2% steel				0	
Slab	Assume 2% steel				9004	
					11209	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	75.00	16.33	0.75	1	34	CY
Curb	75.00	0.50	0.50	0	0	
					34	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	25.00	3.00	3.00	0	0	CY
Beam Seat	25.00	3.00	3.00	2	17	
Wingwalls	6.52	2.25	3.00	0	0	
					17	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	0	0	CY
					0	CY
Item 517, Twin Steel Tube Railing, modified.						
	75.00	1.00	1.00	2	150	LF
Item 518, Porous Backfill with Geotextile Fabric						
	25.00	2.00	5.00	2	19	CY
Item 518, 6" Perforated Plastic Pipe						
	25.00	1.00	1.00	2	50	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	10.00	1.00	1.00	2	20	LF

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 441 Asphalt Surface Course						
	75.00	16.33	0.13	1	6	CY
Item 445 Asphalt Intermediate Course						
	75.00	16.33	0.21	1	9	CY
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	80.00	1.00	1.00	0	0	LF
Pier	5.00	1.00	1.00	0	0	
	5.00	1.00	1.00	0	0	
					0	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				2205	LB
Pier	Assume 2% steel				0	
Slab	Assume 2% steel				9004	
					11209	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	75.00	16.33	0.75	1	34	CY
Curb	75.00	0.50	0.50	0	0	
					34	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	25.00	3.00	3.00	0	0	CY
Beam Seat	25.00	3.00	3.00	2	17	
Wingwalls	6.52	2.25	3.00	0	0	
					17	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	0	0	CY
					0	CY
Item 517, Twin Steel Tube Railing, modified.						
	75.00	1.00	1.00	2	150	LF
Item 518, Porous Backfill with Geotextile Fabric						
	25.00	2.00	5.00	2	19	CY
Item 518, 6" Perforated Plastic Pipe						
	25.00	1.00	1.00	2	50	LF
Item 613, Low Strength Mortar Backfill						
	75.00	16.33	3.00	1	136	CY

Designed by:_____Checked by:_____

		Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven							
	Rear Abutment	50.00	1.00	1.00	0	0	LF
	Foward Abutment	65.00	1.00	1.00	0	0	
	Pier	50.00	1.00	1.00	0	0	
		50.00	1.00	1.00	0	0	
						0	LF
Item 507, 12" CIP Reinforced Piles, Furnished							
	Abutment	55.00	1.00	1.00	0	0	LF
		70.00	1.00	1.00	0	0	
	Pier	55.00	1.00	1.00	0	0	
		55.00	1.00	1.00	0	0	
						0	LF
Item 509, Epoxy Coated Reinforcing Steel							
	Abutment	Assume 1% steel				0	LB
	Pier	Assume 2% steel				0	
	Slab	Assume 2% steel				26373	
						26373	LB
Item 511, Class QC2 Concrete, Superstructure							
	Parapet	241.00	4.08 SF	1.00	2	73	CY
	Deck	241.00	2.00	0.75	2	27	
						100	CY
Item 511, Class QC1 Concrete, Abutment Including Footing							
Fwd	Footing	23.25	6.50	3.00	0	0	CY
	Beam Seat	23.25	4.75	5.50	0	0	
	Wingwalls	15.00	1.50	9.50	0	0	
	Backwall	23.25	1.75	4.00	0	0	
						0	CY
Item 511, Class QC1 Concrete, Abutment not Including Footing							
Rear	Beam Seat	23.25	3.00	23.00	0	0	CY
	Wingwalls	40.00	3.00	27.00	0	0	
	Backwall	23.25	1.75	4.00	0	0	
						0	CY
Item 511, Class QC1 Concrete, Pier above Footing							
		15.00	3.00	18.00	0	0	CY
		23.25	3.00	23.00	0	0	
						0	CY
Item 511, Class QC1 Concrete, Footing							
	Rear Abutment	23.25	20.00	3.00	0	0	CY
	Piers	38.25	8.00	3.00	0	0	
						0	CY

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 517, Twin Steel Tube Railing, modified.						
	241.00	1.00	1.00	1	241	LF
Item 518, Porous Backfill with Geotextile Fabric						
Rear Abutment	23.25	2.00	27.00	0	0	CY
	40.00	2.00	27.00	0	0	
Forward Abutment	23.25	2.00	12.50	0	0	
	15.00	2.00	12.50	0	0	
					0	CY
Item 518, 6" Perforated Plastic Pipe						
Rear Abutment	23.25	1.00	1.00	0	0	LF
	40.00	1.00	1.00	0	0	
Forward Abutment	23.25	1.00	1.00	0	0	
	15.00	1.00	1.00	0	0	
					0	LF
Item 847, Concrete Overlay						
	241.00	6.00	0.13	1	20	SY

Designed by:_____Checked by:_____

Segment 3 Structure Type Study

Stantec

STRUCTURE TYPE STUDY
Wasson-Armleder Trail
Bridges on Segment 3

February 27, 2024

Prepared for:
ODOT - District 8

Prepared by:
Stantec

Project Number:
173620146

The conclusions in the Report titled Structure Type Study are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from ODOT - District 8 (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

Prepared by: _____
Signature

_____
Printed Name

Reviewed by: _____
Signature

_____
Printed Name

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1 Introduction

The purpose of this report is to determine and evaluate the feasible structure types on each of the four alternative alignments (A-D) proposed for the Segment 3 portion of the trail. The evaluation is to aid in determining the preferred alignment with which to move forward. This study will determine the recommended structure type and the cost of the proposed structure for each alternative alignment.

The proposed paved shared-use path will be 12 feet wide with 5-foot shoulders on each side. Segment 3 extends from south of Red Bank Road to the Armleder-to-Lunken Connector Trail. The first portion of the segment runs along the west side of Duck Creek then crosses Duck Creek at one of four possible locations.

2 Design Considerations

2.1 Design Specifications

All proposed structures will be designed in accordance with the 2020 ODOT Bridge Design Manual, the ODOT Multimodal Design Guide (2023), the AASHTO LRFD Bridge Design Specifications, 9th Edition (2020) and the AASHTO Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition (2009).

2.2 Bridge Design Criteria

- Pedestrian Live Load of 90 psf
- H15-44 vehicle loading (Ambulance or maintenance vehicles) without dynamic load allowance
- No Future Wearing Surface
- Bridges must minimize impacts to the 100-year recurrence backwater elevation from the Ohio River. The 100-year recurrence flood of Duck Creek does not control flooding in this area.
- The width of the bridges must provide 16 feet face to face of the railings in accordance with the ODOT Mulitmodal Design Guide.

2.3 Geotechnical

A geotechnical investigation has not been performed at this stage of the project. Geotechnical information is based on historical borings in the vicinity of the bridges. The historical borings indicate the presence of sand and gravel to a depth of approximately 20 feet, then clay and or sand to a depth of approximately 80 feet. Rock was not encountered in any of the borings. Therefore, the assumption for this study is that all foundations will be deep foundations using CIP piling.

2.4 Hydraulics

All four alignments, and thus all four bridges, lie in an area inundated by the 100-year flood. The FEMA 100-year water surface elevations at the bridges are controlled by backwater from the Ohio River by way of the Little Miami river. Based on the trail profiles all four of the bridges will be submerged for this condition

The four bridges also lie within the 100-year floodway of Duck Creek. The bridges will all be submerged for this condition as well.

To minimize the impact of the bridges on the 100-year floods, the waterway opening to the top of bank will be maintained with no fill being placed within the banks which would reduce the waterway opening.

A preliminary hydraulic analysis was performed on Duck Creek for this study. A summary of this analysis is included in the Feasibility Study. A detailed hydraulic study will be performed on the selected alternative and a separate report will be submitted.

3 Alternatives

The alternative structure types for Segments 3-B thru 3-E are presented in this section. Based on the hydraulic analysis results which indicate these bridges are subject to flooded conditions, the superstructure types have been limited to concrete or prestressed concrete. Steel has not been considered due to the potential for accelerated corrosion caused by frequent flooding.

3.1 Segment 3-B

3.1.1 ALIGNMENT

The trail runs parallel to the adjacent railroad on the ground between the railroad and Duck Creek. Prior to crossing the bridge, the trail makes a 212.21-degree curve to the left and crosses the creek on a tangent before making a 212.21-degree curve to the right. The tangent is skewed approximately 39 degrees to the flow of the creek.

3.1.2 SPAN ARRANGEMENT

The east bank of Duck Creek is sloped much steeper than 2:1. Therefore, to avoid disturbing the slope, the abutment on this side has been set back from the top of slope a reasonable distance while not extending further into the horizontal curve than is necessary. However, the extension into the curve is sufficient to require the end of the deck be curved. The west bank slopes up slightly steeper than 2:1, then levels out for a short distance. The proposed abutment was set by extending a 2:1 slope up from the top of this lower creek bank. However, this would require the deck be curved at the west end. Therefore, the abutment has been moved forward to allow the use of a straight deck while maintaining the minimum required horizontal clearances on the bridge.

The resulting length of the bridge is approximately 95 feet. As noted above, a continuous reinforced concrete slab bridge and a prestressed concrete box beam bridge will be considered for this alternative. Minimizing the superstructure depth is critical to reducing the impact of the bridge on the 100-year flood elevation. Therefore, a three-span will be considered since a single span bridge would require significantly deeper prestressed concrete box beams.

3.1.3 ALTERNATIVE 1

This alternative considers a three-span reinforced concrete slab bridge. The spans are set at 29-36.25-29 feet for an overall length of 94.25 feet. Based on Standard Drawing CS-1-08, the slab depth will be 18.5 inches. The standard drawing indicates the design is acceptable for skews up to 30 degrees, so the skew of the bridge substructure has been adjusted to be at 30 degrees to the centerline. This provides an acceptable alignment with the flow of the creek.

3.1.4 ALTERNATIVE 2

This alternative considers a three-span prestressed concrete box beam bridge with a composite concrete slab. The spans are set at 32-32-32 feet. Preliminary design indicates four CB17-48 composite prestressed box beams are required for this alternative. A 6-inch concrete slab will be utilized to minimize flooding impacts on the bridge.

3.2 Segment 3-C

3.2.1 ALIGNMENT

The trail runs parallel to the adjacent railroad on the ground between the railroad and Duck Creek. Prior to crossing the bridge, the trail makes a 212.21-degree curve to the left and crosses the creek on a tangent before making a 212.21-degree curve to the right. The tangent is skewed approximately 33 degrees to the flow of the creek.

3.2.2 SPAN ARRANGEMENT

For the initial layout, the overall length of bridge was set utilizing 2:1 slopes on the banks up from the creek bed. The existing west bank rise is steeper than 2:1, therefore, this bank will be maintained and the abutment footing placed at an elevation which allows for erosion of the bank to the 2:1 slope. The east bank is approximately at a 2:1 slope and the abutment will be placed near the top of the bank.

Setting the west abutment at the top of the existing slope caused the bridge to extend significantly into the horizontal curve on the west approach. Due to the skew and sharpness of the curve, the north edge of the deck did not reach the abutment. Therefore, this abutment was moved forward to a location where the bridge deck, while still within the curve, would be supported on the abutment and permit a straight bridge deck. The resulting overall length of the bridge is approximately 110 feet.

Due to the flooding concerns, only two superstructure types were considered, prestressed concrete box beams or a continuous reinforced concrete slab. Minimizing the superstructure depth is critical to

reducing the impact of the bridge on the 100-year flood elevation. Therefore, a three-span will be considered since a single span bridge would require significantly deeper prestressed concrete box beams.

3.2.3 ALTERNATIVE 1

This alternative considers a three-span reinforced concrete slab bridge. The spans are set at 34-42.5-34 feet for an overall length of 110.50 feet. Based on Standard Drawing CS-1-08, the slab depth will be 21 inches. The standard drawing indicates the design is acceptable for skews up to 30 degrees, so the skew of the bridge substructure has been adjusted to be 30 degrees to the centerline. This provides an acceptable alignment with the flow of the creek.

3.2.4 ALTERNATIVE 2

This alternative considers a three-span prestressed concrete box beam bridge with a composite concrete slab. The spans are set at 37-37-37 feet. Preliminary design indicates four CB17-48 beams are required for this alternative.

3.3 Segment 3-D

3.3.1 ALIGNMENT

The trail runs parallel to the adjacent railroad on the ground between the railroad and Duck Creek. Prior to crossing the bridge, the trail makes a 9.55-degree curve to the left and crosses the creek on a tangent before making a 57.3-degree curve to the right. The tangent is skewed approximately 57 degrees to the flow of the creek.

3.3.2 SPAN ARRANGEMENT

For the initial layout, the overall length of bridge was set utilizing a 2:1 slope extending up from the top of bank on the existing west bank. The existing east bank is approximately a 2:1 slope and the abutment will be placed near the top of the bank.

Setting the west abutment at the top of the 2:1 slope caused the bridge to extend into the horizontal curve on the west approach, requiring the deck to be curved at that end. By moving this abutment forward approximately 20 feet, a straight deck can be used with a resulting overall length of approximately 135 feet.

With a straight deck, the possible structure types were a three-span reinforced concrete slab bridge, and a single or three-span prestressed concrete bridge utilizing box beams or I-beams. Minimizing the superstructure depth is critical to reducing the impact of the bridge on the 100-year flood elevation. Therefore, the single span prestressed concrete I-beam structure was eliminated due to the depth of girder that would be required for a 135-foot span. The three-span prestressed concrete I-beam structure was determined to require a greater depth superstructure than a prestressed concrete box beam bridge.

Therefore, a three-span structure will be considered comparing composite prestressed box beams and a reinforced concrete slab structure.

3.3.3 ALTERNATIVE 1

This alternative considers a three-span reinforced concrete slab bridge. The spans are set at 42-52.5-42 feet for an overall length of 136.50 feet. Based on Standard Drawing CS-1-08, the slab depth will be 25 inches. The standard drawing indicates the design is acceptable for skews up to 30 degrees, so the final design will need to be analyzed for the skew of the bridge which is 57 degrees.

3.3.4 ALTERNATIVE 2

This alternative considers a three-span prestressed concrete box beam bridge with a composite concrete slab. The spans are set at 45-45-45 feet. Preliminary design indicates four CB21-48 beams are required for this alternative. Since the skew exceeds the maximum of 30 degrees permitted for the prestressed concrete box beams, the final design of the beams will require special detailing and design.

3.4 Segment 3-E

3.4.1 ALIGNMENT

The trail runs parallel to the adjacent railroad on the ground between the railroad and Duck Creek. Prior to crossing the bridge, the trail makes a 212.21-degree curve to the left and crosses the creek on a tangent which extends well beyond the creek. The tangent is skewed approximately 43.5 degrees to the flow of the creek.

3.4.2 SPAN ARRANGEMENT

For the initial layout, the overall length of bridge was set utilizing a 2:1 slope extending up from the toe of bank on the existing west bank. The existing east bank is approximately a 2:1 slope. The existing bank will be extended up and the abutment will be placed near the top of the bank. This results in a total length of 128 feet for the bridge.

With a straight deck for the full length of the bridge, the possible superstructure types were a single span prestressed concrete I-beam, a three-span reinforced concrete slab bridge, and a three-span prestressed concrete bridge utilizing box beams or I-beams.

With a straight deck, the possible structure types were a three-span reinforced concrete slab bridge, and a single or three-span prestressed concrete bridge utilizing box beams or I-beams. Minimizing the superstructure depth is critical to reducing the impact of the bridge on the 100-year flood elevation. Therefore, the single span prestressed concrete I-beam structure was eliminated due to the depth of girder that would be required for a 128-foot span. The three-span prestressed concrete I-beam structure was determined to require a greater depth superstructure than a prestressed concrete box beam bridge. Therefore, a three-span structure will be considered comparing composite prestressed box beams and a reinforced concrete slab structure.



3.4.3 ALTERNATIVE 1

This alternative considers a three-span reinforced concrete slab bridge. The spans are set at 40-50-40 feet for an overall length of 130 feet. Based on Standard Drawing CS-1-08, the slab depth will be 24 inches. The standard drawing indicates the design is acceptable for skews up to 30 degrees, so the final design of the slab will need to be checked since the 43.5 degree skew of the bridge exceeds this limit.

3.4.4 ALTERNATIVE 2

This alternative considers a three-span prestressed concrete box beam bridge with a composite concrete slab. The spans are set at 43.5-43.5-43.5 feet. Preliminary design indicates four CB21-48 beams are required for this alternative. Since the skew exceeds the maximum of 30 degrees permitted for the prestressed concrete box beams, the final design of the beams will require special detailing and design.

4 Cost Estimates

Preliminary construction cost estimates were developed for each alternative structure type on each alignment. Since all structure types are of similar material, future maintenance costs will be similar for each alternative and thus do not impact the selection of the preferred alternative.

Alignment Segment	Estimated Construction Cost
3-B	
Alternative 1 – CIP concrete slab	$528,179
Alternative 2 - PCBB	$688,012
3-C	
Alternative 1 – CIP concrete slab	$596,997
Alternative 2 - PCBB	$728,543
3-D	
Alternative 1 – CIP concrete slab	$682,020
Alternative 2 - PCBB	$862,899
3-E	
Alternative 1 – CIP concrete slab	$714,545
Alternative 2 - PCBB	$900,754

5 Recommendation

Based on the estimated initial construction cost, Alternative 1 is recommended for each of the proposed trail segments, 3-B, 3-C, 3-D, and 3-E. This bridge type is a continuous concrete slab superstructure.

APPENDIX A

Appendix A

A.1 Proposed Trail Alignments

A.2 Segment 3-B Estimated Construction Costs and Quantities

A.3 Segment 3-C Estimated Construction Costs and Quantities

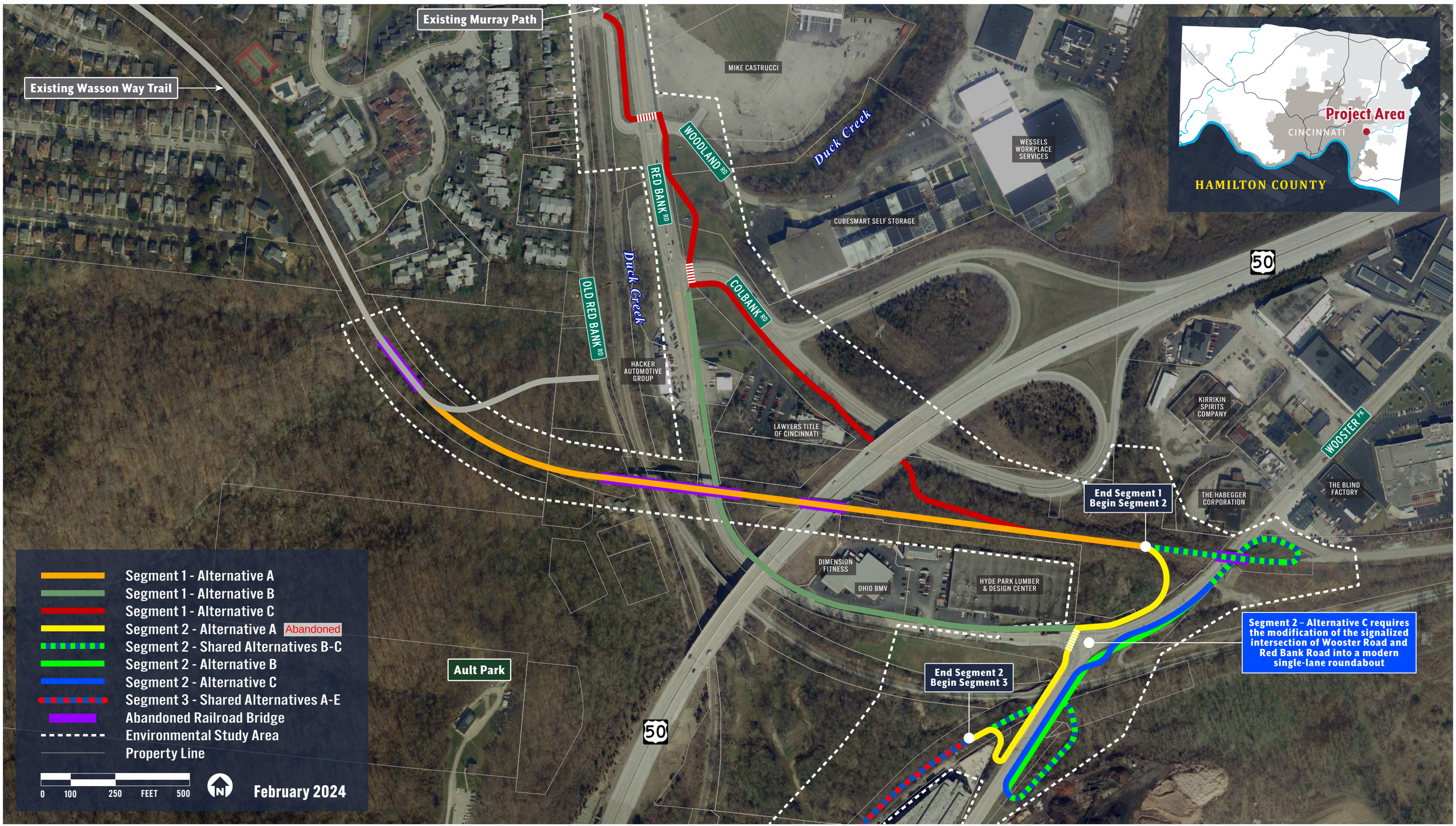
A.4 Segment 3-D Estimated Construction Costs and Quantities

A.5 Segment 3-E Estimated Construction Costs and Quantities

APPENDIX A.1

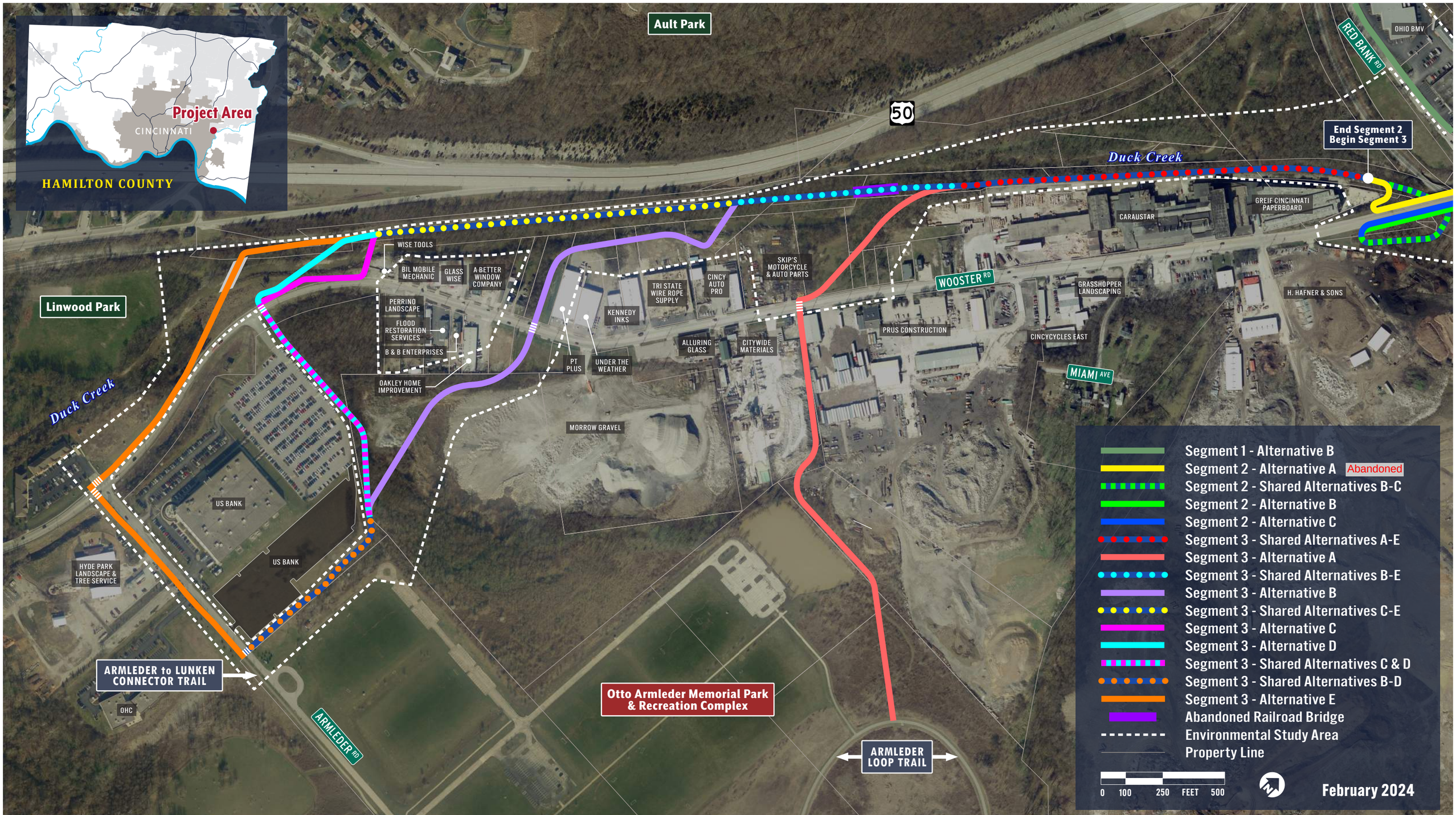
Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



Shared Use Path Alternatives

Wasson Way Trail Connection to Otto Armleder Park (PID 113603)



APPENDIX A.2

Estimate Seg 3-B, Alt. 1

Estimated Cost:$440,148.84

Contingency: 20.00%

Estimated Total: $528,178.61

Wasson Armleder
Structure Type Study
Segment 3-B, Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,000.000	FT	$12.61283	$12,612.83
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,090.000	FT	$48.61848	$52,994.14
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	34,500.000	LB	$2.01795	$69,619.27
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E32212	92.000	CY	$1,000.00000	$92,000.00
	CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE				
0011	511E42510	7.000	CY	$1,875.20968	$13,126.47
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E44110	62.000	CY	$962.80458	$59,693.88
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E70100	192.000	FT	$482.03582	$92,550.88
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0017	518E21200	138.000	CY	$112.50923	$15,526.27
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	62.000	FT	$10.41180	$645.53
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	80.000	FT	$17.24461	$1,379.57
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$440,148.84

Estimate Seg-3-B, Alt 2

Estimated Cost:$573,343.63

Contingency: 20.00%

Estimated Total: $688,012.36

Wasson Armleder
Structure Type Study
Segment 3-B, Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
Group 0001: Initial Group					
0005	505E11100 PILE DRIVING EQUIPMENT MOBILIZATION	1.000	LS	$30,000.00000	$30,000.00
0006	507E00500 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	1,000.000	FT	$12.61283	$12,612.83
0007	507E00550 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	1,090.000	FT	$48.61848	$52,994.14
0008	509E10000 EPOXY COATED STEEL REINFORCEMENT	19,900.000	LB	$2.11681	$42,124.52
0009	511E34444 CLASS QC2 CONCRETE, BRIDGE DECK	48.000	CY	$2,705.78029	$129,877.45
0011	511E42510 CLASS QC1 CONCRETE, PIER CAP	12.000	CY	$1,875.20968	$22,502.52
0012	511E43510 CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING	72.000	CY	$567.36696	$40,850.42
0014	515E12030 PRESTRESSED CONCRETE COMPOSITE BOX BEAM BRIDGE MEMBERS, LEVE L 1, CB17-48	12.000	EACH	$11,350.67337	$136,208.08
0016	516E43100 ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE) <2" THICK	48.000	EACH	$117.70158	$5,649.68
0019	517E70100 RAILING (THREE STEEL TUBE BRIDGE RAILING)	193.000	FT	$482.03582	$93,032.91
0020	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	45.000	CY	$121.80587	$5,481.26
0021	518E40000 6" PERFORATED CORRUGATED PLASTIC PIPE	62.000	FT	$10.41180	$645.53
0022	518E40010 6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S	79.000	FT	$17.26955	$1,364.29

Total for Group 0001:$573,343.63

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	10	500	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1000	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	10	550	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1090	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				8151	LB
Pier	Assume 2% steel				1937	
Slab	Assume 2% steel				24424	
					34512	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	95.98	16.00	1.54	1	88	CY
Diaphragm	18.48	2.25	1.50	2	5	
					92	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	31.00	3.00	3.00	2	21	CY
Beam Seat	31.00	2.25	5.50	2	28	
Wingwalls	12.52	2.25	3.00	4	13	
					62	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	2	7	CY
					7	CY
Item 517, Twin Steel Tube Railing, modified.						
	95.98	1.00	1.00	2	192	LF
Item 518, Porous Backfill with Geotextile Fabric						
	31.00	2.00	10.00	2	46	CY
Item 518, 6" Perforated Plastic Pipe						
	31.00	1.00	1.00	2	62	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	20.00	1.00	1.00	4	80	LF

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	10	500	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1000	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	10	550	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1090	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				9501	LB
Pier	Assume 1% steel				1630	
Slab	Assume 2% steel				8809	
					19939	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	96.31	16.00	0.58	1	33	CY
Diaphragm	18.48	3.00	1.83	0	0	
					33	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	31.00	3.00	3.00	2	21	CY
Beam Seat	31.00	3.00	5.00	2	34	
Wingwalls	12.52	3.00	3.00	4	17	
					72	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	18.48	3.00	3.00	2	12	CY
					12	CY
Item 515, PCBB CB17-48						
	1.00	1.00	1.00	12	12	EA
Item 516, Elastomeric bearings with intenal laminates						
	1.00	1.00	1.00	48	48	EA

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 517, Twin Steel Tube Railing, modified.	96.31	1.00	1.00	2	193	LF
Item 518, Porous Backfill with Geotextile Fabric	31.00	2.00	9.83	2	45	CY
Item 518, 6" Perforated Plastic Pipe	31.00	1.00	1.00	2	62	LF
Item 518, 6" Non-Perforated Plastic Pipe	19.67	1.00	1.00	4	79	LF

Designed by:_____Checked by:_____

APPENDIX A.3

Estimate Seg 3-C, Alt. 1

Estimated Cost:$497,497.53

Contingency: 20.00%

Estimated Total: $596,997.04

Wasson Armleder
Structure Type Study
Segment 3-C, Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				
Group 0001: Initial Group					
0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,000.000	FT	$12.61283	$12,612.83
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,090.000	FT	$48.61848	$52,994.14
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	42,100.000	LB	$1.98333	$83,498.19
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E32212	121.000	CY	$992.10438	$120,044.63
	CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE				
0011	511E42510	7.000	CY	$1,875.20968	$13,126.47
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E44110	62.000	CY	$962.80458	$59,693.88
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E70100	224.000	FT	$482.03582	$107,976.02
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0017	518E21200	138.000	CY	$112.50923	$15,526.27
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	62.000	FT	$10.41180	$645.53
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	80.000	FT	$17.24461	$1,379.57
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$497,497.53

Estimate Seg-3-C, Alt 2

Estimated Cost:$607,119.36

Contingency: 20.00%

Estimated Total: $728,543.23

Wasson Armleder
Structure Type Study
Segment 3-C, Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,000.000	FT	$12.61283	$12,612.83
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,090.000	FT	$48.61848	$52,994.14
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	21,400.000	LB	$2.10348	$45,014.47
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E34444	55.000	CY	$2,642.51050	$145,338.08
	CLASS QC2 CONCRETE, BRIDGE DECK				
0011	511E42510	12.000	CY	$1,875.20968	$22,502.52
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E43510	72.000	CY	$567.36696	$40,850.42
	CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING				
0014	515E12030	12.000	EACH	$11,350.67337	$136,208.08
	PRESTRESSED CONCRETE COMPOSITE BOX BEAM BRIDGE MEMBERS, LEVE L 1, CB17-48				
0016	516E43100	48.000	EACH	$117.70158	$5,649.68
	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE) <2" THICK				
0019	517E70100	225.000	FT	$482.03582	$108,458.06
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0020	518E21200	45.000	CY	$121.80587	$5,481.26
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0021	518E40000	62.000	FT	$10.41180	$645.53
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0022	518E40010	79.000	FT	$17.26955	$1,364.29
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$607,119.36

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	10	500	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1000	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	10	550	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1090	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				8151	LB
Pier	Assume 2% steel				1937	
Slab	Assume 2% steel				32019	
					42106	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	112.23	16.00	1.75	1	116	CY
Diaphragm	18.48	2.25	1.50	2	5	
					121	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	31.00	3.00	3.00	2	21	CY
Beam Seat	31.00	2.25	5.50	2	28	
Wingwalls	12.52	2.25	3.00	4	13	
					62	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	16.47	3.00	2.00	2	7	CY
					7	CY
Item 517, Twin Steel Tube Railing, modified.						
	112.23	1.00	1.00	2	224	LF
Item 518, Porous Backfill with Geotextile Fabric						
	31.00	2.00	10.00	2	46	CY
Item 518, 6" Perforated Plastic Pipe						
	31.00	1.00	1.00	2	62	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	20.00	1.00	1.00	4	80	LF

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	10	500	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1000	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	10	550	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1090	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				9501	LB
Pier	Assume 1% steel				1630	
Slab	Assume 2% steel				10273	
					21403	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	112.31	16.00	0.58	1	39	CY
Diaphragm	18.48	3.00	1.83	0	0	
					39	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	31.00	3.00	3.00	2	21	CY
Beam Seat	31.00	3.00	5.00	2	34	
Wingwalls	12.52	3.00	3.00	4	17	
					72	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	18.48	3.00	3.00	2	12	CY
					12	CY
Item 515, PCBB CB17-48						
	1.00	1.00	1.00	12	12	EA
Item 516, Elastomeric bearings with intenal laminates						
	1.00	1.00	1.00	48	48	EA

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 517, Twin Steel Tube Railing, modified.	112.31	1.00	1.00	2	225	LF
Item 518, Porous Backfill with Geotextile Fabric	31.00	2.00	9.83	2	45	CY
Item 518, 6" Perforated Plastic Pipe	31.00	1.00	1.00	2	62	LF
Item 518, 6" Non-Perforated Plastic Pipe	19.67	1.00	1.00	4	79	LF

Designed by:_____Checked by:_____

APPENDIX A.4

Estimate Seg 3-D, Alt. 1

Estimated Cost:$568,349.79

Contingency: 20.00%

Estimated Total: $682,019.75

Wasson Armleder
Structure Type Study
Segment 3-D, Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,325.000	FT	$10.96187	$14,524.48
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,445.000	FT	$48.61848	$70,253.70
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	48,400.000	LB	$1.95944	$94,836.90
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E32212	125.000	CY	$992.10438	$124,013.05
	CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE				
0011	511E42510	11.000	CY	$1,875.20968	$20,627.31
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E44110	95.000	CY	$832.32890	$79,071.25
	CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING				
0015	517E70100	227.000	FT	$482.03582	$109,422.13
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0017	518E21200	213.000	CY	$109.10208	$23,238.74
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0018	518E40000	96.000	FT	$10.23601	$982.66
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0019	518E40010	80.000	FT	$17.24461	$1,379.57
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$568,349.79

Estimate Seg-3-D, Alt 2

Estimated Cost:$719,082.49

Contingency: 20.00%

Estimated Total: $862,898.99

Wasson Armleder
Structure Type Study
Segment 3-D, Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				

Group 0001: Initial Group

0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,325.000	FT	$10.96187	$14,524.48
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,445.000	FT	$48.61848	$70,253.70
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	28,400.000	LB	$2.05237	$58,287.31
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E34444	43.000	CY	$2,758.01002	$118,594.43
	CLASS QC2 CONCRETE, BRIDGE DECK				
0011	511E42510	20.000	CY	$1,875.20968	$37,504.19
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E43510	110.000	CY	$547.39813	$60,213.79
	CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING				
0014	515E12050	12.000	EACH	$17,001.84924	$204,022.19
	PRESTRESSED CONCRETE COMPOSITE BOX BEAM BRIDGE MEMBERS, LEVE L 1, CB21-48				
0016	516E43100	48.000	EACH	$117.70158	$5,649.68
	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE) <2" THICK				
0019	517E70100	227.000	FT	$482.03582	$109,422.13
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0020	518E21200	70.000	CY	$118.05197	$8,263.64
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0021	518E40000	96.000	FT	$10.23601	$982.66
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0022	518E40010	79.000	FT	$17.26955	$1,364.29
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$719,082.49

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	14	700	LF
Pier	63.00	1.00	1.00	5	315	
	62.00	1.00	1.00	5	310	
					1325	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	14	770	LF
Pier	68.00	1.00	1.00	5	340	
	67.00	1.00	1.00	5	335	
					1445	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				12519	LB
Pier	Assume 2% steel				2872	
Slab	Assume 2% steel				33020	
					48411	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	113.25	16.00	1.75	1	117	CY
Diaphragm	29.38	2.25	1.50	2	7	
					125	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	48.00	3.00	3.00	2	32	CY
Beam Seat	48.00	2.25	5.50	2	44	
Wingwalls	18.62	2.25	3.00	4	19	
					95	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	24.42	3.00	2.00	2	11	CY
					11	CY
Item 517, Twin Steel Tube Railing, modified.						
	113.25	1.00	1.00	2	227	LF
Item 518, Porous Backfill with Geotextile Fabric						
	48.00	2.00	10.00	2	71	CY
Item 518, 6" Perforated Plastic Pipe						
	48.00	1.00	1.00	2	96	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	20.00	1.00	1.00	4	80	LF

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	14	700	LF
Pier	63.00	1.00	1.00	5	315	
	62.00	1.00	1.00	5	310	
					1325	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	14	770	LF
Pier	68.00	1.00	1.00	5	340	
	67.00	1.00	1.00	5	335	
					1445	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				14575	LB
Pier	Assume 1% steel				2591	
Slab	Assume 2% steel				11264	
					28429	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	113.67	17.33	0.58	1	43	CY
Diaphragm	29.38	3.00	1.83	0	0	
					43	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	48.00	3.00	3.00	2	32	CY
Beam Seat	48.00	3.00	5.00	2	53	
Wingwalls	18.62	3.00	3.00	4	25	
					110	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	29.38	3.00	3.00	2	20	CY
					20	CY
Item 515, PCBB CB21-48						
	1.00	1.00	1.00	12	12	EA
Item 516, Elastomeric bearings with intenal laminates						
	1.00	1.00	1.00	48	48	EA

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 517, Twin Steel Tube Railing, modified.	113.67	1.00	1.00	2	227	LF
Item 518, Porous Backfill with Geotextile Fabric	48.00	2.00	9.83	2	70	CY
Item 518, 6" Perforated Plastic Pipe	48.00	1.00	1.00	2	96	LF
Item 518, 6" Non-Perforated Plastic Pipe	19.67	1.00	1.00	4	79	LF

Designed by:_____Checked by:_____

APPENDIX A.5

Estimate Seg 3-E, Alt. 1

Estimated Cost:$595,453.97

Contingency: 20.00%

Estimated Total: $714,544.76

Wasson Armleder
Structure Type Study
Segment 3-E, Alternative 1

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
Group 0001: Initial Group					
0005	505E11100 PILE DRIVING EQUIPMENT MOBILIZATION	1.000	LS	$30,000.00000	$30,000.00
0006	507E00500 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	1,100.000	FT	$12.02755	$13,230.31
0007	507E00550 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	1,200.000	FT	$48.61848	$58,342.18
0008	509E10000 EPOXY COATED STEEL REINFORCEMENT	54,500.000	LB	$1.93933	$105,693.49
0009	511E32212 CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE	162.000	CY	$992.10438	$160,720.91
0011	511E42510 CLASS QC1 CONCRETE, PIER CAP	8.000	CY	$1,875.20968	$15,001.68
0012	511E44110 CLASS QC1 CONCRETE, ABUTMENT NOT INCLUDING FOOTING	71.000	CY	$919.28532	$65,269.26
0015	517E70100 RAILING (THREE STEEL TUBE BRIDGE RAILING)	264.000	FT	$482.03582	$127,257.46
0017	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	160.000	CY	$111.33629	$17,813.81
0018	518E40000 6" PERFORATED CORRUGATED PLASTIC PIPE	72.000	FT	$10.35134	$745.30
0019	518E40010 6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S	80.000	FT	$17.24461	$1,379.57

Total for Group 0001:$595,453.97

Estimate Seg-3-E, Alt 2

Estimated Cost:$750,628.09

Contingency: 20.00%

Estimated Total: $900,753.71

Wasson Armleder
Structure Type Study
Segment 3-E, Alternative 2

Base Date: 02/27/24

Spec Year: 23

Unit System: E

Work Type: GEN CONST: INVLVS 2 OR MOR MAJ WRK TYPE

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: SUMMER

County: HAMILTON

Latitude of Midpoint: 0

Longitude of Midpoint: 0

District: 08

Federal/State Project Number:

Prepared by Stantec on 02/27/24

Line #	Item Number	Quantity	Units	Unit Price	Extension
	Description				
	Supplemental Description				
Group 0001: Initial Group					
0005	505E11100	1.000	LS	$30,000.00000	$30,000.00
	PILE DRIVING EQUIPMENT MOBILIZATION				
0006	507E00500	1,100.000	FT	$12.02755	$13,230.31
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN				
0007	507E00550	1,200.000	FT	$48.61848	$58,342.18
	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED				
0008	509E10000	30,000.000	LB	$2.04262	$61,278.60
	EPOXY COATED STEEL REINFORCEMENT				
0009	511E34444	65.000	CY	$2,566.88732	$166,847.68
	CLASS QC2 CONCRETE, BRIDGE DECK				
0011	511E42510	15.000	CY	$1,875.20968	$28,128.15
	CLASS QC1 CONCRETE, PIER CAP				
0012	511E43510	83.000	CY	$560.58823	$46,528.82
	CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING				
0014	515E12050	12.000	EACH	$17,001.84924	$204,022.19
	PRESTRESSED CONCRETE COMPOSITE BOX BEAM BRIDGE MEMBERS, LEVE L 1, CB21-48				
0016	516E43100	48.000	EACH	$117.70158	$5,649.68
	ELASTOMERIC BEARING WITH INTERNAL LAMINATES ONLY (NEOPRENE) <2" THICK				
0019	517E70100	266.000	FT	$482.03582	$128,221.53
	RAILING (THREE STEEL TUBE BRIDGE RAILING)				
0020	518E21200	52.000	CY	$120.56452	$6,269.36
	POROUS BACKFILL WITH GEOTEXTILE FABRIC				
0021	518E40000	72.000	FT	$10.35134	$745.30
	6" PERFORATED CORRUGATED PLASTIC PIPE				
0022	518E40010	79.000	FT	$17.26955	$1,364.29
	6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIAL S				

Total for Group 0001:$750,628.09

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	12	600	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1100	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	12	660	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1200	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				9386	LB
Pier	Assume 2% steel				2244	
Slab	Assume 2% steel				42876	
					54506	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	132.07	16.00	2.00	1	157	CY
Diaphragm	22.06	2.25	1.50	2	6	
					162	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	36.00	3.00	3.00	2	24	CY
Beam Seat	36.00	2.25	5.50	2	33	
Wingwalls	13.94	2.25	3.00	4	14	
					71	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	19.08	3.00	2.00	2	8	CY
					8	CY
Item 517, Twin Steel Tube Railing, modified.						
	132.07	1.00	1.00	2	264	LF
Item 518, Porous Backfill with Geotextile Fabric						
	36.00	2.00	10.00	2	53	CY
Item 518, 6" Perforated Plastic Pipe						
	36.00	1.00	1.00	2	72	LF
Item 518, 6" Non-Perforated Plastic Pipe						
	20.00	1.00	1.00	4	80	LF

	Length	Width	Height	Number	Total	Units
Item 507, 12" CIP Reinforced Piles, Driven						
Abutment	50.00	1.00	1.00	12	600	LF
Pier	63.00	1.00	1.00	4	252	
	62.00	1.00	1.00	4	248	
					1100	LF
Item 507, 12" CIP Reinforced Piles, Furnished						
Abutment	55.00	1.00	1.00	12	660	LF
Pier	68.00	1.00	1.00	4	272	
	67.00	1.00	1.00	4	268	
					1200	LF
Item 509, Epoxy Coated Reinforcing Steel						
Abutment	Assume 1% steel				10927	LB
Pier	Assume 1% steel				1945	
Slab	Assume 2% steel				12143	
					25015	LB
Item 511, Class QC2 Concrete, Superstructure						
Slab	132.76	16.00	0.58	1	46	CY
Diaphragm	22.06	3.00	1.83	0	0	
					46	CY
Item 511, Class QC1 Concrete, Abutment Including Footing						
Footing	36.00	3.00	3.00	2	24	CY
Beam Seat	36.00	3.00	5.00	2	40	
Wingwalls	13.94	3.00	3.00	4	19	
					83	CY
Item 511, Class QC1 Concrete, Pier above Footing						
	22.06	3.00	3.00	2	15	CY
					15	CY
Item 515, PCBB CB21-48						
	1.00	1.00	1.00	12	12	EA
Item 516, Elastomeric bearings with intenal laminates						
	1.00	1.00	1.00	48	48	EA

Designed by:_____Checked by:_____

	Length	Width	Height	Number	Total	Units
Item 517, Twin Steel Tube Railing, modified.	132.76	1.00	1.00	2	266	LF
Item 518, Porous Backfill with Geotextile Fabric	36.00	2.00	9.83	2	52	CY
Item 518, 6" Perforated Plastic Pipe	36.00	1.00	1.00	2	72	LF
Item 518, 6" Non-Perforated Plastic Pipe	19.67	1.00	1.00	4	79	LF

Designed by:_____Checked by:_____

Attachment E

Hydraulic Calculations

Stantec

Memo

To:	Mike Sturdevant Cincinnati, Ohio	From:	Eric Adkins Cincinnati
Project/File:	173620146	Date:	February 28, 2024

Reference: Wasson - Armleder Trail Extension Hydraulic Analysis for Feasibility Study

The hydraulic analysis started with the effective FEMA HEC-RAS model for Duck Creek. Average Cross section spacing in the approximately 1 mile long section of Duck Creek that our models were spread over was 300-400 feet. Interpolated cross sections were used between the model cross sections to bring the average spacing to approximately 100 feet. No Survey was performed for the feasibility study hydraulic analysis. A detailed stream survey will need to be conducted and an updated analysis performed once a preferred alternative is chosen.

Alternate 3B causes a rise in the 100 year water surface elevation of Duck Creek of 2.08 feet above the existing 100 year water surface elevation of 501.00' immediately upstream of the proposed bridge. The rise continues approximately 5400 feet upstream until it rejoins the existing profile.

Alternate 3C causes a rise in the 100 year water surface elevation of Duck Creek of 0.90 feet above the existing 100 year water surface elevation of 494.84' immediately upstream of the proposed bridge. The rise continues approximately 4900 feet upstream until it rejoins the existing profile.

Alternate 3D causes a rise in the 100 year water surface elevation of Duck Creek of 0.38 feet above the existing 100 year water surface elevation of 493.15' immediately upstream of the proposed bridge. The rise continues approximately 2000 feet upstream until it rejoins the existing profile.

Alternate 3E causes a rise in the 100 year water surface elevation of Duck Creek of 0.90 feet above the existing 100 year water surface elevation of 491.27' immediately upstream of the proposed bridge. The rise continues approximately 2200 feet upstream until it rejoins the existing profile.

A copy of the HEC-RAS Output for the 100-year flood of the Existing and all four alternates follows this memo.

Sincerely,

STANTEC CONSULTING SERVICES INC.



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Design with community in mind

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.415	100 year	Existing Prelim	7700.00	538.90	561.57	554.47	565.24	0.001658	15.37	500.93	22.20	0.57
Reach-1	5.415	100 year	Proposed 3B	7700.00	538.90	561.57	554.47	565.24	0.001658	15.37	500.93	22.20	0.57
Reach-1	5.415	100 year	Proposed 3C	7700.00	538.90	561.57	554.47	565.24	0.001658	15.37	500.93	22.20	0.57
Reach-1	5.415	100 year	Proposed 3D	7700.00	538.90	561.57	554.47	565.24	0.001658	15.37	500.93	22.20	0.57
Reach-1	5.415	100 year	PR3E Raised	7700.00	538.90	561.57	554.47	565.24	0.001658	15.37	500.93	22.20	0.57
Reach-1	5.3675			Culvert									
Reach-1	5.32	100 year	Existing Prelim	7980.00	537.40	554.30	553.33	561.38	0.003671	21.34	374.03	22.20	0.92
Reach-1	5.32	100 year	Proposed 3B	7980.00	537.40	554.30	553.33	561.38	0.003671	21.34	374.03	22.20	0.92
Reach-1	5.32	100 year	Proposed 3C	7980.00	537.40	554.30	553.33	561.38	0.003671	21.34	374.03	22.20	0.92
Reach-1	5.32	100 year	Proposed 3D	7980.00	537.40	554.30	553.33	561.38	0.003671	21.34	374.03	22.20	0.92
Reach-1	5.32	100 year	PR3E Raised	7980.00	537.40	554.30	553.33	561.38	0.003671	21.34	374.03	22.20	0.92
Reach-1	5.308	100 year	Existing Prelim	7980.00	537.30	554.48	554.48	560.99	0.003177	20.47	389.86	30.00	1.00
Reach-1	5.308	100 year	Proposed 3B	7980.00	537.30	554.48	554.48	560.99	0.003177	20.47	389.86	30.00	1.00
Reach-1	5.308	100 year	Proposed 3C	7980.00	537.30	554.48	554.48	560.99	0.003177	20.47	389.86	30.00	1.00
Reach-1	5.308	100 year	Proposed 3D	7980.00	537.30	554.48	554.48	560.99	0.003177	20.47	389.86	30.00	1.00
Reach-1	5.308	100 year	PR3E Raised	7980.00	537.30	554.48	554.48	560.99	0.003177	20.47	389.86	30.00	1.00
Reach-1	5.213	100 year	Existing Prelim	7980.00	535.80	551.10	549.80	556.49	0.002501	18.62	428.64	30.00	0.87
Reach-1	5.213	100 year	Proposed 3B	7980.00	535.80	551.10	549.80	556.49	0.002501	18.62	428.64	30.00	0.87
Reach-1	5.213	100 year	Proposed 3C	7980.00	535.80	551.10	549.80	556.49	0.002501	18.62	428.64	30.00	0.87
Reach-1	5.213	100 year	Proposed 3D	7980.00	535.80	551.10	549.80	556.49	0.002501	18.62	428.64	30.00	0.87
Reach-1	5.213	100 year	PR3E Raised	7980.00	535.80	551.10	549.80	556.49	0.002501	18.62	428.64	30.00	0.87
Reach-1	5.14	100 year	Existing Prelim	7980.00	534.60	550.46	548.57	555.45	0.002258	17.92	445.39	30.00	0.82
Reach-1	5.14	100 year	Proposed 3B	7980.00	534.60	550.46	548.57	555.45	0.002258	17.92	445.39	30.00	0.82
Reach-1	5.14	100 year	Proposed 3C	7980.00	534.60	550.46	548.57	555.45	0.002258	17.92	445.39	30.00	0.82
Reach-1	5.14	100 year	Proposed 3D	7980.00	534.60	550.46	548.57	555.45	0.002258	17.92	445.39	30.00	0.82
Reach-1	5.14	100 year	PR3E Raised	7980.00	534.60	550.46	548.57	555.45	0.002258	17.92	445.39	30.00	0.82
Reach-1	5.113	100 year	Existing Prelim	8210.00	534.00	548.22	548.22	554.90	0.003276	20.72	396.16	29.97	1.00
Reach-1	5.113	100 year	Proposed 3B	8210.00	534.00	548.22	548.22	554.90	0.003276	20.72	396.16	29.97	1.00
Reach-1	5.113	100 year	Proposed 3C	8210.00	534.00	548.22	548.22	554.90	0.003276	20.72	396.16	29.97	1.00
Reach-1	5.113	100 year	Proposed 3D	8210.00	534.00	548.22	548.22	554.90	0.003276	20.72	396.16	29.97	1.00
Reach-1	5.113	100 year	PR3E Raised	8210.00	534.00	548.22	548.22	554.90	0.003276	20.72	396.16	29.97	1.00
Reach-1	5.104	100 year	Existing Prelim	8210.00	533.90	547.79	546.90	553.01	0.002397	18.32	448.07	34.97	0.90
Reach-1	5.104	100 year	Proposed 3B	8210.00	533.90	547.79	546.90	553.01	0.002397	18.32	448.07	34.97	0.90
Reach-1	5.104	100 year	Proposed 3C	8210.00	533.90	547.79	546.90	553.01	0.002397	18.32	448.07	34.97	0.90
Reach-1	5.104	100 year	Proposed 3D	8210.00	533.90	547.79	546.90	553.01	0.002397	18.32	448.07	34.97	0.90
Reach-1	5.104	100 year	PR3E Raised	8210.00	533.90	547.79	546.90	553.01	0.002397	18.32	448.07	34.97	0.90
Reach-1	5.095	100 year	Existing Prelim	8210.00	533.80	549.06		552.34	0.001300	14.54	564.64	39.98	0.68
Reach-1	5.095	100 year	Proposed 3B	8210.00	533.80	549.06		552.34	0.001300	14.54	564.64	39.98	0.68
Reach-1	5.095	100 year	Proposed 3C	8210.00	533.80	549.06		552.34	0.001300	14.54	564.64	39.98	0.68
Reach-1	5.095	100 year	Proposed 3D	8210.00	533.80	549.06		552.34	0.001300	14.54	564.64	39.98	0.68
Reach-1	5.095	100 year	PR3E Raised	8210.00	533.80	549.06		552.34	0.001300	14.54	564.64	39.98	0.68
Reach-1	5.076	100 year	Existing Prelim	8210.00	533.50	549.01		552.18	0.001238	14.29	574.73	39.98	0.66
Reach-1	5.076	100 year	Proposed 3B	8210.00	533.50	549.01		552.18	0.001238	14.29	574.73	39.98	0.66
Reach-1	5.076	100 year	Proposed 3C	8210.00	533.50	549.01		552.18	0.001238	14.29	574.73	39.98	0.66
Reach-1	5.076	100 year	Proposed 3D	8210.00	533.50	549.01		552.18	0.001238	14.29	574.73	39.98	0.66
Reach-1	5.076	100 year	PR3E Raised	8210.00	533.50	549.01		552.18	0.001238	14.29	574.73	39.98	0.66
Reach-1	5.029	100 year	Existing Prelim	8210.00	532.60	548.97		551.79	0.001055	13.48	608.91	39.98	0.61
Reach-1	5.029	100 year	Proposed 3B	8210.00	532.60	548.97		551.79	0.001055	13.48	608.91	39.98	0.61
Reach-1	5.029	100 year	Proposed 3C	8210.00	532.60	548.97		551.79	0.001055	13.48	608.91	39.98	0.61
Reach-1	5.029	100 year	Proposed 3D	8210.00	532.60	548.97		551.79	0.001055	13.48	608.91	39.98	0.61
Reach-1	5.029	100 year	PR3E Raised	8210.00	532.60	548.97		551.79	0.001055	13.48	608.91	39.98	0.61
Reach-1	5	100 year	Existing Prelim	8210.00	532.50	548.76		551.62	0.001075	13.58	604.61	39.98	0.62
Reach-1	5	100 year	Proposed 3B	8210.00	532.50	548.76		551.62	0.001075	13.58	604.61	39.98	0.62
Reach-1	5	100 year	Proposed 3C	8210.00	532.50	548.76		551.62	0.001075	13.58	604.61	39.98	0.62
Reach-1	5	100 year	Proposed 3D	8210.00	532.50	548.76		551.62	0.001075	13.58	604.61	39.98	0.62
Reach-1	5	100 year	PR3E Raised	8210.00	532.50	548.76		551.62	0.001075	13.58	604.61	39.98	0.62
Reach-1	4.994	100 year	Existing Prelim	8210.00	532.00	550.02		551.00	0.004518	6.83	1040.31	75.45	0.40
Reach-1	4.994	100 year	Proposed 3B	8210.00	532.00	550.02		551.00	0.004518	6.83	1040.31	75.45	0.40
Reach-1	4.994	100 year	Proposed 3C	8210.00	532.00	550.02		551.00	0.004518	6.83	1040.31	75.45	0.40
Reach-1	4.994	100 year	Proposed 3D	8210.00	532.00	550.02		551.00	0.004518	6.83	1040.31	75.45	0.40
Reach-1	4.994	100 year	PR3E Raised	8210.00	532.00	550.02		551.00	0.004518	6.83	1040.31	75.45	0.40
Reach-1	4.984	100 year	Existing Prelim	8210.00	530.00	550.16		550.78	0.001194	6.68	1408.49	90.00	0.28
Reach-1	4.984	100 year	Proposed 3B	8210.00	530.00	550.16		550.78	0.001194	6.68	1408.49	90.00	0.28
Reach-1	4.984	100 year	Proposed 3C	8210.00	530.00	550.16		550.78	0.001194	6.68	1408.49	90.00	0.28
Reach-1	4.984	100 year	Proposed 3D	8210.00	530.00	550.16		550.78	0.001194	6.68	1408.49	90.00	0.28
Reach-1	4.984	100 year	PR3E Raised	8210.00	530.00	550.16		550.78	0.001194	6.68	1408.49	90.00	0.28
Reach-1	4.975	100 year	Existing Prelim	8210.00	530.00	550.29		550.66	0.000798	5.49	1877.56	134.46	0.23
Reach-1	4.975	100 year	Proposed 3B	8210.00	530.00	550.29		550.66	0.000798	5.49	1877.56	134.46	0.23
Reach-1	4.975	100 year	Proposed 3C	8210.00	530.00	550.29		550.66	0.000798	5.49	1877.56	134.46	0.23
Reach-1	4.975	100 year	Proposed 3D	8210.00	530.00	550.29		550.66	0.000798	5.49	1877.56	134.46	0.23
Reach-1	4.975	100 year	PR3E Raised	8210.00	530.00	550.29		550.66	0.000798	5.49	1877.56	134.46	0.23
Reach-1	4.966	100 year	Existing Prelim	8210.00	530.00	549.98		550.59	0.001342	6.46	1414.02	139.83	0.29

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.966	100 year	Proposed 3B	8210.00	530.00	549.98		550.59	0.001342	6.46	1414.02	139.83	0.29
Reach-1	4.966	100 year	Proposed 3C	8210.00	530.00	549.98		550.59	0.001342	6.46	1414.02	139.83	0.29
Reach-1	4.966	100 year	Proposed 3D	8210.00	530.00	549.98		550.59	0.001342	6.46	1414.02	139.83	0.29
Reach-1	4.966	100 year	PR3E Raised	8210.00	530.00	549.98		550.59	0.001342	6.46	1414.02	139.83	0.29
Reach-1	4.895	100 year	Existing Prelim	8210.00	530.00	549.36		550.04	0.001560	6.78	1329.33	135.52	0.31
Reach-1	4.895	100 year	Proposed 3B	8210.00	530.00	549.36		550.04	0.001560	6.78	1329.33	135.52	0.31
Reach-1	4.895	100 year	Proposed 3C	8210.00	530.00	549.36		550.04	0.001560	6.78	1329.33	135.52	0.31
Reach-1	4.895	100 year	Proposed 3D	8210.00	530.00	549.36		550.04	0.001560	6.78	1329.33	135.52	0.31
Reach-1	4.895	100 year	PR3E Raised	8210.00	530.00	549.36		550.04	0.001560	6.78	1329.33	135.52	0.31
Reach-1	4.811	100 year	Existing Prelim	8210.00	530.00	548.66		549.35	0.001537	7.25	1355.51	95.00	0.32
Reach-1	4.811	100 year	Proposed 3B	8210.00	530.00	548.66		549.35	0.001537	7.25	1355.51	95.00	0.32
Reach-1	4.811	100 year	Proposed 3C	8210.00	530.00	548.66		549.35	0.001537	7.25	1355.51	95.00	0.32
Reach-1	4.811	100 year	Proposed 3D	8210.00	530.00	548.66		549.35	0.001537	7.25	1355.51	95.00	0.32
Reach-1	4.811	100 year	PR3E Raised	8210.00	530.00	548.66		549.35	0.001537	7.25	1355.51	95.00	0.32
Reach-1	4.788	100 year	Existing Prelim	5600.00	530.60	546.03	541.94	548.98	0.000917	13.77	406.58	123.37	0.62
Reach-1	4.788	100 year	Proposed 3B	5600.00	530.60	546.03	541.94	548.98	0.000917	13.77	406.58	123.37	0.62
Reach-1	4.788	100 year	Proposed 3C	5600.00	530.60	546.03	541.94	548.98	0.000917	13.77	406.58	123.37	0.62
Reach-1	4.788	100 year	Proposed 3D	5600.00	530.60	546.03	541.94	548.98	0.000917	13.77	406.58	123.37	0.62
Reach-1	4.788	100 year	PR3E Raised	5600.00	530.60	546.03	541.94	548.98	0.000917	13.77	406.58	123.37	0.62
Reach-1	4.783			Bridge									
Reach-1	4.778	100 year	Existing Prelim	5600.00	530.60	545.49	541.93	548.66	0.001034	14.28	392.18	121.86	0.66
Reach-1	4.778	100 year	Proposed 3B	5600.00	530.60	545.49	541.93	548.66	0.001034	14.28	392.18	121.86	0.66
Reach-1	4.778	100 year	Proposed 3C	5600.00	530.60	545.49	541.93	548.66	0.001034	14.28	392.18	121.86	0.66
Reach-1	4.778	100 year	Proposed 3D	5600.00	530.60	545.49	541.93	548.66	0.001034	14.28	392.18	121.86	0.66
Reach-1	4.778	100 year	PR3E Raised	5600.00	530.60	545.49	541.93	548.66	0.001034	14.28	392.18	121.86	0.66
Reach-1	4.775	100 year	Existing Prelim	5600.00	530.60	546.11		548.37	0.001755	12.06	464.19	30.00	0.54
Reach-1	4.775	100 year	Proposed 3B	5600.00	530.60	546.11		548.37	0.001755	12.06	464.19	30.00	0.54
Reach-1	4.775	100 year	Proposed 3C	5600.00	530.60	546.11		548.37	0.001755	12.06	464.19	30.00	0.54
Reach-1	4.775	100 year	Proposed 3D	5600.00	530.60	546.11		548.37	0.001755	12.06	464.19	30.00	0.54
Reach-1	4.775	100 year	PR3E Raised	5600.00	530.60	546.11		548.37	0.001755	12.06	464.19	30.00	0.54
Reach-1	4.772	100 year	Existing Prelim	5600.00	530.60	546.50		548.17	0.001176	10.38	539.42	34.00	0.46
Reach-1	4.772	100 year	Proposed 3B	5600.00	530.60	546.50		548.17	0.001176	10.38	539.42	34.00	0.46
Reach-1	4.772	100 year	Proposed 3C	5600.00	530.60	546.50		548.17	0.001176	10.38	539.42	34.00	0.46
Reach-1	4.772	100 year	Proposed 3D	5600.00	530.60	546.50		548.17	0.001176	10.38	539.42	34.00	0.46
Reach-1	4.772	100 year	PR3E Raised	5600.00	530.60	546.50		548.17	0.001176	10.38	539.42	34.00	0.46
Reach-1	4.769	100 year	Existing Prelim	5600.00	530.60	547.02		547.93	0.000483	8.12	923.94	96.38	0.35
Reach-1	4.769	100 year	Proposed 3B	5600.00	530.60	547.02		547.93	0.000483	8.12	923.94	96.38	0.35
Reach-1	4.769	100 year	Proposed 3C	5600.00	530.60	547.02		547.93	0.000483	8.12	923.94	96.38	0.35
Reach-1	4.769	100 year	Proposed 3D	5600.00	530.60	547.02		547.93	0.000483	8.12	923.94	96.38	0.35
Reach-1	4.769	100 year	PR3E Raised	5600.00	530.60	547.02		547.93	0.000483	8.12	923.94	96.38	0.35
Reach-1	4.743	100 year	Existing Prelim	5600.00	529.90	546.89		547.86	0.000464	8.24	987.52	115.80	0.35
Reach-1	4.743	100 year	Proposed 3B	5600.00	529.90	546.89		547.86	0.000464	8.24	987.52	115.80	0.35
Reach-1	4.743	100 year	Proposed 3C	5600.00	529.90	546.89		547.86	0.000464	8.24	987.52	115.80	0.35
Reach-1	4.743	100 year	Proposed 3D	5600.00	529.90	546.89		547.86	0.000464	8.24	987.52	115.80	0.35
Reach-1	4.743	100 year	PR3E Raised	5600.00	529.90	546.89		547.86	0.000464	8.24	987.52	115.80	0.35
Reach-1	4.736	100 year	Existing Prelim	8320.00	529.60	546.71	542.41	547.84	0.000240	9.99	1482.43	144.40	0.43
Reach-1	4.736	100 year	Proposed 3B	8320.00	529.60	546.71	542.41	547.84	0.000240	9.99	1482.43	144.40	0.43
Reach-1	4.736	100 year	Proposed 3C	8320.00	529.60	546.71	542.41	547.84	0.000240	9.99	1482.43	144.40	0.43
Reach-1	4.736	100 year	Proposed 3D	8320.00	529.60	546.71	542.41	547.84	0.000240	9.99	1482.43	144.40	0.43
Reach-1	4.736	100 year	PR3E Raised	8320.00	529.60	546.71	542.41	547.84	0.000240	9.99	1482.43	144.40	0.43
Reach-1	4.7315			Bridge									
Reach-1	4.727	100 year	Existing Prelim	8320.00	529.60	545.09	542.23	546.67	0.000372	11.62	1247.59	144.40	0.53
Reach-1	4.727	100 year	Proposed 3B	8320.00	529.60	545.09	542.23	546.67	0.000372	11.62	1247.59	144.40	0.53
Reach-1	4.727	100 year	Proposed 3C	8320.00	529.60	545.09	542.23	546.67	0.000372	11.62	1247.59	144.40	0.53
Reach-1	4.727	100 year	Proposed 3D	8320.00	529.60	545.09	542.23	546.67	0.000372	11.62	1247.59	144.40	0.53
Reach-1	4.727	100 year	PR3E Raised	8320.00	529.60	545.09	542.23	546.67	0.000372	11.62	1247.59	144.40	0.53
Reach-1	4.716	100 year	Existing Prelim	8320.00	529.30	541.05	541.05	546.27	0.002017	18.59	492.35	53.00	0.96
Reach-1	4.716	100 year	Proposed 3B	8320.00	529.30	541.05	541.05	546.27	0.002017	18.59	492.35	53.00	0.96
Reach-1	4.716	100 year	Proposed 3C	8320.00	529.30	541.05	541.05	546.27	0.002017	18.59	492.35	53.00	0.96
Reach-1	4.716	100 year	Proposed 3D	8320.00	529.30	541.05	541.05	546.27	0.002017	18.59	492.35	53.00	0.96
Reach-1	4.716	100 year	PR3E Raised	8320.00	529.30	541.05	541.05	546.27	0.002017	18.59	492.35	53.00	0.96
Reach-1	4.641	100 year	Existing Prelim	8200.00	527.40	539.31	538.93	543.88	0.001789	17.39	518.40	56.00	0.91
Reach-1	4.641	100 year	Proposed 3B	8200.00	527.40	539.31	538.93	543.88	0.001789	17.39	518.40	56.00	0.91
Reach-1	4.641	100 year	Proposed 3C	8200.00	527.40	539.31	538.93	543.88	0.001789	17.39	518.40	56.00	0.91
Reach-1	4.641	100 year	Proposed 3D	8200.00	527.40	539.31	538.93	543.88	0.001789	17.39	518.40	56.00	0.91
Reach-1	4.641	100 year	PR3E Raised	8200.00	527.40	539.31	538.93	543.88	0.001789	17.39	518.40	56.00	0.91
Reach-1	4.595	100 year	Existing Prelim	8040.00	526.70	539.56	538.10	543.25	0.001302	15.69	571.36	56.00	0.79
Reach-1	4.595	100 year	Proposed 3B	8040.00	526.70	539.56	538.10	543.25	0.001302	15.69	571.36	56.00	0.79
Reach-1	4.595	100 year	Proposed 3C	8040.00	526.70	539.56	538.10	543.25	0.001302	15.69	571.36	56.00	0.79
Reach-1	4.595	100 year	Proposed 3D	8040.00	526.70	539.56	538.10	543.25	0.001302	15.69	571.36	56.00	0.79
Reach-1	4.595	100 year	PR3E Raised	8040.00	526.70	539.56	538.10	543.25	0.001302	15.69	571.36	56.00	0.79

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.533	100 year	Existing Prelim	8040.00	526.10	539.97		542.55	0.000941	13.55	904.02	108.00	0.65
Reach-1	4.533	100 year	Proposed 3B	8040.00	526.10	539.97		542.55	0.000941	13.55	904.02	108.00	0.65
Reach-1	4.533	100 year	Proposed 3C	8040.00	526.10	539.97		542.55	0.000941	13.55	904.02	108.00	0.65
Reach-1	4.533	100 year	Proposed 3D	8040.00	526.10	539.97		542.55	0.000941	13.55	904.02	108.00	0.65
Reach-1	4.533	100 year	PR3E Raised	8040.00	526.10	539.97		542.55	0.000941	13.55	904.02	108.00	0.65
Reach-1	4.455	100 year	Existing Prelim	7780.00	525.20	538.99	536.68	542.08	0.001119	14.33	673.67	96.36	0.70
Reach-1	4.455	100 year	Proposed 3B	7780.00	525.20	538.99	536.68	542.08	0.001119	14.33	673.67	96.36	0.70
Reach-1	4.455	100 year	Proposed 3C	7780.00	525.20	538.99	536.68	542.08	0.001119	14.33	673.67	96.36	0.70
Reach-1	4.455	100 year	Proposed 3D	7780.00	525.20	538.99	536.68	542.08	0.001119	14.33	673.67	96.36	0.70
Reach-1	4.455	100 year	PR3E Raised	7780.00	525.20	538.99	536.68	542.08	0.001119	14.33	673.67	96.36	0.70
Reach-1	4.355	100 year	Existing Prelim	7780.00	524.40	539.52		541.29	0.000539	11.36	948.77	105.82	0.52
Reach-1	4.355	100 year	Proposed 3B	7780.00	524.40	539.52		541.29	0.000539	11.36	948.77	105.82	0.52
Reach-1	4.355	100 year	Proposed 3C	7780.00	524.40	539.52		541.29	0.000539	11.36	948.77	105.82	0.52
Reach-1	4.355	100 year	Proposed 3D	7780.00	524.40	539.52		541.29	0.000539	11.36	948.77	105.82	0.52
Reach-1	4.355	100 year	PR3E Raised	7780.00	524.40	539.52		541.29	0.000539	11.36	948.77	105.82	0.52
Reach-1	4.325	100 year	Existing Prelim	7780.00	524.00	540.04		540.84	0.002487	7.52	1134.36	110.70	0.36
Reach-1	4.325	100 year	Proposed 3B	7780.00	524.00	540.04		540.84	0.002487	7.52	1134.36	110.70	0.36
Reach-1	4.325	100 year	Proposed 3C	7780.00	524.00	540.04		540.84	0.002487	7.52	1134.36	110.70	0.36
Reach-1	4.325	100 year	Proposed 3D	7780.00	524.00	540.04		540.84	0.002487	7.52	1134.36	110.70	0.36
Reach-1	4.325	100 year	PR3E Raised	7780.00	524.00	540.04		540.84	0.002487	7.52	1134.36	110.70	0.36
Reach-1	4.242	100 year	Existing Prelim	7470.00	521.10	539.75		540.10	0.000899	5.00	1638.46	139.88	0.22
Reach-1	4.242	100 year	Proposed 3B	7470.00	521.10	539.75		540.10	0.000899	5.00	1638.46	139.88	0.22
Reach-1	4.242	100 year	Proposed 3C	7470.00	521.10	539.75		540.10	0.000899	5.00	1638.46	139.88	0.22
Reach-1	4.242	100 year	Proposed 3D	7470.00	521.10	539.75		540.10	0.000899	5.00	1638.46	139.88	0.22
Reach-1	4.242	100 year	PR3E Raised	7470.00	521.10	539.75		540.10	0.000899	5.00	1638.46	139.88	0.22
Reach-1	4.178	100 year	Existing Prelim	7470.00	519.40	539.34		539.76	0.001082	5.53	1496.55	118.36	0.23
Reach-1	4.178	100 year	Proposed 3B	7470.00	519.40	539.34		539.76	0.001082	5.53	1496.55	118.36	0.23
Reach-1	4.178	100 year	Proposed 3C	7470.00	519.40	539.34		539.76	0.001082	5.53	1496.55	118.36	0.23
Reach-1	4.178	100 year	Proposed 3D	7470.00	519.40	539.34		539.76	0.001082	5.53	1496.55	118.36	0.23
Reach-1	4.178	100 year	PR3E Raised	7470.00	519.40	539.34		539.76	0.001082	5.53	1496.55	118.36	0.23
Reach-1	4.166	100 year	Existing Prelim	7470.00	519.00	538.54	528.43	539.58	0.004179	8.17	914.25	235.37	0.33
Reach-1	4.166	100 year	Proposed 3B	7470.00	519.00	538.54	528.43	539.58	0.004179	8.17	914.25	235.37	0.33
Reach-1	4.166	100 year	Proposed 3C	7470.00	519.00	538.54	528.43	539.58	0.004179	8.17	914.25	235.37	0.33
Reach-1	4.166	100 year	Proposed 3D	7470.00	519.00	538.54	528.43	539.58	0.004179	8.17	914.25	235.37	0.33
Reach-1	4.166	100 year	PR3E Raised	7470.00	519.00	538.54	528.43	539.58	0.004179	8.17	914.25	235.37	0.33
Reach-1	4.165			Bridge									
Reach-1	4.164	100 year	Existing Prelim	7470.00	519.00	538.12	528.43	539.20	0.004501	8.35	894.10	234.07	0.34
Reach-1	4.164	100 year	Proposed 3B	7470.00	519.00	538.12	528.43	539.20	0.004501	8.35	894.10	234.07	0.34
Reach-1	4.164	100 year	Proposed 3C	7470.00	519.00	538.12	528.43	539.20	0.004501	8.35	894.10	234.07	0.34
Reach-1	4.164	100 year	Proposed 3D	7470.00	519.00	538.12	528.43	539.20	0.004501	8.35	894.10	234.07	0.34
Reach-1	4.164	100 year	PR3E Raised	7470.00	519.00	538.12	528.43	539.20	0.004501	8.35	894.10	234.07	0.34
Reach-1	4.142	100 year	Existing Prelim	7470.00	518.80	538.58		538.72	0.000890	3.64	2633.99	264.06	0.16
Reach-1	4.142	100 year	Proposed 3B	7470.00	518.80	538.58		538.72	0.000890	3.64	2633.99	264.06	0.16
Reach-1	4.142	100 year	Proposed 3C	7470.00	518.80	538.58		538.72	0.000890	3.64	2633.99	264.06	0.16
Reach-1	4.142	100 year	Proposed 3D	7470.00	518.80	538.58		538.72	0.000890	3.64	2633.99	264.06	0.16
Reach-1	4.142	100 year	PR3E Raised	7470.00	518.80	538.58		538.72	0.000890	3.64	2633.99	264.06	0.16
Reach-1	4.057	100 year	Existing Prelim	7060.00	518.10	537.98		538.28	0.000966	4.79	1707.20	134.96	0.20
Reach-1	4.057	100 year	Proposed 3B	7060.00	518.10	537.98		538.28	0.000966	4.79	1707.20	134.96	0.20
Reach-1	4.057	100 year	Proposed 3C	7060.00	518.10	537.98		538.28	0.000966	4.79	1707.20	134.96	0.20
Reach-1	4.057	100 year	Proposed 3D	7060.00	518.10	537.98		538.28	0.000966	4.79	1707.20	134.96	0.20
Reach-1	4.057	100 year	PR3E Raised	7060.00	518.10	537.98		538.28	0.000966	4.79	1707.20	134.96	0.20
Reach-1	4.041	100 year	Existing Prelim	7060.00	517.90	533.62	531.21	537.79	0.001583	16.38	430.98	104.18	0.76
Reach-1	4.041	100 year	Proposed 3B	7060.00	517.90	533.62	531.21	537.79	0.001583	16.38	430.98	104.18	0.76
Reach-1	4.041	100 year	Proposed 3C	7060.00	517.90	533.62	531.21	537.79	0.001583	16.38	430.98	104.18	0.76
Reach-1	4.041	100 year	Proposed 3D	7060.00	517.90	533.62	531.21	537.79	0.001583	16.38	430.98	104.18	0.76
Reach-1	4.041	100 year	PR3E Raised	7060.00	517.90	533.62	531.21	537.79	0.001583	16.38	430.98	104.18	0.76
Reach-1	4.0285			Bridge									
Reach-1	4.016	100 year	Existing Prelim	7060.00	517.90	531.21	531.21	537.22	0.002914	19.67	358.88	101.54	1.00
Reach-1	4.016	100 year	Proposed 3B	7060.00	517.90	531.21	531.21	537.22	0.002914	19.67	358.88	101.54	1.00
Reach-1	4.016	100 year	Proposed 3C	7060.00	517.90	531.21	531.21	537.22	0.002914	19.67	358.88	101.54	1.00
Reach-1	4.016	100 year	Proposed 3D	7060.00	517.90	531.21	531.21	537.22	0.002914	19.67	358.88	101.54	1.00
Reach-1	4.016	100 year	PR3E Raised	7060.00	517.90	531.21	531.21	537.22	0.002914	19.67	358.88	101.54	1.00
Reach-1	4.001	100 year	Existing Prelim	7060.00	517.60	532.02		533.57	0.000738	10.85	1005.44	102.41	0.52
Reach-1	4.001	100 year	Proposed 3B	7060.00	517.60	532.02		533.57	0.000738	10.85	1005.44	102.41	0.52
Reach-1	4.001	100 year	Proposed 3C	7060.00	517.60	532.02		533.57	0.000738	10.85	1005.44	102.41	0.52
Reach-1	4.001	100 year	Proposed 3D	7060.00	517.60	532.02		533.57	0.000738	10.85	1005.44	102.41	0.52
Reach-1	4.001	100 year	PR3E Raised	7060.00	517.60	532.02		533.57	0.000738	10.85	1005.44	102.41	0.52
Reach-1	3.948	100 year	Existing Prelim	7330.00	517.00	531.85		533.36	0.000691	10.73	1117.85	150.25	0.50
Reach-1	3.948	100 year	Proposed 3B	7330.00	517.00	531.85		533.36	0.000691	10.73	1117.85	150.25	0.50
Reach-1	3.948	100 year	Proposed 3C	7330.00	517.00	531.85		533.36	0.000691	10.73	1117.85	150.25	0.50
Reach-1	3.948	100 year	Proposed 3D	7330.00	517.00	531.85		533.36	0.000691	10.73	1117.85	150.25	0.50
Reach-1	3.948	100 year	PR3E Raised	7330.00	517.00	531.85		533.36	0.000691	10.73	1117.85	150.25	0.50

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.866	100 year	Existing Prelim	7330.00	516.10	531.77		533.01	0.000566	9.94	1375.15	242.97	0.46
Reach-1	3.866	100 year	Proposed 3B	7330.00	516.10	531.77		533.01	0.000566	9.94	1375.15	242.97	0.46
Reach-1	3.866	100 year	Proposed 3C	7330.00	516.10	531.77		533.01	0.000566	9.94	1375.15	242.97	0.46
Reach-1	3.866	100 year	Proposed 3D	7330.00	516.10	531.77		533.01	0.000566	9.94	1375.15	242.97	0.46
Reach-1	3.866	100 year	PR3E Raised	7330.00	516.10	531.77		533.01	0.000566	9.94	1375.15	242.97	0.46
Reach-1	3.82	100 year	Existing Prelim	7330.00	515.80	530.56	526.83	532.72	0.001146	12.15	799.27	134.99	0.57
Reach-1	3.82	100 year	Proposed 3B	7330.00	515.80	530.56	526.83	532.72	0.001146	12.15	799.27	134.99	0.57
Reach-1	3.82	100 year	Proposed 3C	7330.00	515.80	530.56	526.83	532.72	0.001146	12.15	799.27	134.99	0.57
Reach-1	3.82	100 year	Proposed 3D	7330.00	515.80	530.56	526.83	532.72	0.001146	12.15	799.27	134.99	0.57
Reach-1	3.82	100 year	PR3E Raised	7330.00	515.80	530.56	526.83	532.72	0.001146	12.15	799.27	134.99	0.57
Reach-1	3.79	100 year	Existing Prelim	7330.00	515.50	530.87		532.36	0.000820	10.55	1046.75	135.84	0.48
Reach-1	3.79	100 year	Proposed 3B	7330.00	515.50	530.87		532.36	0.000820	10.55	1046.75	135.84	0.48
Reach-1	3.79	100 year	Proposed 3C	7330.00	515.50	530.87		532.36	0.000820	10.55	1046.75	135.84	0.48
Reach-1	3.79	100 year	Proposed 3D	7330.00	515.50	530.87		532.36	0.000820	10.55	1046.75	135.84	0.48
Reach-1	3.79	100 year	PR3E Raised	7330.00	515.50	530.87		532.36	0.000820	10.55	1046.75	135.84	0.48
Reach-1	3.766	100 year	Existing Prelim	7330.00	515.30	530.54	525.82	532.22	0.001172	10.41	704.00	55.40	0.51
Reach-1	3.766	100 year	Proposed 3B	7330.00	515.30	530.54	525.82	532.22	0.001172	10.41	704.00	55.40	0.51
Reach-1	3.766	100 year	Proposed 3C	7330.00	515.30	530.54	525.82	532.22	0.001172	10.41	704.00	55.40	0.51
Reach-1	3.766	100 year	Proposed 3D	7330.00	515.30	530.54	525.82	532.22	0.001172	10.41	704.00	55.40	0.51
Reach-1	3.766	100 year	PR3E Raised	7330.00	515.30	530.54	525.82	532.22	0.001172	10.41	704.00	55.40	0.51
Reach-1	3.7645			Bridge									
Reach-1	3.763	100 year	Existing Prelim	7330.00	515.30	530.33	525.84	532.07	0.001229	10.58	692.63	55.37	0.53
Reach-1	3.763	100 year	Proposed 3B	7330.00	515.30	530.33	525.84	532.07	0.001229	10.58	692.63	55.37	0.53
Reach-1	3.763	100 year	Proposed 3C	7330.00	515.30	530.33	525.84	532.07	0.001229	10.58	692.63	55.37	0.53
Reach-1	3.763	100 year	Proposed 3D	7330.00	515.30	530.33	525.84	532.07	0.001229	10.58	692.63	55.37	0.53
Reach-1	3.763	100 year	PR3E Raised	7330.00	515.30	530.33	525.84	532.07	0.001229	10.58	692.63	55.37	0.53
Reach-1	3.754	100 year	Existing Prelim	7330.00	515.20	530.27		532.02	0.000941	10.63	705.63	60.33	0.51
Reach-1	3.754	100 year	Proposed 3B	7330.00	515.20	530.27		532.02	0.000941	10.63	705.63	60.33	0.51
Reach-1	3.754	100 year	Proposed 3C	7330.00	515.20	530.27		532.02	0.000941	10.63	705.63	60.33	0.51
Reach-1	3.754	100 year	Proposed 3D	7330.00	515.20	530.27		532.02	0.000941	10.63	705.63	60.33	0.51
Reach-1	3.754	100 year	PR3E Raised	7330.00	515.20	530.27		532.02	0.000941	10.63	705.63	60.33	0.51
Reach-1	3.71	100 year	Existing Prelim	7330.00	514.50	530.09		531.80	0.000905	10.53	744.37	75.97	0.50
Reach-1	3.71	100 year	Proposed 3B	7330.00	514.50	530.09		531.80	0.000905	10.53	744.37	75.97	0.50
Reach-1	3.71	100 year	Proposed 3C	7330.00	514.50	530.09		531.80	0.000905	10.53	744.37	75.97	0.50
Reach-1	3.71	100 year	Proposed 3D	7330.00	514.50	530.09		531.80	0.000905	10.53	744.37	75.97	0.50
Reach-1	3.71	100 year	PR3E Raised	7330.00	514.50	530.09		531.80	0.000905	10.53	744.37	75.97	0.50
Reach-1	3.686	100 year	Existing Prelim	7330.00	514.20	530.45		531.53	0.000448	8.43	971.43	103.10	0.40
Reach-1	3.686	100 year	Proposed 3B	7330.00	514.20	530.45		531.53	0.000448	8.43	971.43	103.10	0.40
Reach-1	3.686	100 year	Proposed 3C	7330.00	514.20	530.45		531.53	0.000448	8.43	971.43	103.10	0.40
Reach-1	3.686	100 year	Proposed 3D	7330.00	514.20	530.45		531.53	0.000448	8.43	971.43	103.10	0.40
Reach-1	3.686	100 year	PR3E Raised	7330.00	514.20	530.45		531.53	0.000448	8.43	971.43	103.10	0.40
Reach-1	3.628	100 year	Existing Prelim	7330.00	514.00	530.03		531.34	0.000643	9.61	1153.65	248.15	0.44
Reach-1	3.628	100 year	Proposed 3B	7330.00	514.00	530.03		531.34	0.000643	9.61	1153.65	248.15	0.44
Reach-1	3.628	100 year	Proposed 3C	7330.00	514.00	530.03		531.34	0.000643	9.61	1153.65	248.15	0.44
Reach-1	3.628	100 year	Proposed 3D	7330.00	514.00	530.03		531.34	0.000643	9.61	1153.65	248.15	0.44
Reach-1	3.628	100 year	PR3E Raised	7330.00	514.00	530.03		531.34	0.000643	9.61	1153.65	248.15	0.44
Reach-1	3.593	100 year	Existing Prelim	7330.00	513.40	529.19		531.07	0.000977	11.24	756.01	75.61	0.51
Reach-1	3.593	100 year	Proposed 3B	7330.00	513.40	529.19		531.07	0.000977	11.24	756.01	75.61	0.51
Reach-1	3.593	100 year	Proposed 3C	7330.00	513.40	529.19		531.07	0.000977	11.24	756.01	75.61	0.51
Reach-1	3.593	100 year	Proposed 3D	7330.00	513.40	529.19		531.07	0.000977	11.24	756.01	75.61	0.51
Reach-1	3.593	100 year	PR3E Raised	7330.00	513.40	529.19		531.07	0.000977	11.24	756.01	75.61	0.51
Reach-1	3.568	100 year	Existing Prelim	7330.00	513.20	528.28	524.30	530.86	0.001173	12.90	568.41	98.33	0.61
Reach-1	3.568	100 year	Proposed 3B	7330.00	513.20	528.28	524.30	530.86	0.001173	12.90	568.41	98.33	0.61
Reach-1	3.568	100 year	Proposed 3C	7330.00	513.20	528.28	524.30	530.86	0.001173	12.90	568.41	98.33	0.61
Reach-1	3.568	100 year	Proposed 3D	7330.00	513.20	528.28	524.30	530.86	0.001173	12.90	568.41	98.33	0.61
Reach-1	3.568	100 year	PR3E Raised	7330.00	513.20	528.28	524.30	530.86	0.001173	12.90	568.41	98.33	0.61
Reach-1	3.5635			Bridge									
Reach-1	3.559	100 year	Existing Prelim	7330.00	513.20	526.72	524.30	529.99	0.001736	14.51	505.34	90.35	0.72
Reach-1	3.559	100 year	Proposed 3B	7330.00	513.20	526.72	524.30	529.99	0.001736	14.51	505.34	90.35	0.72
Reach-1	3.559	100 year	Proposed 3C	7330.00	513.20	526.72	524.30	529.99	0.001736	14.51	505.34	90.35	0.72
Reach-1	3.559	100 year	Proposed 3D	7330.00	513.20	526.72	524.30	529.99	0.001736	14.51	505.34	90.35	0.72
Reach-1	3.559	100 year	PR3E Raised	7330.00	513.20	526.72	524.30	529.99	0.001736	14.51	505.34	90.35	0.72
Reach-1	3.548	100 year	Existing Prelim	7330.00	513.00	527.10		529.69	0.001565	13.08	673.34	91.91	0.63
Reach-1	3.548	100 year	Proposed 3B	7330.00	513.00	527.10		529.69	0.001565	13.08	673.34	91.91	0.63
Reach-1	3.548	100 year	Proposed 3C	7330.00	513.00	527.10		529.69	0.001565	13.08	673.34	91.91	0.63
Reach-1	3.548	100 year	Proposed 3D	7330.00	513.00	527.10		529.69	0.001565	13.08	673.34	91.91	0.63
Reach-1	3.548	100 year	PR3E Raised	7330.00	513.00	527.10		529.69	0.001565	13.08	673.34	91.91	0.63
Reach-1	3.462	100 year	Existing Prelim	7330.00	511.90	527.30		528.84	0.000938	10.70	1246.99	197.10	0.49
Reach-1	3.462	100 year	Proposed 3B	7330.00	511.90	527.30		528.84	0.000938	10.70	1246.99	197.10	0.49
Reach-1	3.462	100 year	Proposed 3C	7330.00	511.90	527.30		528.84	0.000938	10.70	1246.99	197.10	0.49
Reach-1	3.462	100 year	Proposed 3D	7330.00	511.90	527.30		528.84	0.000938	10.70	1246.99	197.10	0.49

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.462	100 year	PR3E Raised	7330.00	511.90	527.30		528.84	0.000938	10.70	1246.99	197.10	0.49
Reach-1	3.441	100 year	Existing Prelim	7330.00	511.80	525.56	522.56	528.57	0.001183	13.92	526.42	92.40	0.68
Reach-1	3.441	100 year	Proposed 3B	7330.00	511.80	525.56	522.56	528.57	0.001183	13.92	526.42	92.40	0.68
Reach-1	3.441	100 year	Proposed 3C	7330.00	511.80	525.56	522.56	528.57	0.001183	13.92	526.42	92.40	0.68
Reach-1	3.441	100 year	Proposed 3D	7330.00	511.80	525.56	522.56	528.57	0.001183	13.92	526.42	92.40	0.68
Reach-1	3.441	100 year	PR3E Raised	7330.00	511.80	525.56	522.56	528.57	0.001183	13.92	526.42	92.40	0.68
Reach-1	3.434			Bridge									
Reach-1	3.427	100 year	Existing Prelim	7330.00	511.80	525.19	522.57	528.38	0.001301	14.33	511.65	89.66	0.71
Reach-1	3.427	100 year	Proposed 3B	7330.00	511.80	525.19	522.57	528.38	0.001301	14.33	511.65	89.66	0.71
Reach-1	3.427	100 year	Proposed 3C	7330.00	511.80	525.19	522.57	528.38	0.001301	14.33	511.65	89.66	0.71
Reach-1	3.427	100 year	Proposed 3D	7330.00	511.80	525.19	522.57	528.38	0.001301	14.33	511.65	89.66	0.71
Reach-1	3.427	100 year	PR3E Raised	7330.00	511.80	525.19	522.57	528.38	0.001301	14.33	511.65	89.66	0.71
Reach-1	3.41	100 year	Existing Prelim	7330.00	511.60	525.58		528.04	0.001481	12.83	738.72	108.61	0.61
Reach-1	3.41	100 year	Proposed 3B	7330.00	511.60	525.58		528.04	0.001481	12.83	738.72	108.61	0.61
Reach-1	3.41	100 year	Proposed 3C	7330.00	511.60	525.58		528.04	0.001481	12.83	738.72	108.61	0.61
Reach-1	3.41	100 year	Proposed 3D	7330.00	511.60	525.58		528.04	0.001481	12.83	738.72	108.61	0.61
Reach-1	3.41	100 year	PR3E Raised	7330.00	511.60	525.58		528.04	0.001481	12.83	738.72	108.61	0.61
Reach-1	3.308	100 year	Existing Prelim	7330.00	510.60	525.15		526.29	0.005237	9.68	1020.15	129.28	0.46
Reach-1	3.308	100 year	Proposed 3B	7330.00	510.60	525.15		526.29	0.005237	9.68	1020.15	129.28	0.46
Reach-1	3.308	100 year	Proposed 3C	7330.00	510.60	525.15		526.29	0.005237	9.68	1020.15	129.28	0.46
Reach-1	3.308	100 year	Proposed 3D	7330.00	510.60	525.15		526.29	0.005237	9.68	1020.15	129.28	0.46
Reach-1	3.308	100 year	PR3E Raised	7330.00	510.60	525.15		526.29	0.005237	9.68	1020.15	129.28	0.46
Reach-1	3.219	100 year	Existing Prelim	7330.00	509.70	524.14		524.61	0.002086	5.54	1387.06	153.03	0.29
Reach-1	3.219	100 year	Proposed 3B	7330.00	509.70	524.14		524.61	0.002086	5.54	1387.06	153.03	0.29
Reach-1	3.219	100 year	Proposed 3C	7330.00	509.70	524.14		524.61	0.002086	5.54	1387.06	153.03	0.29
Reach-1	3.219	100 year	Proposed 3D	7330.00	509.70	524.14		524.61	0.002086	5.54	1387.06	153.03	0.29
Reach-1	3.219	100 year	PR3E Raised	7330.00	509.70	524.14		524.61	0.002086	5.54	1387.06	153.03	0.29
Reach-1	3.132	100 year	Existing Prelim	7330.00	508.30	523.22		523.66	0.001997	5.49	1469.63	178.82	0.29
Reach-1	3.132	100 year	Proposed 3B	7330.00	508.30	523.22		523.66	0.001997	5.49	1469.63	178.82	0.29
Reach-1	3.132	100 year	Proposed 3C	7330.00	508.30	523.22		523.66	0.001997	5.49	1469.63	178.82	0.29
Reach-1	3.132	100 year	Proposed 3D	7330.00	508.30	523.22		523.66	0.001997	5.49	1469.63	178.82	0.29
Reach-1	3.132	100 year	PR3E Raised	7330.00	508.30	523.22		523.66	0.001997	5.49	1469.63	178.82	0.29
Reach-1	3.038	100 year	Existing Prelim	7330.00	504.90	519.80		521.62	0.010300	10.81	678.29	67.42	0.60
Reach-1	3.038	100 year	Proposed 3B	7330.00	504.90	519.80		521.62	0.010300	10.81	678.29	67.42	0.60
Reach-1	3.038	100 year	Proposed 3C	7330.00	504.90	519.80		521.62	0.010300	10.81	678.29	67.42	0.60
Reach-1	3.038	100 year	Proposed 3D	7330.00	504.90	519.80		521.62	0.010300	10.81	678.29	67.42	0.60
Reach-1	3.038	100 year	PR3E Raised	7330.00	504.90	519.80		521.62	0.010300	10.81	678.29	67.42	0.60
Reach-1	3.03475*	100 year	Existing Prelim	7330.00	504.80	519.82		521.39	0.007516	10.05	729.28	70.27	0.55
Reach-1	3.03475*	100 year	Proposed 3B	7330.00	504.80	519.82		521.39	0.007516	10.05	729.28	70.27	0.55
Reach-1	3.03475*	100 year	Proposed 3C	7330.00	504.80	519.82		521.39	0.007516	10.05	729.28	70.27	0.55
Reach-1	3.03475*	100 year	Proposed 3D	7330.00	504.80	519.82		521.39	0.007516	10.05	729.28	70.27	0.55
Reach-1	3.03475*	100 year	PR3E Raised	7330.00	504.80	519.82		521.39	0.007516	10.05	729.28	70.27	0.55
Reach-1	3.0315*	100 year	Existing Prelim	7330.00	504.70	519.86		521.22	0.005316	9.35	784.42	73.15	0.50
Reach-1	3.0315*	100 year	Proposed 3B	7330.00	504.70	519.86		521.22	0.005316	9.35	784.42	73.15	0.50
Reach-1	3.0315*	100 year	Proposed 3C	7330.00	504.70	519.86		521.22	0.005316	9.35	784.42	73.15	0.50
Reach-1	3.0315*	100 year	Proposed 3D	7330.00	504.70	519.86		521.22	0.005316	9.35	784.42	73.15	0.50
Reach-1	3.0315*	100 year	PR3E Raised	7330.00	504.70	519.86		521.22	0.005316	9.35	784.42	73.15	0.50
Reach-1	3.02825*	100 year	Existing Prelim	7330.00	504.60	519.91		521.09	0.003898	8.73	841.91	78.00	0.45
Reach-1	3.02825*	100 year	Proposed 3B	7330.00	504.60	519.91		521.09	0.003898	8.73	841.91	78.00	0.45
Reach-1	3.02825*	100 year	Proposed 3C	7330.00	504.60	519.91		521.09	0.003898	8.73	841.91	78.00	0.45
Reach-1	3.02825*	100 year	Proposed 3D	7330.00	504.60	519.91		521.09	0.003898	8.73	841.91	78.00	0.45
Reach-1	3.02825*	100 year	PR3E Raised	7330.00	504.60	519.91		521.09	0.003898	8.73	841.91	78.00	0.45
Reach-1	3.025*	100 year	Existing Prelim	7330.00	504.50	519.96		520.99	0.002740	8.18	903.83	84.78	0.41
Reach-1	3.025*	100 year	Proposed 3B	7330.00	504.50	519.96		520.99	0.002740	8.18	903.83	84.78	0.41
Reach-1	3.025*	100 year	Proposed 3C	7330.00	504.50	519.96		520.99	0.002740	8.18	903.83	84.78	0.41
Reach-1	3.025*	100 year	Proposed 3D	7330.00	504.50	519.96		520.99	0.002740	8.18	903.83	84.78	0.41
Reach-1	3.025*	100 year	PR3E Raised	7330.00	504.50	519.96		520.99	0.002740	8.18	903.83	84.78	0.41
Reach-1	3.02175*	100 year	Existing Prelim	7330.00	504.40	520.00		520.92	0.001915	7.67	972.62	94.90	0.37
Reach-1	3.02175*	100 year	Proposed 3B	7330.00	504.40	520.00		520.92	0.001915	7.67	972.62	94.90	0.37
Reach-1	3.02175*	100 year	Proposed 3C	7330.00	504.40	520.00		520.92	0.001915	7.67	972.62	94.90	0.37
Reach-1	3.02175*	100 year	Proposed 3D	7330.00	504.40	520.00		520.92	0.001915	7.67	972.62	94.90	0.37
Reach-1	3.02175*	100 year	PR3E Raised	7330.00	504.40	520.00		520.92	0.001915	7.67	972.62	94.90	0.37
Reach-1	3.0185*	100 year	Existing Prelim	7330.00	504.30	520.06		520.86	0.001319	7.20	1053.87	103.92	0.34
Reach-1	3.0185*	100 year	Proposed 3B	7330.00	504.30	520.06		520.86	0.001319	7.20	1053.87	103.92	0.34
Reach-1	3.0185*	100 year	Proposed 3C	7330.00	504.30	520.06		520.86	0.001319	7.20	1053.87	103.92	0.34
Reach-1	3.0185*	100 year	Proposed 3D	7330.00	504.30	520.06		520.86	0.001319	7.20	1053.87	103.92	0.34
Reach-1	3.0185*	100 year	PR3E Raised	7330.00	504.30	520.06		520.86	0.001319	7.20	1053.87	103.92	0.34
Reach-1	3.01525*	100 year	Existing Prelim	7330.00	504.20	520.11		520.81	0.000947	6.77	1142.88	105.24	0.31
Reach-1	3.01525*	100 year	Proposed 3B	7330.00	504.20	520.11		520.81	0.000947	6.77	1142.88	105.24	0.31
Reach-1	3.01525*	100 year	Proposed 3C	7330.00	504.20	520.11		520.81	0.000947	6.77	1142.88	105.24	0.31
Reach-1	3.01525*	100 year	Proposed 3D	7330.00	504.20	520.11		520.81	0.000947	6.77	1142.88	105.24	0.31
Reach-1	3.01525*	100 year	PR3E Raised	7330.00	504.20	520.11		520.81	0.000947	6.77	1142.88	105.24	0.31

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	3.012	100 year	Existing Prelim	7330.00	504.10	520.04	512.45	520.78	0.000818	6.93	1058.47	106.55	0.32
Reach-1	3.012	100 year	Proposed 3B	7330.00	504.10	520.04	512.45	520.78	0.000818	6.93	1058.47	106.55	0.32
Reach-1	3.012	100 year	Proposed 3C	7330.00	504.10	520.04	512.45	520.78	0.000818	6.93	1058.47	106.55	0.32
Reach-1	3.012	100 year	Proposed 3D	7330.00	504.10	520.04	512.45	520.78	0.000818	6.93	1058.47	106.55	0.32
Reach-1	3.012	100 year	PR3E Raised	7330.00	504.10	520.04	512.45	520.78	0.000818	6.93	1058.47	106.55	0.32
Reach-1	3.011			Bridge									
Reach-1	3.01	100 year	Existing Prelim	7330.00	504.10	518.69	512.46	519.60	0.000284	7.65	958.33	106.55	0.37
Reach-1	3.01	100 year	Proposed 3B	7330.00	504.10	518.69	512.46	519.60	0.000284	7.65	958.33	106.55	0.37
Reach-1	3.01	100 year	Proposed 3C	7330.00	504.10	518.69	512.46	519.60	0.000284	7.65	958.33	106.55	0.37
Reach-1	3.01	100 year	Proposed 3D	7330.00	504.10	518.69	512.46	519.60	0.000284	7.65	958.33	106.55	0.37
Reach-1	3.01	100 year	PR3E Raised	7330.00	504.10	518.69	512.46	519.60	0.000284	7.65	958.33	106.55	0.37
Reach-1	3.008	100 year	Existing Prelim	7330.00	503.70	518.48		519.55	0.000295	8.31	882.48	63.98	0.39
Reach-1	3.008	100 year	Proposed 3B	7330.00	503.70	518.48		519.55	0.000295	8.31	882.48	63.98	0.39
Reach-1	3.008	100 year	Proposed 3C	7330.00	503.70	518.48		519.55	0.000295	8.31	882.48	63.98	0.39
Reach-1	3.008	100 year	Proposed 3D	7330.00	503.70	518.48		519.55	0.000295	8.31	882.48	63.98	0.39
Reach-1	3.008	100 year	PR3E Raised	7330.00	503.70	518.48		519.55	0.000295	8.31	882.48	63.98	0.39
Reach-1	3.006	100 year	Existing Prelim	7330.00	503.30	518.19	511.60	519.48	0.000235	9.36	858.53	59.00	0.43
Reach-1	3.006	100 year	Proposed 3B	7330.00	503.30	518.19	511.60	519.48	0.000235	9.36	858.53	59.00	0.43
Reach-1	3.006	100 year	Proposed 3C	7330.00	503.30	518.19	511.60	519.48	0.000235	9.36	858.53	59.00	0.43
Reach-1	3.006	100 year	Proposed 3D	7330.00	503.30	518.19	511.60	519.48	0.000235	9.36	858.53	59.00	0.43
Reach-1	3.006	100 year	PR3E Raised	7330.00	503.30	518.19	511.60	519.48	0.000235	9.36	858.53	59.00	0.43
Reach-1	2.850			Culvert									
Reach-1	2.800	100 year	Existing Prelim	7330.00	502.80	515.20	511.64	517.45	0.000771	12.04	608.67	49.10	0.60
Reach-1	2.800	100 year	Proposed 3B	7330.00	502.80	515.20	511.64	517.45	0.000771	12.04	608.67	49.10	0.60
Reach-1	2.800	100 year	Proposed 3C	7330.00	502.80	515.20	511.64	517.45	0.000771	12.04	608.67	49.10	0.60
Reach-1	2.800	100 year	Proposed 3D	7330.00	502.80	515.20	511.64	517.45	0.000771	12.04	608.67	49.10	0.60
Reach-1	2.800	100 year	PR3E Raised	7330.00	502.80	515.20	511.64	517.45	0.000771	12.04	608.67	49.10	0.60
Reach-1	2.700			Culvert									
Reach-1	2.519	100 year	Existing Prelim	7330.00	496.00	511.81		513.12	0.000213	9.28	912.59	59.00	0.41
Reach-1	2.519	100 year	Proposed 3B	7330.00	496.00	512.04		513.32	0.000203	9.15	926.18	59.00	0.40
Reach-1	2.519	100 year	Proposed 3C	7330.00	496.00	511.81		513.13	0.000213	9.28	912.85	59.00	0.41
Reach-1	2.519	100 year	Proposed 3D	7330.00	496.00	511.81		513.12	0.000213	9.28	912.62	59.00	0.41
Reach-1	2.519	100 year	PR3E Raised	7330.00	496.00	511.81		513.12	0.000213	9.28	912.62	59.00	0.41
Reach-1	2.481	100 year	Existing Prelim	7630.00	495.40	512.31		512.79	0.001113	5.92	1461.68	151.05	0.29
Reach-1	2.481	100 year	Proposed 3B	7630.00	495.40	512.54		512.99	0.001040	5.79	1495.56	151.56	0.28
Reach-1	2.481	100 year	Proposed 3C	7630.00	495.40	512.32		512.79	0.001112	5.92	1462.34	151.06	0.29
Reach-1	2.481	100 year	Proposed 3D	7630.00	495.40	512.31		512.79	0.001113	5.92	1461.76	151.06	0.29
Reach-1	2.481	100 year	PR3E Raised	7630.00	495.40	512.31		512.79	0.001113	5.92	1461.76	151.06	0.29
Reach-1	2.430	100 year	Existing Prelim	7630.00	495.10	512.38		512.58	0.000252	3.63	2144.50	190.70	0.18
Reach-1	2.430	100 year	Proposed 3B	7630.00	495.10	512.60		512.80	0.000238	3.56	2186.83	191.70	0.17
Reach-1	2.430	100 year	Proposed 3C	7630.00	495.10	512.38		512.59	0.000252	3.63	2145.30	190.72	0.18
Reach-1	2.430	100 year	Proposed 3D	7630.00	495.10	512.38		512.58	0.000252	3.63	2144.58	190.70	0.18
Reach-1	2.430	100 year	PR3E Raised	7630.00	495.10	512.38		512.58	0.000252	3.63	2144.58	190.70	0.18
Reach-1	2.410	100 year	Existing Prelim	7630.00	493.00	510.78		512.38	0.003152	10.15	751.87	73.74	0.56
Reach-1	2.410	100 year	Proposed 3B	7630.00	493.00	511.10		512.60	0.002878	9.83	775.89	74.21	0.54
Reach-1	2.410	100 year	Proposed 3C	7630.00	493.00	510.78		512.38	0.003146	10.14	752.34	73.75	0.56
Reach-1	2.410	100 year	Proposed 3D	7630.00	493.00	510.78		512.38	0.003151	10.15	751.92	73.74	0.56
Reach-1	2.410	100 year	PR3E Raised	7630.00	493.00	510.78		512.38	0.003151	10.15	751.92	73.74	0.56
Reach-1	2.38	100 year	Existing Prelim	7630.00	493.00	509.87		511.79	0.003835	11.11	686.50	68.23	0.62
Reach-1	2.38	100 year	Proposed 3B	7630.00	493.00	510.32		512.07	0.003602	10.63	718.05	73.06	0.60
Reach-1	2.38	100 year	Proposed 3C	7630.00	493.00	509.88		511.80	0.003826	11.10	687.13	68.25	0.62
Reach-1	2.38	100 year	Proposed 3D	7630.00	493.00	509.88		511.79	0.003834	11.11	686.57	68.23	0.62
Reach-1	2.38	100 year	PR3E Raised	7630.00	493.00	509.88		511.79	0.003834	11.11	686.57	68.23	0.62
Reach-1	2.347	100 year	Existing Prelim	7630.00	495.00	510.56		511.04	0.001086	5.70	1369.78	138.67	0.28
Reach-1	2.347	100 year	Proposed 3B	7630.00	495.00	510.94		511.38	0.000963	5.47	1422.60	139.80	0.26
Reach-1	2.347	100 year	Proposed 3C	7630.00	495.00	510.56		511.05	0.001083	5.69	1370.90	138.69	0.28
Reach-1	2.347	100 year	Proposed 3D	7630.00	495.00	510.56		511.04	0.001086	5.70	1369.90	138.67	0.28
Reach-1	2.347	100 year	PR3E Raised	7630.00	495.00	510.56		511.04	0.001086	5.70	1369.90	138.67	0.28
Reach-1	2.314	100 year	Existing Prelim	7630.00	489.70	510.34		510.86	0.000956	5.84	1465.23	206.00	0.25
Reach-1	2.314	100 year	Proposed 3B	7630.00	489.70	510.75		511.22	0.000863	5.64	1548.26	206.00	0.24
Reach-1	2.314	100 year	Proposed 3C	7630.00	489.70	510.35		510.87	0.000954	5.84	1467.01	206.00	0.25
Reach-1	2.314	100 year	Proposed 3D	7630.00	489.70	510.35		510.86	0.000955	5.84	1465.43	206.00	0.25
Reach-1	2.314	100 year	PR3E Raised	7630.00	489.70	510.35		510.86	0.000955	5.84	1465.43	206.00	0.25
Reach-1	2.312	100 year	Existing Prelim	7630.00	489.70	510.17		510.83	0.002089	6.66	1279.90	206.00	0.31
Reach-1	2.312	100 year	Proposed 3B	7630.00	489.70	510.60		511.20	0.001831	6.35	1369.45	206.00	0.29
Reach-1	2.312	100 year	Proposed 3C	7630.00	489.70	510.18		510.84	0.002083	6.65	1281.82	206.00	0.31
Reach-1	2.312	100 year	Proposed 3D	7630.00	489.70	510.17		510.83	0.002089	6.65	1280.11	206.00	0.31
Reach-1	2.312	100 year	PR3E Raised	7630.00	489.70	510.17		510.83	0.002089	6.65	1280.11	206.00	0.31
Reach-1	2.310	100 year	Existing Prelim	7630.00	489.70	510.25		510.78	0.000979	5.89	1445.88	206.00	0.26
Reach-1	2.310	100 year	Proposed 3B	7630.00	489.70	510.67		511.15	0.000880	5.68	1532.09	206.00	0.24

Limits of WSE effects from bridges for alt. 3B

Limits of WSE effects from bridges for alt. 3C

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2.310	100 year	Proposed 3C	7630.00	489.70	510.26		510.78	0.000977	5.89	1447.71	206.00	0.26
Reach-1	2.310	100 year	Proposed 3D	7630.00	489.70	510.25		510.78	0.000979	5.89	1446.07	206.00	0.26
Reach-1	2.310	100 year	PR3E Raised	7630.00	489.70	510.25		510.78	0.000979	5.89	1446.07	206.00	0.26
Reach-1	2.28	100 year	Existing Prelim	7630.00	489.50	508.99		510.43	0.003294	9.83	832.70	70.83	0.42
Reach-1	2.28	100 year	Proposed 3B	7630.00	489.50	509.51		510.84	0.002929	9.46	870.30	72.96	0.40
Reach-1	2.28	100 year	Proposed 3C	7630.00	489.50	509.00		510.43	0.003285	9.82	833.49	70.88	0.42
Reach-1	2.28	100 year	Proposed 3D	7630.00	489.50	508.99		510.43	0.003293	9.83	832.78	70.83	0.42
Reach-1	2.28	100 year	PR3E Raised	7630.00	489.50	508.99		510.43	0.003293	9.83	832.78	70.83	0.42
Reach-1	2.265	100 year	Existing Prelim	7630.00	489.00	509.18		510.12	0.001338	7.77	981.90	69.59	0.36
Reach-1	2.265	100 year	Proposed 3B	7630.00	489.00	509.68		510.56	0.001214	7.50	1017.24	70.34	0.35
Reach-1	2.265	100 year	Proposed 3C	7630.00	489.00	509.19		510.13	0.001335	7.76	982.65	69.60	0.36
Reach-1	2.265	100 year	Proposed 3D	7630.00	489.00	509.18		510.12	0.001338	7.77	981.97	69.59	0.36
Reach-1	2.265	100 year	PR3E Raised	7630.00	489.00	509.18		510.12	0.001338	7.77	981.97	69.59	0.36
Reach-1	2.253	100 year	Existing Prelim	7630.00	489.20	509.38	498.66	509.90	0.001747	5.76	1324.08	176.02	0.24
Reach-1	2.253	100 year	Proposed 3B	7630.00	489.20	509.87	498.66	510.36	0.001593	5.61	1361.07	179.71	0.23
Reach-1	2.253	100 year	Proposed 3C	7630.00	489.20	509.39	498.66	509.91	0.001743	5.76	1324.87	176.10	0.24
Reach-1	2.253	100 year	Proposed 3D	7630.00	489.20	509.38	498.66	509.91	0.001746	5.76	1324.16	176.03	0.24
Reach-1	2.253	100 year	PR3E Raised	7630.00	489.20	509.38	498.66	509.91	0.001746	5.76	1324.16	176.03	0.24
Reach-1	2.252			Bridge									
Reach-1	2.251	100 year	Existing Prelim	7630.00	489.20	507.94	498.66	508.55	0.002326	6.28	1214.99	168.42	0.28
Reach-1	2.251	100 year	Proposed 3B	7630.00	489.20	508.40	498.66	508.98	0.002117	6.11	1249.78	170.56	0.26
Reach-1	2.251	100 year	Proposed 3C	7630.00	489.20	507.95	498.66	508.56	0.002322	6.28	1215.74	168.47	0.28
Reach-1	2.251	100 year	Proposed 3D	7630.00	489.20	507.94	498.66	508.55	0.002326	6.28	1215.07	168.43	0.28
Reach-1	2.251	100 year	PR3E Raised	7630.00	489.20	507.94	498.66	508.55	0.002326	6.28	1215.07	168.43	0.28
Reach-1	2.237	100 year	Existing Prelim	7630.00	488.50	507.93		508.38	0.001498	5.39	1446.40	103.27	0.24
Reach-1	2.237	100 year	Proposed 3B	7630.00	488.50	508.39		508.81	0.001364	5.23	1494.84	104.72	0.23
Reach-1	2.237	100 year	Proposed 3C	7630.00	488.50	507.94		508.38	0.001495	5.38	1447.43	103.30	0.24
Reach-1	2.237	100 year	Proposed 3D	7630.00	488.50	507.93		508.38	0.001497	5.39	1446.51	103.28	0.24
Reach-1	2.237	100 year	PR3E Raised	7630.00	488.50	507.93		508.38	0.001497	5.39	1446.51	103.28	0.24
Reach-1	2.209	100 year	Existing Prelim	7630.00	487.70	507.87		508.16	0.000918	4.43	1883.63	175.08	0.20
Reach-1	2.209	100 year	Proposed 3B	7630.00	487.70	508.35		508.61	0.000817	4.27	1968.89	180.42	0.19
Reach-1	2.209	100 year	Proposed 3C	7630.00	487.70	507.88		508.17	0.000915	4.43	1885.44	175.15	0.20
Reach-1	2.209	100 year	Proposed 3D	7630.00	487.70	507.87		508.16	0.000918	4.43	1883.81	175.09	0.20
Reach-1	2.209	100 year	PR3E Raised	7630.00	487.70	507.87		508.16	0.000918	4.43	1883.81	175.09	0.20
Reach-1	2.181	100 year	Existing Prelim	7630.00	486.70	507.88		508.01	0.000540	3.54	2935.13	335.02	0.15
Reach-1	2.181	100 year	Proposed 3B	7630.00	486.70	508.37		508.48	0.000463	3.34	3099.58	339.61	0.14
Reach-1	2.181	100 year	Proposed 3C	7630.00	486.70	507.89		508.02	0.000538	3.53	2938.66	335.12	0.15
Reach-1	2.181	100 year	Proposed 3D	7630.00	486.70	507.88		508.01	0.000540	3.54	2935.48	335.03	0.15
Reach-1	2.181	100 year	PR3E Raised	7630.00	486.70	507.88		508.01	0.000540	3.54	2935.48	335.03	0.15
Reach-1	2.112	100 year	Existing Prelim	10120.00	484.20	507.70		507.82	0.000480	3.54	4040.26	422.31	0.15
Reach-1	2.112	100 year	Proposed 3B	10120.00	484.20	508.21		508.32	0.000416	3.36	4258.34	429.68	0.14
Reach-1	2.112	100 year	Proposed 3C	10120.00	484.20	507.71		507.83	0.000479	3.54	4044.95	422.47	0.15
Reach-1	2.112	100 year	Proposed 3D	10120.00	484.20	507.70		507.82	0.000480	3.54	4040.72	422.32	0.15
Reach-1	2.112	100 year	PR3E Raised	10120.00	484.20	507.70		507.82	0.000480	3.54	4040.72	422.32	0.15
Reach-1	2.091	100 year	Existing Prelim	10120.00	483.90	506.16		507.57	0.005464	9.59	1111.17	118.67	0.42
Reach-1	2.091	100 year	Proposed 3B	10120.00	483.90	506.84		508.10	0.004659	9.10	1192.48	119.11	0.39
Reach-1	2.091	100 year	Proposed 3C	10120.00	483.90	506.18		507.58	0.005445	9.58	1112.96	118.68	0.42
Reach-1	2.091	100 year	Proposed 3D	10120.00	483.90	506.16		507.57	0.005462	9.59	1111.35	118.67	0.42
Reach-1	2.091	100 year	PR3E Raised	10120.00	483.90	506.16		507.57	0.005462	9.59	1111.35	118.67	0.42
Reach-1	2.084	100 year	Existing Prelim	10120.00	483.90	505.88		507.36	0.005841	9.80	1077.45	118.49	0.43
Reach-1	2.084	100 year	Proposed 3B	10120.00	483.90	506.61		507.92	0.004918	9.27	1164.75	118.96	0.40
Reach-1	2.084	100 year	Proposed 3C	10120.00	483.90	505.89		507.37	0.005818	9.79	1079.39	118.50	0.43
Reach-1	2.084	100 year	Proposed 3D	10120.00	483.90	505.88		507.36	0.005838	9.80	1077.64	118.49	0.43
Reach-1	2.084	100 year	PR3E Raised	10120.00	483.90	505.88		507.36	0.005839	9.80	1077.64	118.49	0.43
Reach-1	2.054	100 year	Existing Prelim	10120.00	483.60	505.88		506.54	0.002550	6.97	1861.04	335.58	0.32
Reach-1	2.054	100 year	Proposed 3B	10120.00	483.60	506.70		507.24	0.001968	6.35	2160.41	388.04	0.28
Reach-1	2.054	100 year	Proposed 3C	10120.00	483.60	505.90		506.56	0.002534	6.96	1867.47	336.37	0.32
Reach-1	2.054	100 year	Proposed 3D	10120.00	483.60	505.88		506.55	0.002549	6.97	1861.68	335.66	0.32
Reach-1	2.054	100 year	PR3E Raised	10120.00	483.60	505.88		506.55	0.002549	6.97	1861.67	335.66	0.32
Reach-1	1.944	100 year	Existing Prelim	10120.00	483.20	505.18		505.46	0.001177	4.62	2464.97	270.37	0.21
Reach-1	1.944	100 year	Proposed 3B	10120.00	483.20	506.17		506.40	0.000910	4.23	2734.68	277.87	0.18
Reach-1	1.944	100 year	Proposed 3C	10120.00	483.20	505.20		505.48	0.001170	4.61	2471.36	270.53	0.21
Reach-1	1.944	100 year	Proposed 3D	10120.00	483.20	505.18		505.46	0.001176	4.62	2465.61	270.39	0.21
Reach-1	1.944	100 year	PR3E Raised	10120.00	483.20	505.18		505.46	0.001176	4.62	2465.59	270.39	0.21
Reach-1	1.833	100 year	Existing Prelim	10120.00	482.80	503.38		504.22	0.004204	7.36	1375.77	113.91	0.37
Reach-1	1.833	100 year	Proposed 3B	10120.00	482.80	504.80		505.47	0.002979	6.56	1554.06	133.94	0.32
Reach-1	1.833	100 year	Proposed 3C	10120.00	482.80	503.41		504.25	0.004172	7.33	1379.85	114.09	0.37
Reach-1	1.833	100 year	Proposed 3D	10120.00	482.80	503.38		504.22	0.004201	7.35	1376.18	113.93	0.37
Reach-1	1.833	100 year	PR3E Raised	10120.00	482.80	503.38		504.22	0.004201	7.35	1376.17	113.92	0.37
Reach-1	1.801	100 year	Existing Prelim	10120.00	482.80	502.89	493.21	503.62	0.002705	6.84	1478.62	347.34	0.29
Reach-1	1.801	100 year	Proposed 3B	10120.00	482.80	504.91	493.21	505.10	0.000787	3.97	3233.03	352.30	0.16
Reach-1	1.801	100 year	Proposed 3C	10120.00	482.80	502.93	493.21	503.66	0.002685	6.83	1481.96	347.72	0.29

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.801	100 year	Proposed 3D	10120.00	482.80	502.90	493.21	503.63	0.002703	6.84	1478.95	347.38	0.29
Reach-1	1.801	100 year	PR3E Raised	10120.00	482.80	502.90	493.21	503.63	0.002703	6.84	1478.95	347.38	0.29
Reach-1	1.799		Bridge										
Reach-1	1.797	100 year	Existing Prelim	10120.00	482.80	501.34	493.20	502.22	0.003706	7.52	1345.33	332.10	0.34
Reach-1	1.797	100 year	Proposed 3B	10120.00	482.80	503.31	493.20	503.60	0.001320	4.86	2670.12	351.43	0.20
Reach-1	1.797	100 year	Proposed 3C	10120.00	482.80	501.38	493.20	502.25	0.003678	7.51	1348.38	332.45	0.33
Reach-1	1.797	100 year	Proposed 3D	10120.00	482.80	501.35	493.20	502.23	0.003703	7.52	1345.63	332.14	0.33
Reach-1	1.797	100 year	PR3E Raised	10120.00	482.80	501.35	493.20	502.23	0.003703	7.52	1345.63	332.14	0.33
Reach-1	1.771	100 year	Existing Prelim	10120.00	482.60	501.00		501.65	0.003791	6.87	1785.18	329.10	0.36
Reach-1	1.771	100 year	Proposed 3B	10120.00	482.60	503.08	495.50	503.40	0.001607	5.01	2488.37	349.13	0.24
Reach-1	1.771	100 year	Proposed 3C	10120.00	482.60	501.05		501.69	0.003711	6.82	1800.94	329.57	0.36
Reach-1	1.771	100 year	Proposed 3D	10120.00	482.60	501.01		501.65	0.003783	6.87	1786.76	329.15	0.36
Reach-1	1.771	100 year	PR3E Raised	10120.00	482.60	501.01		501.65	0.003783	6.87	1786.72	329.15	0.36
Reach-1	1.742	100 year	Existing Prelim	10120.00	482.50	499.44		500.72	0.008586	9.08	1148.85	179.78	0.53
Reach-1	1.742	100 year	Proposed 3B	10120.00	482.50	499.44		500.72	0.008586	9.08	1148.85	179.78	0.53
Reach-1	1.742	100 year	Proposed 3C	10120.00	482.50	499.53		500.77	0.008346	8.99	1164.36	183.78	0.52
Reach-1	1.742	100 year	Proposed 3D	10120.00	482.50	499.45		500.72	0.008562	9.08	1150.40	180.19	0.53
Reach-1	1.742	100 year	PR3E Raised	10120.00	482.50	499.45		500.72	0.008563	9.08	1150.35	180.17	0.53
Reach-1	1.7256*	100 year	Existing Prelim	10120.00	482.34	498.75		499.98	0.008149	8.98	1198.80	223.91	0.52
Reach-1	1.7256*	100 year	Proposed 3B	10120.00	482.34	498.75		499.98	0.008149	8.98	1198.80	223.91	0.52
Reach-1	1.7256*	100 year	Proposed 3C	10120.00	482.34	498.88		500.06	0.007732	8.83	1227.57	228.10	0.50
Reach-1	1.7256*	100 year	Proposed 3D	10120.00	482.34	498.76		499.99	0.008106	8.97	1201.71	224.33	0.51
Reach-1	1.7256*	100 year	PR3E Raised	10120.00	482.34	498.76		499.99	0.008107	8.97	1201.62	224.32	0.51
Reach-1	1.7092*	100 year	Existing Prelim	10120.00	482.18	498.17		499.29	0.007142	8.68	1300.76	267.61	0.49
Reach-1	1.7092*	100 year	Proposed 3B	10120.00	482.18	498.17		499.29	0.007142	8.68	1300.76	267.61	0.49
Reach-1	1.7092*	100 year	Proposed 3C	10120.00	482.18	498.34		499.40	0.006678	8.49	1348.79	294.46	0.47
Reach-1	1.7092*	100 year	Proposed 3D	10120.00	482.18	498.18		499.30	0.007095	8.66	1305.40	270.32	0.49
Reach-1	1.7092*	100 year	PR3E Raised	10120.00	482.18	498.18		499.30	0.007096	8.66	1305.28	270.25	0.49
Reach-1	1.6928*	100 year	Existing Prelim	10120.00	482.02	497.87		498.68	0.005072	7.66	1558.10	295.19	0.42
Reach-1	1.6928*	100 year	Proposed 3B	10120.00	482.02	497.87		498.68	0.005072	7.66	1558.10	295.19	0.42
Reach-1	1.6928*	100 year	Proposed 3C	10120.00	482.02	498.09		498.83	0.004559	7.36	1624.71	295.78	0.40
Reach-1	1.6928*	100 year	Proposed 3D	10120.00	482.02	497.89		498.69	0.005015	7.63	1565.05	295.25	0.41
Reach-1	1.6928*	100 year	PR3E Raised	10120.00	482.02	497.89		498.69	0.005017	7.63	1564.86	295.25	0.41
Reach-1	1.6764*	100 year	Existing Prelim	10120.00	481.86	497.67		498.25	0.003435	6.60	1768.11	263.95	0.35
Reach-1	1.6764*	100 year	Proposed 3B	10120.00	481.86	497.67		498.25	0.003435	6.60	1768.11	263.95	0.35
Reach-1	1.6764*	100 year	Proposed 3C	10120.00	481.86	497.92		498.45	0.003096	6.35	1832.46	264.48	0.33
Reach-1	1.6764*	100 year	Proposed 3D	10120.00	481.86	497.70		498.27	0.003397	6.57	1774.87	264.01	0.34
Reach-1	1.6764*	100 year	PR3E Raised	10120.00	481.86	497.70		498.27	0.003399	6.57	1774.68	264.00	0.34
Reach-1	1.66	100 year	Existing Prelim	10120.00	481.70	497.49		497.96	0.002545	5.92	1880.69	232.26	0.30
Reach-1	1.66	100 year	Proposed 3B	10120.00	481.70	497.49		497.96	0.002545	5.92	1880.69	232.26	0.30
Reach-1	1.66	100 year	Proposed 3C	10120.00	481.70	497.75		498.19	0.002310	5.72	1940.68	232.74	0.29
Reach-1	1.66	100 year	Proposed 3D	10120.00	481.70	497.52		497.99	0.002519	5.89	1887.03	232.31	0.30
Reach-1	1.66	100 year	PR3E Raised	10120.00	481.70	497.52		497.99	0.002520	5.89	1886.85	232.31	0.30
Reach-1	1.6450*	100 year	Existing Prelim	10120.00	481.53	497.31		497.76	0.002448	5.79	1924.94	240.74	0.30
Reach-1	1.6450*	100 year	Proposed 3B	10120.00	481.53	497.31		497.76	0.002448	5.79	1924.94	240.74	0.30
Reach-1	1.6450*	100 year	Proposed 3C	10120.00	481.53	497.58		498.00	0.002201	5.58	1991.94	241.26	0.28
Reach-1	1.6450*	100 year	Proposed 3D	10120.00	481.53	497.34		497.78	0.002420	5.77	1932.05	240.80	0.29
Reach-1	1.6450*	100 year	PR3E Raised	10120.00	481.53	497.34		497.78	0.002421	5.77	1931.86	240.80	0.29
Reach-1	1.6300*	100 year	Existing Prelim	10120.00	481.35	497.13		497.56	0.002346	5.67	1972.17	249.25	0.29
Reach-1	1.6300*	100 year	Proposed 3B	10120.00	481.35	497.13		497.56	0.002346	5.67	1972.17	249.25	0.29
Reach-1	1.6300*	100 year	Proposed 3C	10120.00	481.35	497.43		497.83	0.002090	5.44	2046.65	249.80	0.27
Reach-1	1.6300*	100 year	Proposed 3D	10120.00	481.35	497.16		497.59	0.002317	5.64	1980.11	249.31	0.29
Reach-1	1.6300*	100 year	PR3E Raised	10120.00	481.35	497.16		497.59	0.002318	5.64	1979.88	249.31	0.29
Reach-1	1.6150*	100 year	Existing Prelim	10120.00	481.17	496.97		497.37	0.002239	5.53	2022.79	257.76	0.28
Reach-1	1.6150*	100 year	Proposed 3B	10120.00	481.17	496.97		497.37	0.002239	5.53	2022.79	257.76	0.28
Reach-1	1.6150*	100 year	Proposed 3C	10120.00	481.17	497.28		497.66	0.001976	5.29	2105.30	258.35	0.27
Reach-1	1.6150*	100 year	Proposed 3D	10120.00	481.17	497.00		497.40	0.002209	5.50	2031.62	257.82	0.28
Reach-1	1.6150*	100 year	PR3E Raised	10120.00	481.17	497.00		497.40	0.002210	5.50	2031.37	257.82	0.28
Reach-1	1.6	100 year	Existing Prelim	9890.00	481.00	496.82		497.19	0.002018	5.25	2082.01	266.33	0.27
Reach-1	1.6	100 year	Proposed 3B	9890.00	481.00	496.82		497.19	0.002018	5.25	2082.01	266.33	0.27
Reach-1	1.6	100 year	Proposed 3C	9890.00	481.00	497.16		497.50	0.001765	5.00	2172.54	266.96	0.25
Reach-1	1.6	100 year	Proposed 3D	9890.00	481.00	496.86		497.22	0.001988	5.22	2091.85	266.40	0.27
Reach-1	1.6	100 year	PR3E Raised	9890.00	481.00	496.86		497.22	0.001989	5.22	2091.57	266.40	0.27
Reach-1	1.5814*	100 year	Existing Prelim	9890.00	480.64	496.61		496.98	0.002140	5.37	2065.95	276.69	0.27
Reach-1	1.5814*	100 year	Proposed 3B	9890.00	480.64	496.61		496.98	0.002140	5.37	2065.95	276.69	0.27
Reach-1	1.5814*	100 year	Proposed 3C	9890.00	480.64	496.98		497.32	0.001838	5.08	2169.29	277.41	0.26
Reach-1	1.5814*	100 year	Proposed 3D	9890.00	480.64	496.65		497.02	0.002104	5.34	2077.29	276.77	0.27
Reach-1	1.5814*	100 year	PR3E Raised	9890.00	480.64	496.65		497.02	0.002105	5.34	2076.96	276.76	0.27
Reach-1	1.5629*	100 year	Existing Prelim	9890.00	480.29	496.37		496.76	0.002316	5.54	2034.94	287.02	0.28
Reach-1	1.5629*	100 year	Proposed 3B	9890.00	480.29	496.37		496.76	0.002316	5.54	2034.94	287.02	0.28
Reach-1	1.5629*	100 year	Proposed 3C	9890.00	480.29	496.79		497.13	0.001942	5.19	2154.32	287.86	0.26
Reach-1	1.5629*	100 year	Proposed 3D	9890.00	480.29	496.42		496.80	0.002270	5.50	2048.20	287.11	0.28

Existing Rail Bridge

Limits of WSE effects from bridges for alts. 3D, 3E

Approximate limit of Little Miami Backwater

Bridge 3B

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.5629*	100 year	PR3E Raised	9890.00	480.29	496.42		496.80	0.002271	5.50	2047.83	287.11	0.28
Reach-1	1.5443*	100 year	Existing Prelim	9890.00	479.93	496.10		496.52	0.002560	5.76	1988.21	297.33	0.30
Reach-1	1.5443*	100 year	Proposed 3B	9890.00	479.93	496.10		496.52	0.002560	5.76	1988.21	297.33	0.30
Reach-1	1.5443*	100 year	Proposed 3C	9890.00	479.93	496.58		496.94	0.002079	5.33	2128.48	298.34	0.27
Reach-1	1.5443*	100 year	Proposed 3D	9890.00	479.93	496.16		496.57	0.002498	5.71	2004.09	297.44	0.29
Reach-1	1.5443*	100 year	PR3E Raised	9890.00	479.93	496.16		496.57	0.002500	5.71	2003.64	297.44	0.29
Reach-1	1.5257*	100 year	Existing Prelim	9890.00	479.57	495.79		496.25	0.002925	6.08	1918.03	307.57	0.32
Reach-1	1.5257*	100 year	Proposed 3B	9890.00	479.57	495.79		496.25	0.002925	6.08	1918.03	307.57	0.32
Reach-1	1.5257*	100 year	Proposed 3C	9890.00	479.57	496.34		496.72	0.002270	5.53	2087.36	308.84	0.28
Reach-1	1.5257*	100 year	Proposed 3D	9890.00	479.57	495.85		496.30	0.002837	6.01	1937.75	307.72	0.31
Reach-1	1.5257*	100 year	PR3E Raised	9890.00	479.57	495.85		496.30	0.002840	6.01	1937.20	307.72	0.31
Reach-1	1.5071*	100 year	Existing Prelim	9890.00	479.21	495.40		495.93	0.003511	6.54	1814.95	317.67	0.34
Reach-1	1.5071*	100 year	Proposed 3B	9890.00	479.21	495.40		495.93	0.003511	6.54	1814.95	317.67	0.34
Reach-1	1.5071*	100 year	Proposed 3C	9890.00	479.21	496.07		496.48	0.002534	5.78	2029.01	319.37	0.30
Reach-1	1.5071*	100 year	Proposed 3D	9890.00	479.21	495.48		495.99	0.003368	6.44	1841.26	317.88	0.34
Reach-1	1.5071*	100 year	PR3E Raised	9890.00	479.21	495.48		495.99	0.003372	6.44	1840.53	317.87	0.34
Reach-1	1.4886*	100 year	Existing Prelim	9890.00	478.86	494.84		495.52	0.004696	7.35	1644.30	327.31	0.39
Reach-1	1.4886*	100 year	Proposed 3B	9890.00	478.86	494.84		495.52	0.004696	7.35	1644.30	327.31	0.39
Reach-1	1.4886*	100 year	Proposed 3C	9890.00	478.86	495.74	490.81	496.21	0.002939	6.14	1942.94	329.89	0.32
Reach-1	1.4886*	100 year	Proposed 3D	9890.00	478.86	494.96		495.61	0.004388	7.16	1685.63	327.67	0.38
Reach-1	1.4886*	100 year	PR3E Raised	9890.00	478.86	494.96		495.60	0.004396	7.17	1684.52	327.66	0.38
Reach-1	1.47	100 year	Existing Prelim	8690.00	478.50	494.39		495.05	0.004638	7.15	1499.83	337.23	0.39
Reach-1	1.47	100 year	Proposed 3B	8690.00	478.50	494.39		495.05	0.004638	7.15	1499.83	337.23	0.39
Reach-1	1.47	100 year	Proposed 3C	8690.00	478.50	494.39		495.05	0.004638	7.15	1499.83	337.23	0.39
Reach-1	1.47	100 year	Proposed 3D	8690.00	478.50	494.56		495.17	0.004203	6.88	1558.75	337.81	0.37
Reach-1	1.47	100 year	PR3E Raised	8690.00	478.50	494.56		495.17	0.004214	6.89	1557.20	337.80	0.37
Reach-1	1.4550*	100 year	Existing Prelim	8690.00	478.17	493.96		494.69	0.004488	7.41	1437.84	309.81	0.40
Reach-1	1.4550*	100 year	Proposed 3B	8690.00	478.17	493.96		494.69	0.004488	7.41	1437.84	309.81	0.40
Reach-1	1.4550*	100 year	Proposed 3C	8690.00	478.17	493.96		494.69	0.004488	7.41	1437.84	309.81	0.40
Reach-1	1.4550*	100 year	Proposed 3D	8690.00	478.17	494.19		494.85	0.003964	7.07	1510.52	310.63	0.38
Reach-1	1.4550*	100 year	PR3E Raised	8690.00	478.17	494.19		494.84	0.003976	7.07	1508.69	310.61	0.38
Reach-1	1.4400*	100 year	Existing Prelim	8690.00	477.85	493.55		494.33	0.004391	7.60	1383.59	282.36	0.41
Reach-1	1.4400*	100 year	Proposed 3B	8690.00	477.85	493.55		494.33	0.004391	7.60	1383.59	282.36	0.41
Reach-1	1.4400*	100 year	Proposed 3C	8690.00	477.85	493.55		494.33	0.004391	7.60	1383.59	282.36	0.41
Reach-1	1.4400*	100 year	Proposed 3D	8690.00	477.85	493.86		494.54	0.003776	7.18	1469.58	283.46	0.38
Reach-1	1.4400*	100 year	PR3E Raised	8690.00	477.85	493.85		494.53	0.003789	7.19	1467.57	283.44	0.38
Reach-1	1.4250*	100 year	Existing Prelim	8690.00	477.53	493.15		493.99	0.004135	7.79	1333.17	254.85	0.42
Reach-1	1.4250*	100 year	Proposed 3B	8690.00	477.53	493.15		493.99	0.004135	7.79	1333.17	254.85	0.42
Reach-1	1.4250*	100 year	Proposed 3C	8690.00	477.53	493.15		493.99	0.004135	7.79	1333.17	254.85	0.42
Reach-1	1.4250*	100 year	Proposed 3D	8690.00	477.53	493.53	487.84	494.25	0.003480	7.31	1428.80	256.26	0.38
Reach-1	1.4250*	100 year	PR3E Raised	8690.00	477.53	493.52		494.24	0.003490	7.32	1427.29	256.24	0.38
Reach-1	1.41	100 year	Existing Prelim	8690.00	477.20	492.79		493.66	0.003936	7.90	1290.82	227.40	0.42
Reach-1	1.41	100 year	Proposed 3B	8690.00	477.20	492.79		493.66	0.003936	7.90	1290.82	227.40	0.42
Reach-1	1.41	100 year	Proposed 3C	8690.00	477.20	492.79		493.66	0.003936	7.90	1290.82	227.40	0.42
Reach-1	1.41	100 year	Proposed 3D	8690.00	477.20	492.79		493.66	0.003936	7.90	1290.82	227.40	0.42
Reach-1	1.41	100 year	PR3E Raised	8690.00	477.20	493.23		493.98	0.003268	7.39	1390.32	229.10	0.38
Reach-1	1.39	100 year	Existing Prelim	8690.00	477.20	491.86		493.12	0.005876	9.23	1046.53	182.62	0.50
Reach-1	1.39	100 year	Proposed 3B	8690.00	477.20	491.86		493.12	0.005876	9.23	1046.53	182.62	0.50
Reach-1	1.39	100 year	Proposed 3C	8690.00	477.20	491.86		493.12	0.005876	9.23	1046.53	182.62	0.50
Reach-1	1.39	100 year	Proposed 3D	8690.00	477.20	491.86		493.12	0.005876	9.23	1046.53	182.62	0.50
Reach-1	1.39	100 year	PR3E Raised	8690.00	477.20	492.51		493.54	0.004565	8.45	1177.04	206.38	0.45
Reach-1	1.3725*	100 year	Existing Prelim	8690.00	476.95	491.27		492.56	0.006100	9.37	1038.51	200.85	0.52
Reach-1	1.3725*	100 year	Proposed 3B	8690.00	476.95	491.27		492.56	0.006100	9.37	1038.51	200.85	0.52
Reach-1	1.3725*	100 year	Proposed 3C	8690.00	476.95	491.27		492.56	0.006100	9.37	1038.51	200.85	0.52
Reach-1	1.3725*	100 year	Proposed 3D	8690.00	476.95	491.27		492.56	0.006100	9.37	1038.51	200.85	0.52
Reach-1	1.3725*	100 year	PR3E Raised	8690.00	476.95	492.17	487.11	493.12	0.004149	8.18	1220.75	204.17	0.43
Reach-1	1.3550*	100 year	Existing Prelim	8690.00	476.70	490.71		492.00	0.006077	9.35	1042.93	194.48	0.52
Reach-1	1.3550*	100 year	Proposed 3B	8690.00	476.70	490.71		492.00	0.006077	9.35	1042.93	194.48	0.52
Reach-1	1.3550*	100 year	Proposed 3C	8690.00	476.70	490.71		492.00	0.006077	9.35	1042.93	194.48	0.52
Reach-1	1.3550*	100 year	Proposed 3D	8690.00	476.70	490.71		492.00	0.006077	9.35	1042.93	194.48	0.52
Reach-1	1.3550*	100 year	PR3E Raised	8690.00	476.70	490.71		492.00	0.006077	9.35	1042.93	194.48	0.52
Reach-1	1.3375*	100 year	Existing Prelim	8690.00	476.45	490.19		491.43	0.005954	9.24	1057.01	185.55	0.52
Reach-1	1.3375*	100 year	Proposed 3B	8690.00	476.45	490.19		491.43	0.005954	9.24	1057.01	185.55	0.52
Reach-1	1.3375*	100 year	Proposed 3C	8690.00	476.45	490.19		491.43	0.005954	9.24	1057.01	185.55	0.52
Reach-1	1.3375*	100 year	Proposed 3D	8690.00	476.45	490.19		491.43	0.005954	9.24	1057.01	185.55	0.52
Reach-1	1.3375*	100 year	PR3E Raised	8690.00	476.45	490.19		491.43	0.005954	9.24	1057.01	185.55	0.52
Reach-1	1.32	100 year	Existing Prelim	8690.00	476.20	489.69		490.87	0.005785	9.07	1077.02	179.99	0.52
Reach-1	1.32	100 year	Proposed 3B	8690.00	476.20	489.69		490.87	0.005785	9.07	1077.02	179.99	0.52
Reach-1	1.32	100 year	Proposed 3C	8690.00	476.20	489.69		490.87	0.005785	9.07	1077.02	179.99	0.52
Reach-1	1.32	100 year	Proposed 3D	8690.00	476.20	489.69		490.87	0.005785	9.07	1077.02	179.99	0.52
Reach-1	1.32	100 year	PR3E Raised	8690.00	476.20	489.69		490.87	0.005785	9.07	1077.02	179.99	0.52
Reach-1	1.26	100 year	Existing Prelim	8690.00	475.00	488.66		489.37	0.003332	7.11	1450.26	287.14	0.39

Bridge 3C

Bridge 3D

Bridge 3E

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: 100 year (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.26	100 year	Proposed 3B	8690.00	475.00	488.66		489.37	0.003332	7.11	1450.26	287.14	0.39
Reach-1	1.26	100 year	Proposed 3C	8690.00	475.00	488.66		489.37	0.003332	7.11	1450.26	287.14	0.39
Reach-1	1.26	100 year	Proposed 3D	8690.00	475.00	488.66		489.37	0.003332	7.11	1450.26	287.14	0.39
Reach-1	1.26	100 year	PR3E Raised	8690.00	475.00	488.66		489.37	0.003332	7.11	1450.26	287.14	0.39
Reach-1	1.201	100 year	Existing Prelim	8690.00	474.50	488.68		488.80	0.000631	3.59	3404.12	558.49	0.17
Reach-1	1.201	100 year	Proposed 3B	8690.00	474.50	488.68		488.80	0.000631	3.59	3404.12	558.49	0.17
Reach-1	1.201	100 year	Proposed 3C	8690.00	474.50	488.68		488.80	0.000631	3.59	3404.12	558.49	0.17
Reach-1	1.201	100 year	Proposed 3D	8690.00	474.50	488.68		488.80	0.000631	3.59	3404.12	558.49	0.17
Reach-1	1.201	100 year	PR3E Raised	8690.00	474.50	488.68		488.80	0.000631	3.59	3404.12	558.49	0.17
Reach-1	1.2	100 year	Existing Prelim	8690.00	474.50	488.69		488.79	0.000710	2.99	3408.08	558.61	0.14
Reach-1	1.2	100 year	Proposed 3B	8690.00	474.50	488.69		488.79	0.000710	2.99	3408.08	558.61	0.14
Reach-1	1.2	100 year	Proposed 3C	8690.00	474.50	488.69		488.79	0.000710	2.99	3408.08	558.61	0.14
Reach-1	1.2	100 year	Proposed 3D	8690.00	474.50	488.69		488.79	0.000710	2.99	3408.08	558.61	0.14
Reach-1	1.2	100 year	PR3E Raised	8690.00	474.50	488.69		488.79	0.000710	2.99	3408.08	558.61	0.14
Reach-1	1.018	100 year	Existing Prelim	8690.00	471.20	487.80		487.97	0.000873	3.51	2647.24	311.80	0.17
Reach-1	1.018	100 year	Proposed 3B	8690.00	471.20	487.80		487.97	0.000873	3.51	2647.24	311.80	0.17
Reach-1	1.018	100 year	Proposed 3C	8690.00	471.20	487.80		487.97	0.000873	3.51	2647.24	311.80	0.17
Reach-1	1.018	100 year	Proposed 3D	8690.00	471.20	487.80		487.97	0.000873	3.51	2647.24	311.80	0.17
Reach-1	1.018	100 year	PR3E Raised	8690.00	471.20	487.80		487.97	0.000873	3.51	2647.24	311.80	0.17
Reach-1	0.998	100 year	Existing Prelim	8690.00	471.10	486.87	481.77	487.71	0.005444	7.34	1183.88	125.40	0.42
Reach-1	0.998	100 year	Proposed 3B	8690.00	471.10	486.87	481.77	487.71	0.005444	7.34	1183.88	125.40	0.42
Reach-1	0.998	100 year	Proposed 3C	8690.00	471.10	486.87	481.77	487.71	0.005444	7.34	1183.88	125.40	0.42
Reach-1	0.998	100 year	Proposed 3D	8690.00	471.10	486.87	481.77	487.71	0.005444	7.34	1183.88	125.40	0.42
Reach-1	0.998	100 year	PR3E Raised	8690.00	471.10	486.87	481.77	487.71	0.005444	7.34	1183.88	125.40	0.42
Reach-1	0.9945			Bridge									
Reach-1	0.991	100 year	Existing Prelim	8690.00	471.10	486.32	481.78	487.26	0.006456	7.80	1114.82	122.73	0.46
Reach-1	0.991	100 year	Proposed 3B	8690.00	471.10	486.32	481.78	487.26	0.006456	7.80	1114.82	122.73	0.46
Reach-1	0.991	100 year	Proposed 3C	8690.00	471.10	486.32	481.78	487.26	0.006456	7.80	1114.82	122.73	0.46
Reach-1	0.991	100 year	Proposed 3D	8690.00	471.10	486.32	481.78	487.26	0.006456	7.80	1114.82	122.73	0.46
Reach-1	0.991	100 year	PR3E Raised	8690.00	471.10	486.32	481.78	487.26	0.006456	7.80	1114.82	122.73	0.46
Reach-1	0.922	100 year	Existing Prelim	8690.00	469.30	483.16		484.44	0.009607	9.68	1036.95	185.43	0.54
Reach-1	0.922	100 year	Proposed 3B	8690.00	469.30	483.16		484.44	0.009607	9.68	1036.95	185.43	0.54
Reach-1	0.922	100 year	Proposed 3C	8690.00	469.30	483.16		484.44	0.009607	9.68	1036.95	185.43	0.54
Reach-1	0.922	100 year	Proposed 3D	8690.00	469.30	483.16		484.44	0.009607	9.68	1036.95	185.43	0.54
Reach-1	0.922	100 year	PR3E Raised	8690.00	469.30	483.16		484.44	0.009607	9.68	1036.95	185.43	0.54
Reach-1	0.79	100 year	Existing Prelim	8690.00	466.50	480.66		481.01	0.002916	5.57	2015.53	481.71	0.31
Reach-1	0.79	100 year	Proposed 3B	8690.00	466.50	480.66		481.01	0.002916	5.57	2015.53	481.71	0.31
Reach-1	0.79	100 year	Proposed 3C	8690.00	466.50	480.66		481.01	0.002916	5.57	2015.53	481.71	0.31
Reach-1	0.79	100 year	Proposed 3D	8690.00	466.50	480.66		481.01	0.002916	5.57	2015.53	481.71	0.31
Reach-1	0.79	100 year	PR3E Raised	8690.00	466.50	480.66		481.01	0.002916	5.57	2015.53	481.71	0.31
Reach-1	0.56	100 year	Existing Prelim	8690.00	463.00	477.91		478.10	0.002409	4.76	3205.71	1356.71	0.27
Reach-1	0.56	100 year	Proposed 3B	8690.00	463.00	477.91		478.10	0.002409	4.76	3205.71	1356.71	0.27
Reach-1	0.56	100 year	Proposed 3C	8690.00	463.00	477.91		478.10	0.002409	4.76	3205.71	1356.71	0.27
Reach-1	0.56	100 year	Proposed 3D	8690.00	463.00	477.91		478.10	0.002409	4.76	3205.71	1356.71	0.27
Reach-1	0.56	100 year	PR3E Raised	8690.00	463.00	477.91		478.10	0.002409	4.76	3205.71	1356.71	0.27
Reach-1	0.34	100 year	Existing Prelim	8690.00	460.00	475.30	468.86	475.58	0.002136	4.90	2894.23	1371.85	0.27
Reach-1	0.34	100 year	Proposed 3B	8690.00	460.00	475.30	468.86	475.58	0.002136	4.90	2894.23	1371.85	0.27
Reach-1	0.34	100 year	Proposed 3C	8690.00	460.00	475.30	468.86	475.58	0.002136	4.90	2894.23	1371.85	0.27
Reach-1	0.34	100 year	Proposed 3D	8690.00	460.00	475.30	468.86	475.58	0.002136	4.90	2894.23	1371.85	0.27
Reach-1	0.34	100 year	PR3E Raised	8690.00	460.00	475.30	468.86	475.58	0.002136	4.90	2894.23	1371.85	0.27

Attachment F

Conceptual BMP Memo

HAM-Wasson Way to Otto Armleder

Preliminary BMP Memo (PID# 113603)

Prepared for:
ODOT District 8

Prepared by:
Stantec Consulting Services Inc.

February 28, 2024

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1.0 BMP Summary

As a part of the feasibility study for the HAM-Wasson Way to Otto Armleder project, Stantec performed some preliminary post construction stormwater best management practice (BMP) calculations. These calculations we performed to identify challenges associated with BMP installation and ensure construction limits for each alternative incorporated the construction of BMP's. These calculations were conducted in accordance with the Ohio department of Transportation, Location and Design Manual, Volume 2. Stantec also utilized several other ODOT BMP resources including the BMP calculation spreadsheet and the ODOT BMP tool.

BMPs are provided for two reasons, to treat stormwater quality and stormwater quantity. Water quality treatment is providing for reduction of pollutants from storm water runoff before leaving the project site. Water quantity treatment is reducing the volume or peak flow rate of storm water runoff to protect the receiving stream's physical characteristics. Most projects, require water quality and quantity treatment. For segments of this project where greater than 1 acre of impervious area (pavement) is being added in new permanent right of way, quantity treatment will be required. Some segments will require quantity treatment, some segments will not.

It is anticipated that several different BMP treatments will be needed for the various alternatives. These include vegetated filter strips, enhanced bankful width ditches, bioretention cells, and manufactured systems. Vegetative based BMPs do not treat water quantity, but bioretention cells and manufactured systems do.

The calculations shown on subsequent pages are preliminary in nature and may change as the project progresses.

The following information should be kept in mind as the project moves forward:

- Earth disturbed areas where stormwater flows outside of the project right-of-way should not be channelized for the sole purpose of BMP construction. These areas can be eliminated from the calculations.

- Narrow vegetated filter strips may be utilized for areas only draining shared-use path pavement.

- There may be additional untreated roadway areas, not associated with the project earth disturbed area, within the existing right of way that can count towards bmp credit if treated.

- Off-site mitigation could be used as a BMP treatment if there are nearby untreated areas, such as parking lots or trailheads, owned by the City of

Cincinnati. This may be easier than constructing manufactured systems or other quantity treatment BMPs in Segment 3.

- Project requirements for shared-use path project can sometimes be quite high. While road construction projects often have treatment requirements between 20% and 30%, shared-use path projects can require nearly up to 100% depending on the setting. ODOT and the Ohio EPA recognize that there are some perimeter fringe areas with any development project that will be difficult to treat. Discussions should be have with these agencies if treatment percentages are above 90%.

- For the purposes of this analysis, each Segment and Alternative has been looked at individually. When constructed, the treatment requirements and types may change based on the configuration of the built phases. For example, if multiple segments are construction together, that will change the overall calculations.

2.0 Segment 1 Conceptual BMP Calculations

Post Construction Stormwater BMP Overview

Segment 1 consists of two alternatives, Alternative A and Alternative C.

Alternative A: The total project earth disturbed area for post construction storm water BMP is 1.29 acres, however, 1.12 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is less than the 1 acre threshold, BMP will be not be required and a NOI will not need to be submitted to Ohio EPA. The preliminary BMP calculations are shown on the following pages.

Alternative C: The total project earth disturbed area for post construction storm water BMP is 2.49 acres, however, 0.50 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 1C is 23.31% of the remaining 1.99 acres. This alternative will therefore be required to treat 0.46 acres for quality. Quantity treatment will not be required because less than 1 acre of new impervious area is being added in new right of way. This alternative will utilize vegetated filter strips and enhanced bankful width ditches to treat stormwater runoff. It is anticipated that a combination of these can be used along Colbank Rd. Narrow vegetated filter strips can be used in some areas since all improvements are pedestrian related. The preliminary BMP calculations are shown on the following pages.

Post Construction Stormwater BMPs should not be a differentiator between the Segment 1 alternatives. BMPs will not be required for Alternative A, however, BMP credit will be relatively easy and inexpensive to obtain for Alternative C.

3.0 Segment 2 Conceptual BMP Calculations

Post Construction Stormwater BMP Overview

Segment 2 consists of two alternatives, Alternative B and Alternative C.

Alternative B: The total project earth disturbed area for post construction storm water BMP is 2.52 acres, however, 0.70 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 2B is 38.87% of the remaining 1.82 acres. This alternative will therefore be required to treat 0.71 acres for quality. Quantity treatment will not be required because less than 1 acre of new impervious area is being added in new right of way. This alternative will utilize vegetated filter strips, enhanced bankful width ditches (vegetated biofilters), and potentially a manufactured system to treat stormwater runoff. It is anticipated that vegetated filter strips can be used inside the loop between Sta. 325+00 and Sta. 329+00 and towards the Segment 3 termini on the abandoned rail line. Narrow vegetated filter strips can be used where all improvements are pedestrian related. Where filter strips cannot be used, vegetated biofilters can be used, potentially on the east side of Wooster Rd. If additional treatment area is needed, a manufactured system will be installed where proposed curb is present, along Wooster Pike. The preliminary BMP calculations are shown on the following pages.

Alternative C: The total project earth disturbed area for post construction storm water BMP is 3.53 acres, however, 0.64 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 2C is 32.63% of the remaining 2.89 acres. This alternative will therefore be required to treat 0.94 acres for quality. Quantity treatment will not be required because less than 1 acre of new impervious area is being added in new right of way. This alternative will utilize vegetated filter strips, enhanced bankful width ditches, and potentially a manufactured system to treat stormwater runoff. It is anticipated that vegetated filter strips can be used inside the loop between Sta. 325+00 and Sta. 329+00 and towards the Segment 3 termini on the abandoned rail line. Narrow vegetated filter strips can be used where all improvements are pedestrian related. Where filter strips cannot be used, vegetated biofilters can be used,

potentially on the east side of Wooster Rd. If additional treatment area is needed, a manufactured system will be installed where proposed curb is present, along Wooster Pike. The preliminary BMP calculations are shown on the following pages.

Post Construction Stormwater BMPs should not be a differentiator between the Segment 2 alternatives. It will be challenging to achieve all BMP credits through vegetative options with either alternative. A manufactured system will most likely be required in both alternative because of the steep slopes, anticipated walls, and proposed curb.

4.0 Segment 3 Conceptual BMP Calculations

Post Construction Stormwater BMP Overview

Segment 3 consists of four alternatives, Alternative B, Alternative C, Alternative D, and Alternative E.

Alternative B: The total project earth disturbed area for post construction storm water BMP is 6.02 acres, however, 2.16 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 3B is 100% of the remaining 3.86 acres. This alternative will therefore be required to treat 3.86 acres. In addition to quality treatment, quantity treatment will be required because more than 1 acre of new impervious area is being added in new right of way. This alternative will need to use bioretention cells, detention basins, or permeable pavement to treat stormwater runoff. The listed BMPS are the most common options when quantity and quality treatment are needed. Additional discussions should be had with ODOT and OEPA to discuss reducing the treatment percent on this alternative as noted in the general discussion above. Discussions should also be had with the City of Cincinnati to determine if there are any untreated right of way areas that could be utilized for offsite mitigation such as at Otto Armleder Park or along Armleder Rd. Further refinement of the vertical profile of the shared use path could also be to potentially increase the sheet flow runoff, thereby reducing the required treatment amount. It is anticipated that after these options are explored, linear bioretention cells could be utilized in trail side ditches along the alignment. The preliminary BMP calculations are shown on the following pages.

Alternative C: The total project earth disturbed area for post construction storm water BMP is 6.01 acres, however, 2.1 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 3C is 76.21% of the remaining 3.91 acres. This alternative will therefore be required to treat 2.98 acres. In addition to quality treatment, quantity treatment will be required because more than 1 acre of new impervious area is being added in new right of way. This alternative will need to use bioretention cells, detention basins, or permeable pavement to treat stormwater runoff. The listed BMPS are the most common options when quantity and quality treatment are needed. Discussions should be had with the

City of Cincinnati to determine if there are any untreated right of way areas that could be utilized for offsite mitigation such as at Otto Armleder Park or along Armleder Rd. Further refinement of the vertical profile of the shared use path could also be done to potentially increase the sheet flow runoff, thereby reducing the required treatment amount. It is anticipated that after these options are explored, linear bioretention cells could be utilized in trail side ditches along the alignment. Permeable pavement may also be a good option for quantity treatment for this alternative. The preliminary BMP calculations are shown on the following pages.

Alternative D: The total project earth disturbed area for post construction storm water BMP is 5.90 acres, however, 2.07 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 3D is 86.31% of the remaining 3.83 acres. This alternative will therefore be required to treat 3.31 acres. In addition to quality treatment, quantity treatment will be required because more than 1 acre of new impervious area is being added in new right of way. This alternative will need to use bioretention cells, detention basins, manufactured systems, or permeable pavement to treat stormwater runoff. The listed BMPS are the most common options when quantity and quality treatment are needed. Discussions should be had with the City of Cincinnati to determine if there are any untreated right of way areas that could be utilized for offsite mitigation such as at Otto Armleder Park or along Armleder Rd. Further refinement of the vertical profile of the shared use path could also be done to potentially increase the sheet flow runoff, thereby reducing the required treatment amount. It is anticipated that after these options are explored, linear bioretention cells could be utilized in trail side ditches along the alignment. Permeable pavement may also be a good option for quantity treatment for this alternative. The preliminary BMP calculations are shown on the following pages.

Alternative E: The total project earth disturbed area for post construction storm water BMP is 6.01 acres, however, 1.92 acres of earth disturbed area sheet flows out of the project area and should not be collected for the sole purposes of stormwater treatment according to Location & Design Manual Section 1112.1. Because the earth disturbed area is greater than the 1 acre threshold, BMP will be required and a NOI will need to be submitted to Ohio EPA. The overall required treatment percentage for Alternative 3E is 71.13% of the remaining 4.09 acres. This alternative will therefore be required to treat 2.91 acres. In addition to quality treatment, quantity treatment will be required because more than 1 acre of new impervious area is being added in new right of way. This alternative will need to use bioretention cells, detention basins, or permeable pavement to treat stormwater runoff. The listed BMPS are the most common options when quantity and quality treatment are needed. Discussions should be had with the

City of Cincinnati to determine if there are any untreated right of way areas that could be utilized for offsite mitigation such as at Otto Armleder Park or along Armleder Rd. Further refinement of the vertical profile of the shared use path could also be done to potentially increase the sheet flow runoff, thereby reducing the required treatment amount. It is anticipated that after these options are explored, linear bioretention cells could be utilized in trail side ditches along the alignment. Permeable pavement may also be a good option for quantity treatment for this alternative. The preliminary BMP calculations are shown on the following pages.

Post Construction Stormwater BMPs should not be a differentiator between the Segment 3 alternatives. Providing the required BMPs will be challenging for all four alternatives since several acres quantity treatment is required. It is possible that construction phasing of the project will provide opportunities for extrea treatment in Segments 1 or 2 to be used for segment 3. As the project is developed, additional coordination should be conducted with project stakeholders to find creative and efficient ways to obtain the required treatment credit.

Post Construction - Project Summary
Segment 1A

Project Data

		Units
Project EDA	1.29	acres
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
Sheet Flow (outside of right of way)	1.12	acres
BMPs Required?	**BMPs and NOI not required**	NA
Ain (New Impervious Area in New Permanent R/W	0	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	**No**	
Water Quantity Treatment Required	**No**	

Post Construction - Project Summary
Segment 1C

Project Data		Units
Project EDA	2.49	acres
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
Sheet Flow (outside of right of way)	0.5	acres
BMPs Required?	**BMPs Required**	NA
Ain (New Impervious Area in New Permanent R/W	0.1	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	**Yes**	
Water Quantity Treatment Required	**No**	
Treatment Percent and Treatment Requirement		
Aix (Project EDA that is inside the existing right-of-way)	2.32	acres
Ain (New Impervious Area in New Permanent R/W)	0.1	acres
T% (Treatment Percent)	**23.31**	**%**
Treatment Requirement	**0.46**	**acres**

Post Construction - Project Summary
Segment 2B

Project Data		Units
Project EDA	2.52	acres
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
Sheet Flow (outside of right of way)	0.7	acres
BMPs Required?	**BMPs Required**	NA
Ain (New Impervious Area in New Permanent R/W	0.25	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	**Yes**	
Water Quantity Treatment Required	**No**	
Treatment Percent and Treatment Requirement		
Aix (Project EDA that is inside the existing right-of-way)	0.81	acres
Ain (New Impervious Area in New Permanent R/W)	0.25	acres
T% (Treatment Percent)	**38.87**	**%**
Treatment Requirement	**0.71**	**acres**

Post Construction - Project Summary
Segment 2C

Project Data			Units
	Project EDA	3.53	acres
	Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
	Sheet Flow (outside of right of way)	0.64	acres
	BMPs Required?	**BMPs Required**	NA
	Ain (New Impervious Area in New Permanent R/W	0.3	acres
	Does Entire Site Drain to Large River (>100 sq. miles)?	No	
	Water Quality Treatment Required	**Yes**	
	Water Quantity Treatment Required	**No**	
Treatment Percent and Treatment Requirement			
	Aix (Project EDA that is inside the existing right-of-way)	1.6	acres
	Ain (New Impervious Area in New Permanent R/W)	0.3	acres
	T% (Treatment Percent)	**32.63**	**%**
	Treatment Requirement	**0.94**	**acres**

Post Construction - Project Summary
Segment 3B

Project Data			Units
	Project EDA	6.02	acres
	Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
	Sheet Flow (outside of right of way)	2.16	acres
	BMPs Required?	**BMPs Required**	NA
	Ain (New Impervious Area in New Permanent R/W	1.53	acres
	Does Entire Site Drain to Large River (>100 sq. miles)?	No	
	Water Quality Treatment Required	**Yes**	
	Water Quantity Treatment Required	**Yes**	
Treatment Percent and Treatment Requirement			
	Aix (Project EDA that is inside the existing right-of-way)	0	acres
	Ain (New Impervious Area in New Permanent R/W)	1.53	acres
	T% (Treatment Percent)	**100.00**	**%**
	Treatment Requirement	**3.86**	**acres**

Post Construction - Project Summary
Segment 3C

Project Data			Units
	Project EDA	6.01	acres
	Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
	Sheet Flow (outside of right of way)	2.1	acres
	BMPs Required?	**BMPs Required**	NA
	Ain (New Impervious Area in New Permanent R/W	1.63	acres
	Does Entire Site Drain to Large River (>100 sq. miles)?	No	
	Water Quality Treatment Required	**Yes**	
	Water Quantity Treatment Required	**Yes**	
Treatment Percent and Treatment Requirement			
	Aix (Project EDA that is inside the existing right-of-way)	0.69	acres
	Ain (New Impervious Area in New Permanent R/W)	1.63	acres
	T% (Treatment Percent)	**76.21**	**%**
	Treatment Requirement	**2.98**	**acres**

Post Construction - Project Summary
Segment 3D

Project Data		Units
Project EDA	5.9	acres
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
Sheet Flow (outside of right of way)	2.07	acres
BMPs Required?	**BMPs Required**	NA
Ain (New Impervious Area in New Permanent R/W	1.55	acres
Does Entire Site Drain to Large River (>100 sq. miles)?	No	
Water Quality Treatment Required	**Yes**	
Water Quantity Treatment Required	**Yes**	
Treatment Percent and Treatment Requirement		
Aix (Project EDA that is inside the existing right-of-way)	0.32	acres
Ain (New Impervious Area in New Permanent R/W)	1.55	acres
T% (Treatment Percent)	**86.31**	**%**
Treatment Requirement	**3.31**	**acres**

Post Construction - Project Summary
Segment 3E

Project Data			Units
	Project EDA	6.01	acres
	Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2	No	
	Sheet Flow (outside of right of way)	1.92	acres
	BMPs Required?	**BMPs Required**	NA
	Ain (New Impervious Area in New Permanent R/W	1.47	acres
	Does Entire Site Drain to Large River (>100 sq. miles)?	No	
	Water Quality Treatment Required	**Yes**	
	Water Quantity Treatment Required	**Yes**	
Treatment Percent and Treatment Requirement			
	Aix (Project EDA that is inside the existing right-of-way)	0.83	acres
	Ain (New Impervious Area in New Permanent R/W)	1.47	acres
	T% (Treatment Percent)	**71.13**	**%**
	Treatment Requirement	**2.91**	**acres**

Attachment G

Environmental Mapping

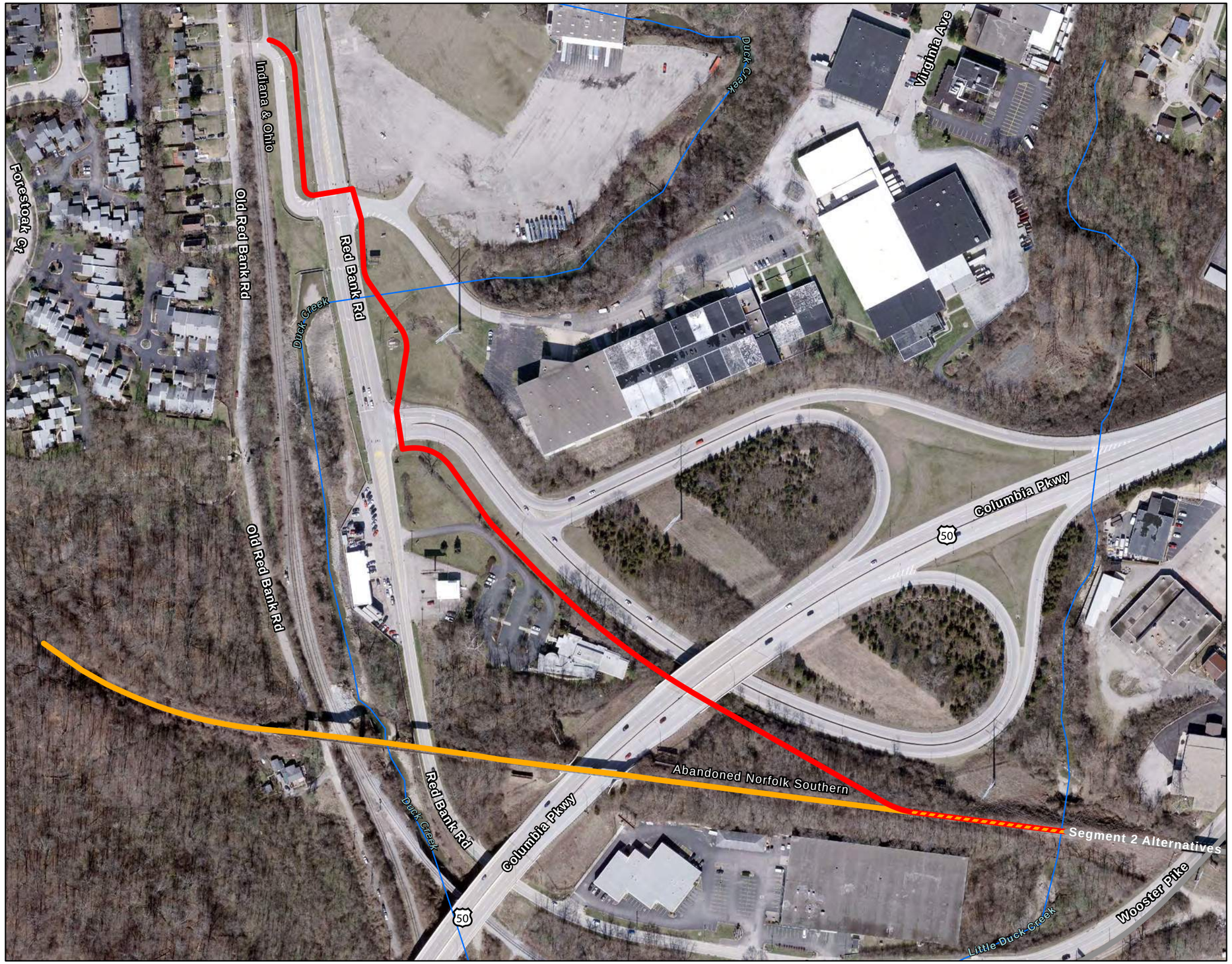


Exhibit No.

1.1

Title

Segment 1- Streams and Wetlands Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

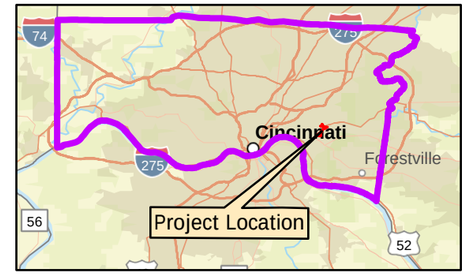
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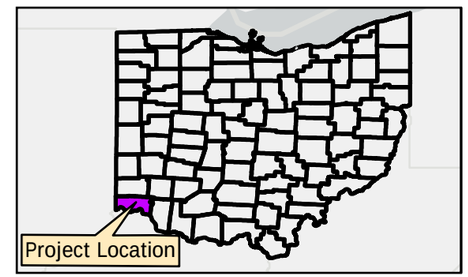
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Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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Exhibit No.
1.2

Title
Segment 2- Streams and Wetlands Map

Client/Project 173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

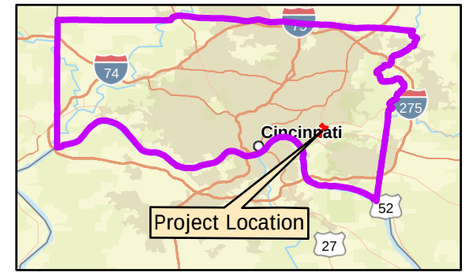
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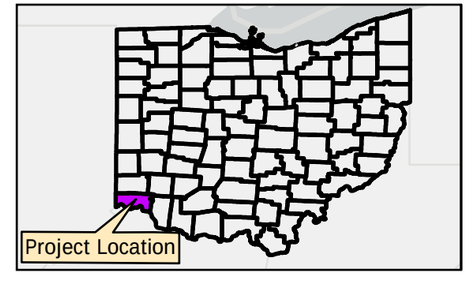
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(At original document size of 11x17)
1:2,700

Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
World Street Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

*All stream lines drawn in from aerial imagery

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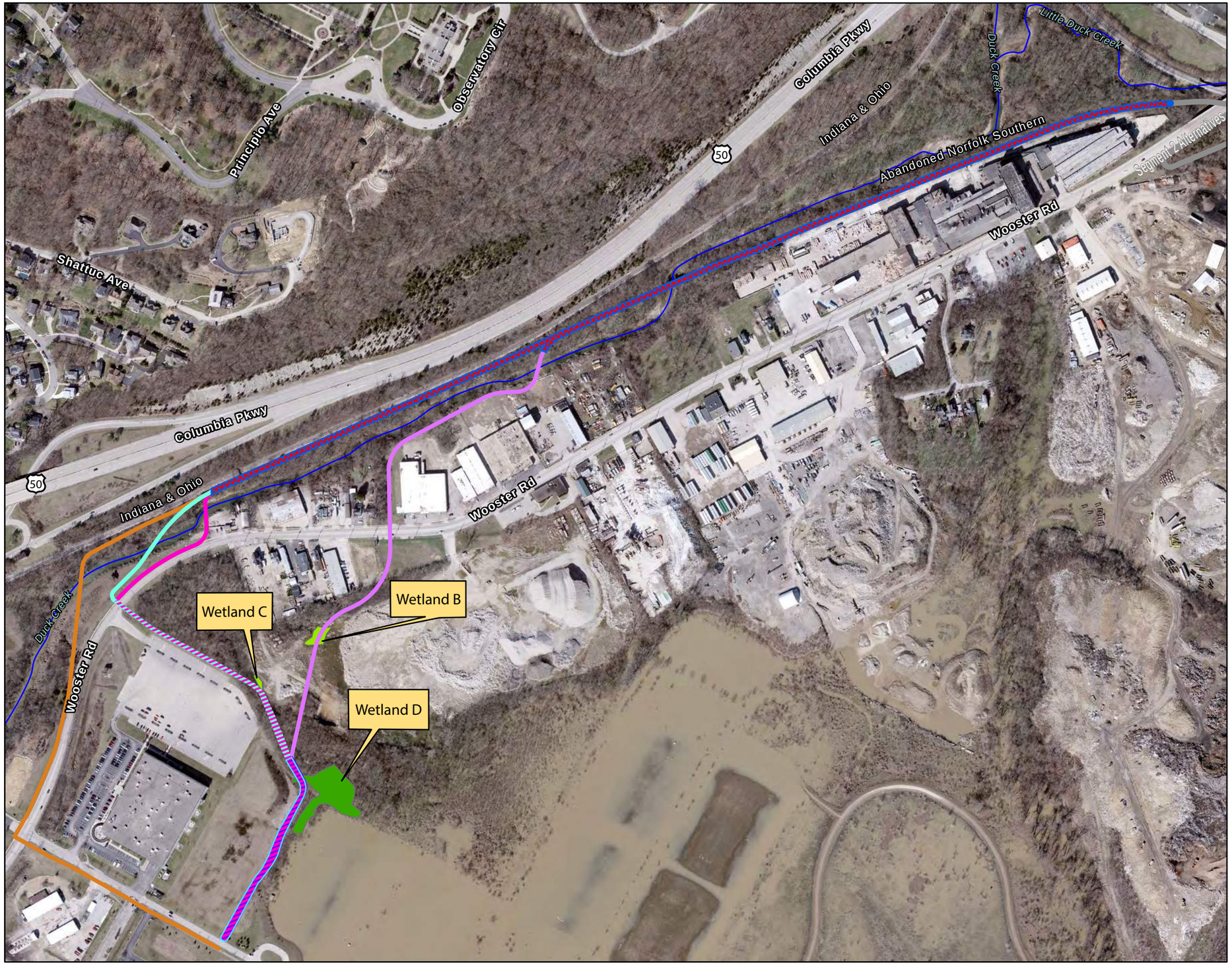


Exhibit No.

1.3

Title

Segment 3- Streams and Wetlands Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

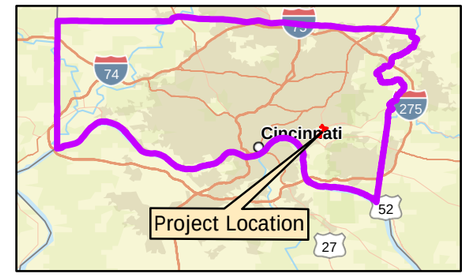
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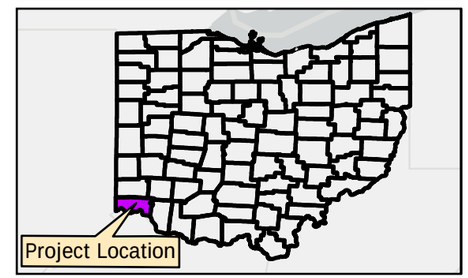
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(At original document size of 11x17)
1:4,700

Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
World Street Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

*All stream lines drawn in from aerial imagery

Stantec

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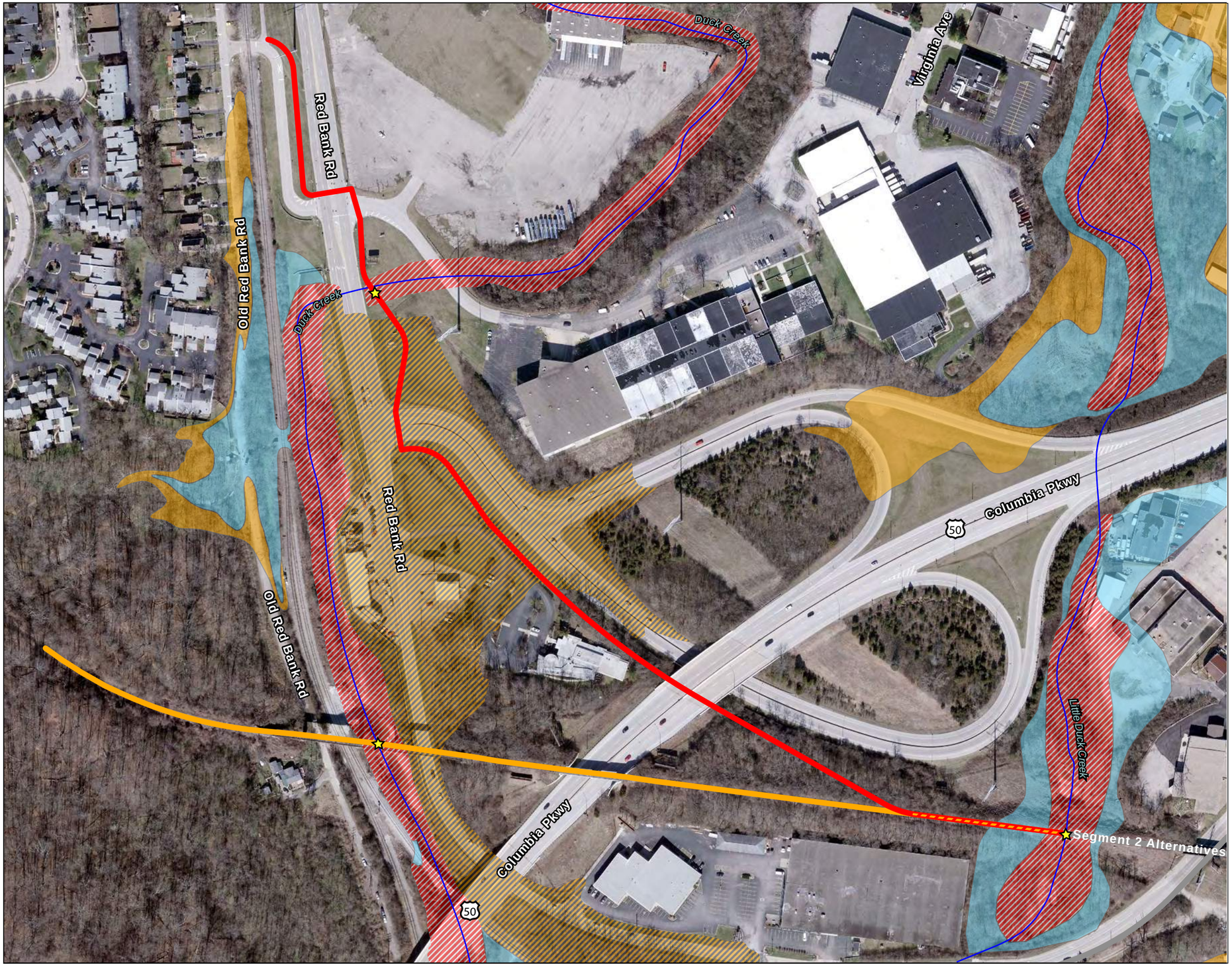


Exhibit No.
2.1

Title
Segment 1- FEMA Floodplains Map

Client/Project
173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

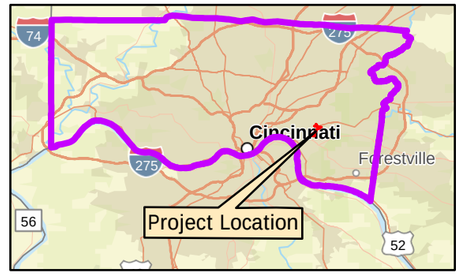
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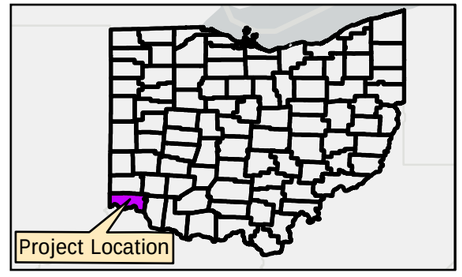
0 200 400 Feet

(At original document size of 11x17)
1:2,700

Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Floodway ★
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

★ No Impacts to floodway anticipated

Stantec

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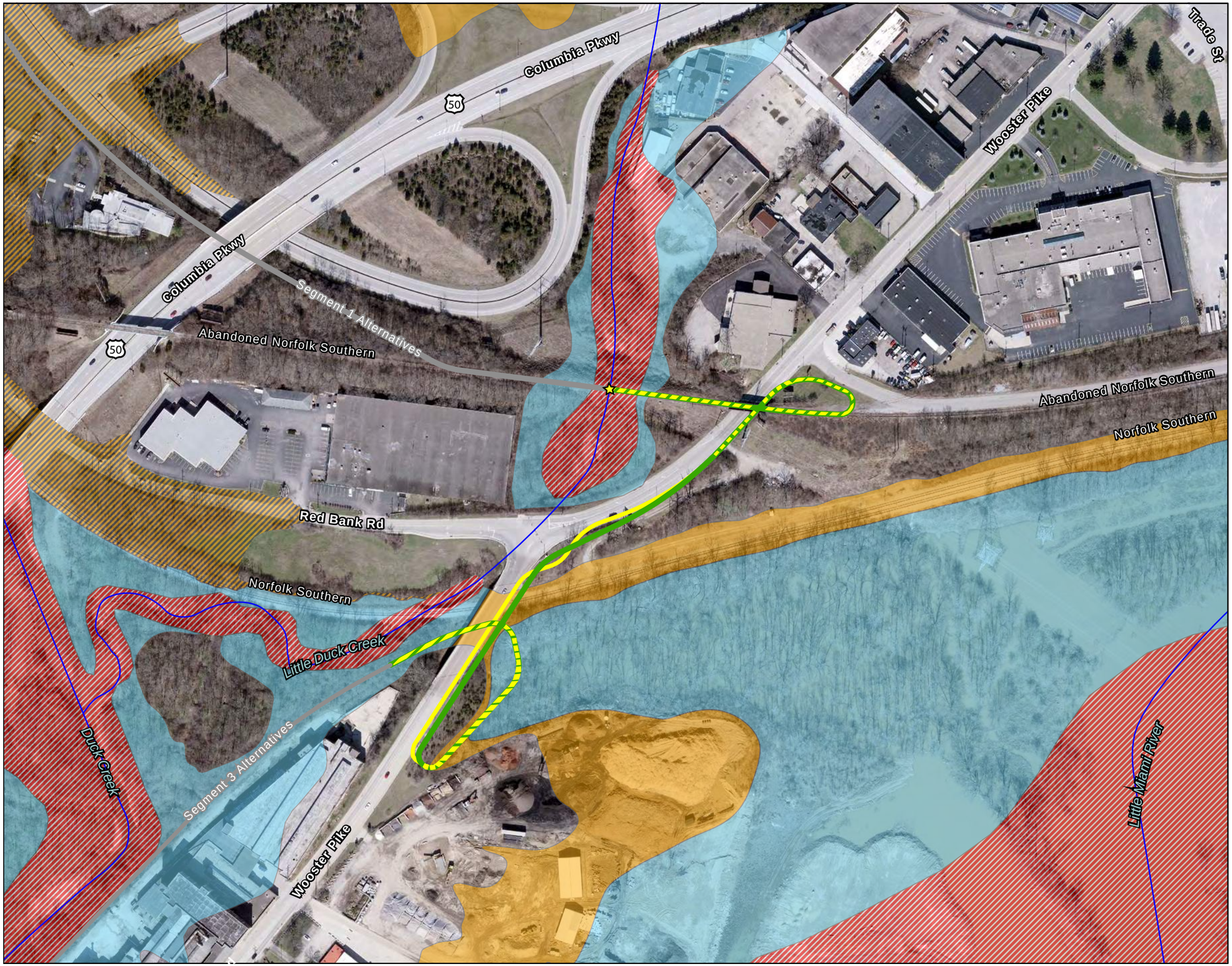


Exhibit No.
2.2

Title
Segment 2- FEMA Floodplains Map

Client/Project
HAM- Wasson Way to Otto Armleder
PID 113603

173620146

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-14

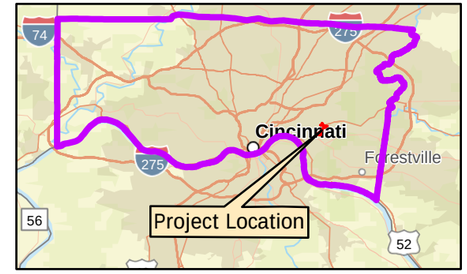
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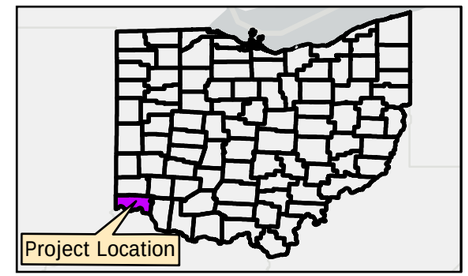
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(At original document size of 11x17)
1:2,700

Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Floodway★
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

★ No Impacts to floodway anticipated

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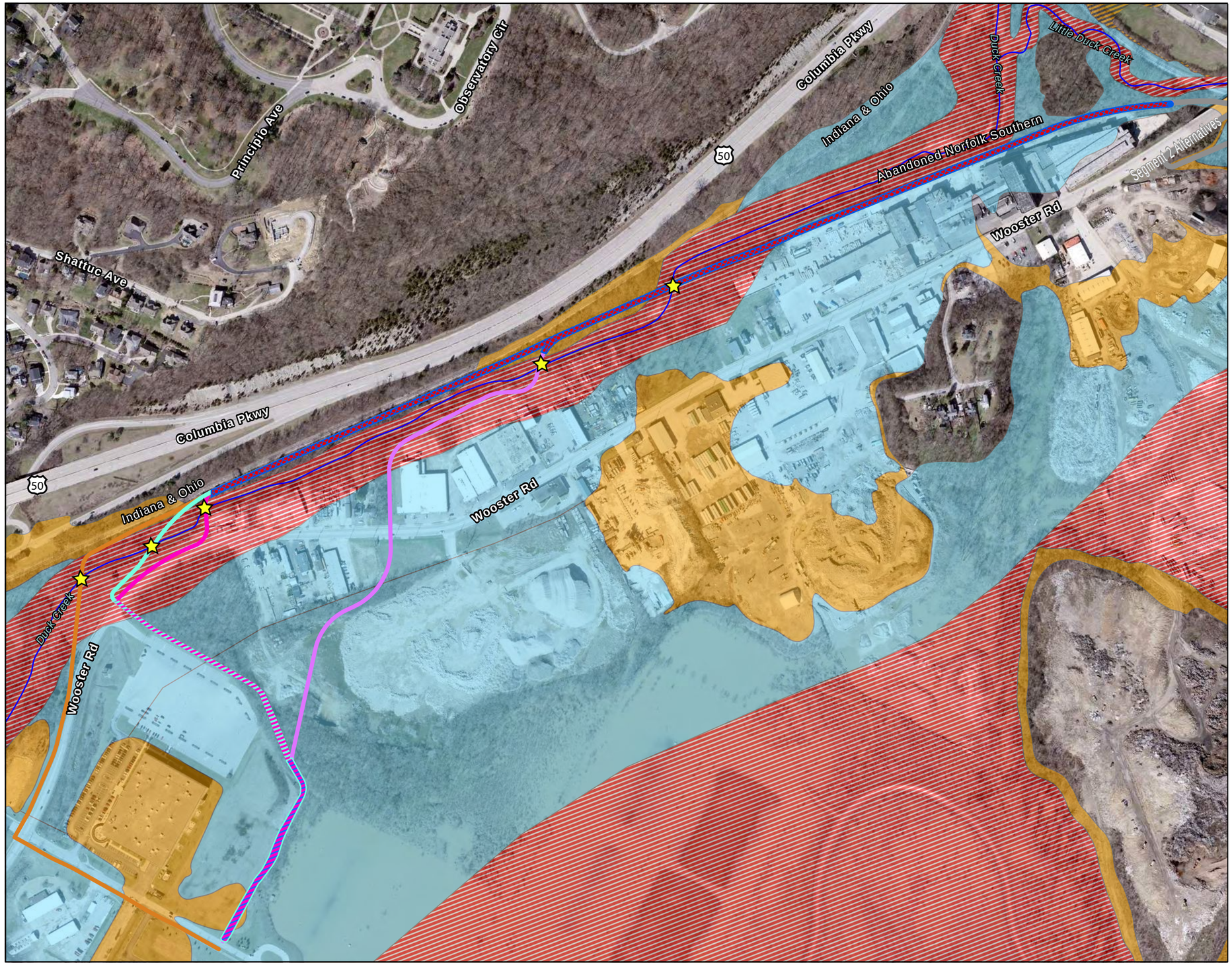


Exhibit No.

2.3

Title

Segment 3- FEMA Floodplains Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

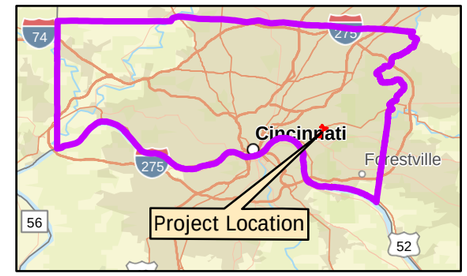
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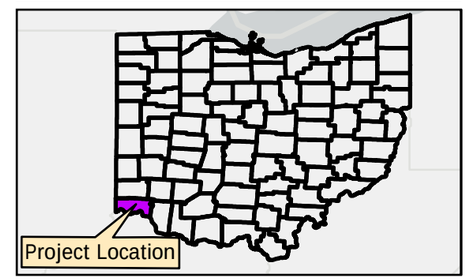
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(At original document size of 11x17)
1:4,700

Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- 1.0% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Floodway★
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

★ No Impacts to floodway anticipated

Stantec

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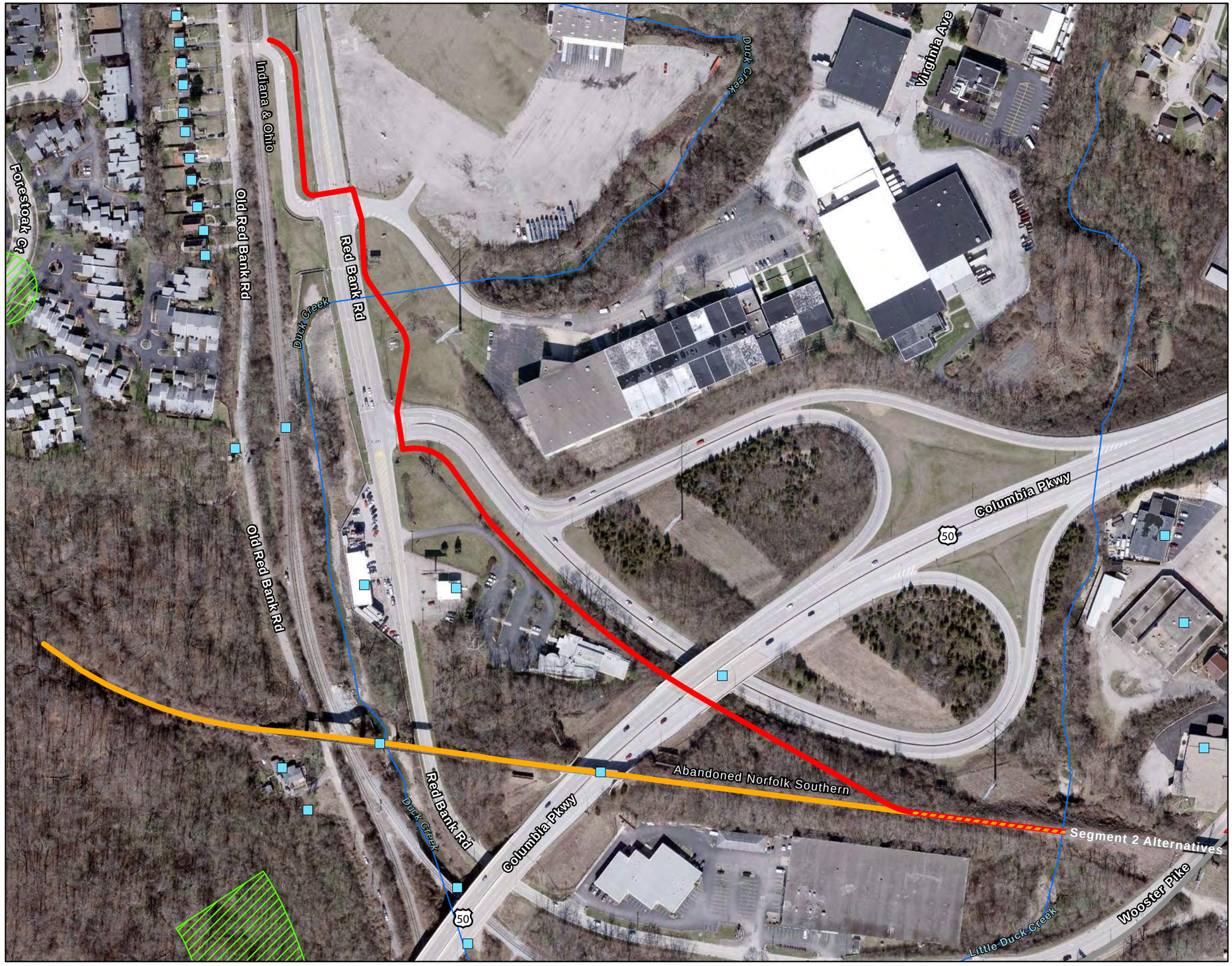


Exhibit No.
3.1

Title
Segment 1- Cultural Resources Map

Client/Project 173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

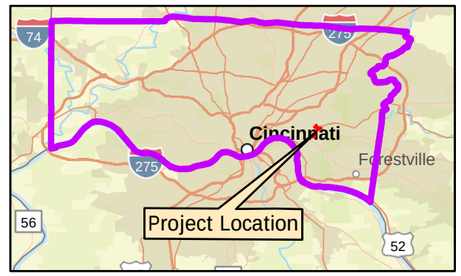
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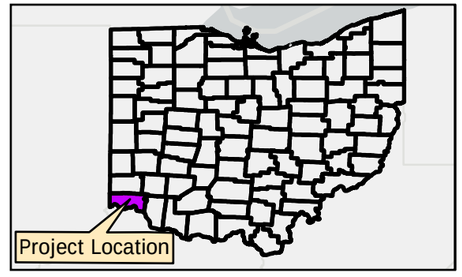
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(At original document size of 11x17)
1:2,700

Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- Archaeological Inventory
- Ohio Historic Inventory
- National Register Listings
- OGS Cemeteries
- SHPO Determinations
- OAI Boundaries
- NR Boundaries
- Previously Surveyed Areas
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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Exhibit No.

3.2

Title

Segment 2- Cultural Resources Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

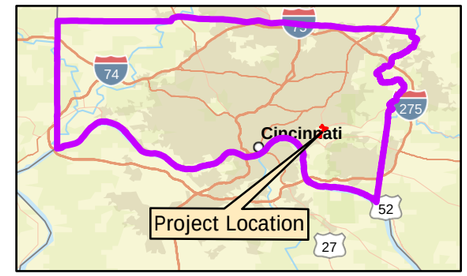
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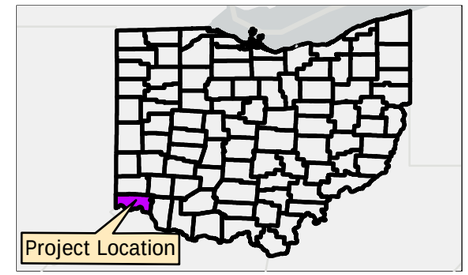
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(At original document size of 11x17)
1:2,700

Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Archaeological Inventory
- Ohio Historic Inventory
- National Register Listings
- OGS Cemeteries
- SHPO Determinations
- OAI Boundaries
- NR Boundaries
- Previously Surveyed Areas
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
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*All stream lines drawn in from aerial imagery

Stantec

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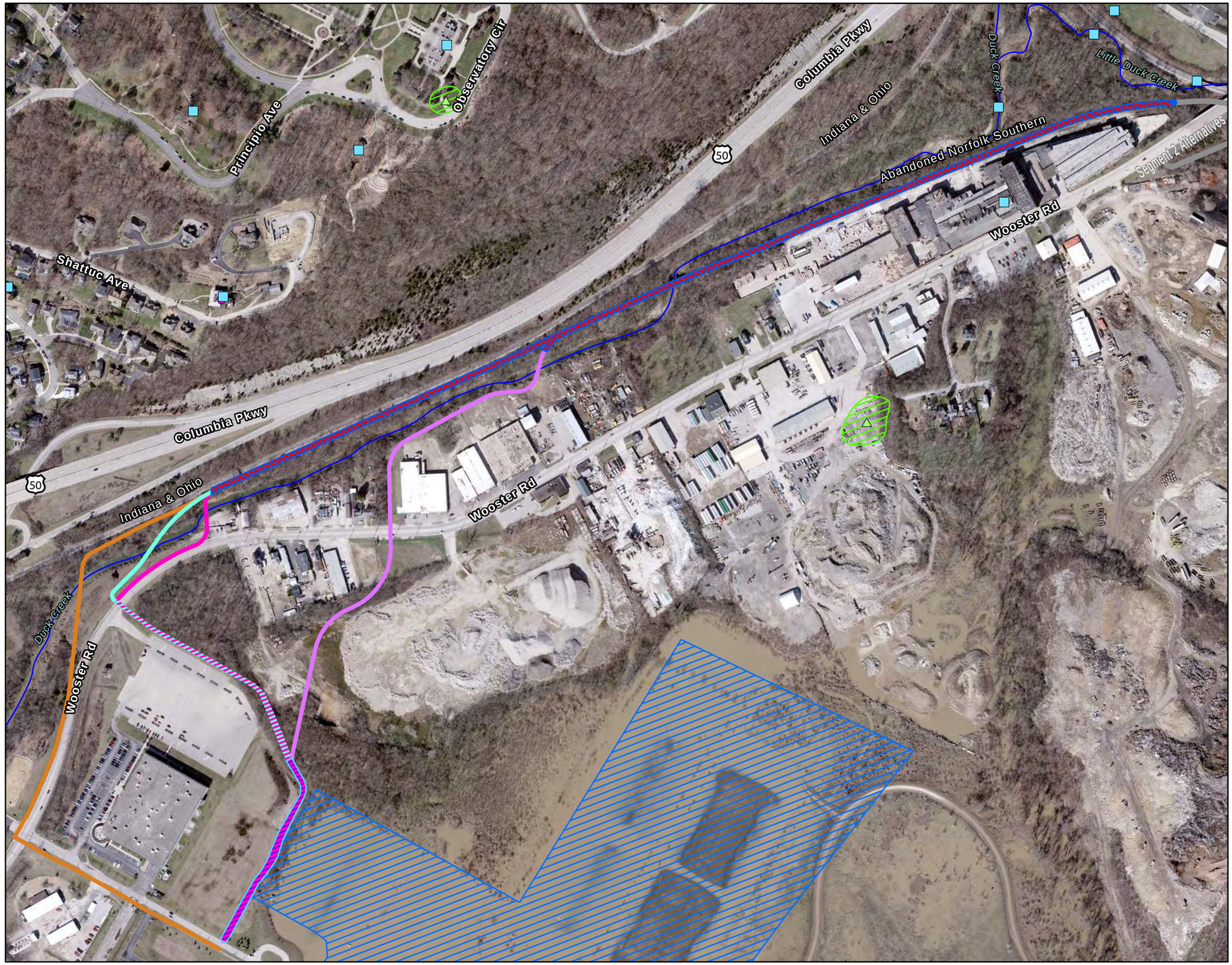


Exhibit No.

3.3

Title

Segment 3- Cultural Resources Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

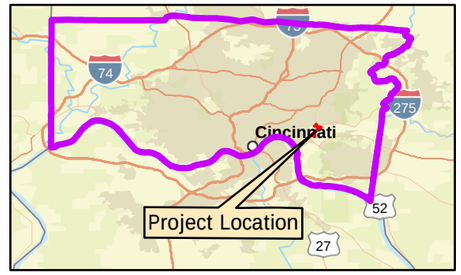
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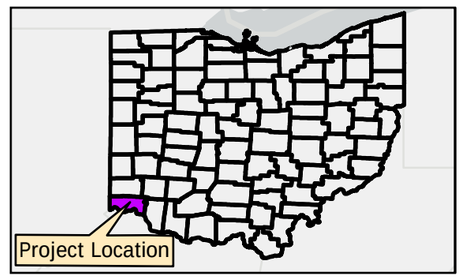
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(At original document size of 11x17)
1:4,700

Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Archaeological Inventory
- Ohio Historic Inventory
- National Register Listings
- OGS Cemeteries
- SHPO Determinations
- OAI Boundaries
- NR Boundaries
- Previously Surveyed Areas
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
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Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

*All stream lines drawn in from aerial imagery

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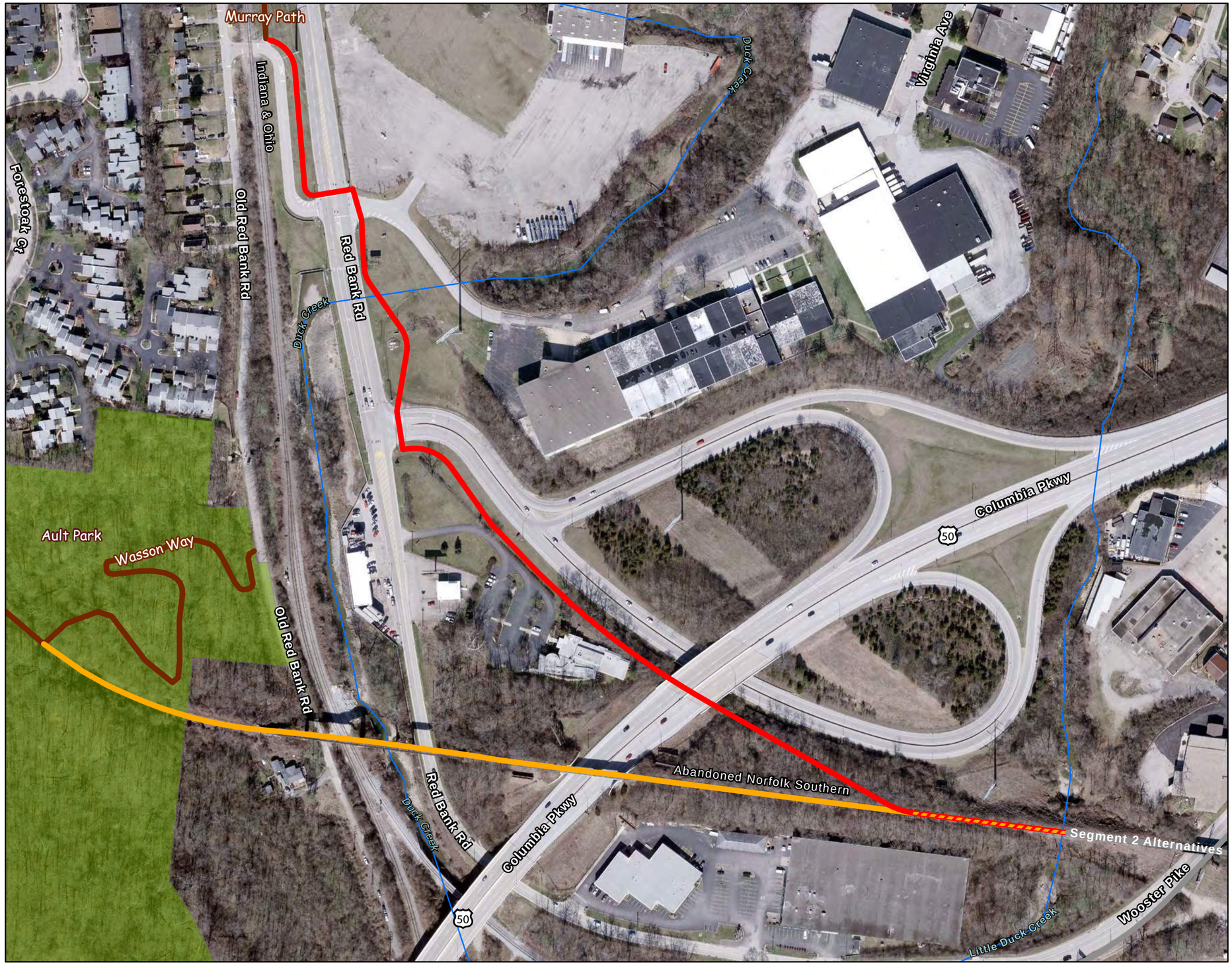


Exhibit No.
4.1

Title
Segment 1- Section 4(f) Properties Map

Client/Project 173620146
HAM- Wasson Way to Otto Armleder
PID 113603

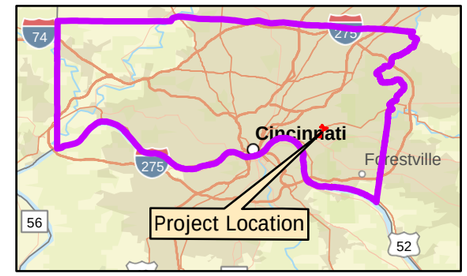
Project Location
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Hamilton County, OH

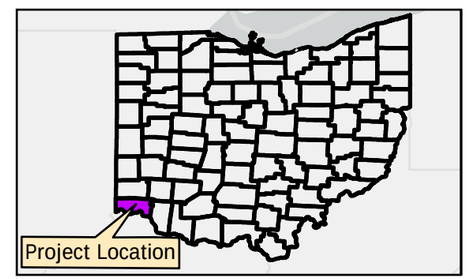
Prepared by RG on 2023-12-11

N

0 200 400 Feet
(At original document size of 11x17)
1:2,700

Legend
- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- Parks
- Existing Trail
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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Exhibit No.

4.2

Title

Segment 2- Section 4(f) Properties Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

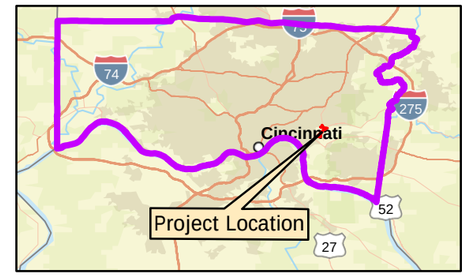
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0 200 400 Feet

(At original document size of 11x17)
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Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Parks
- Trails
- Streams*



Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
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Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

*All stream lines drawn in from aerial imagery

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Exhibit No.

4.3

Title

Segment 3- Section 4(f) Properties Map

Client/Project

173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location

Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

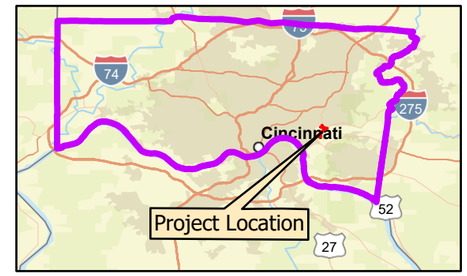
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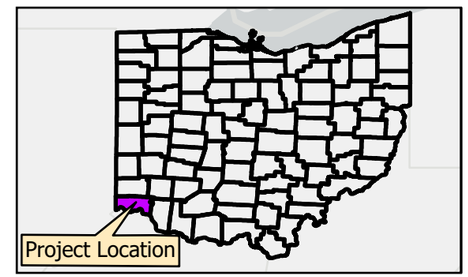
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(At original document size of 11x17)
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Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Parks
- Trails
- Streams*





Notes

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*All stream lines drawn in from aerial imagery

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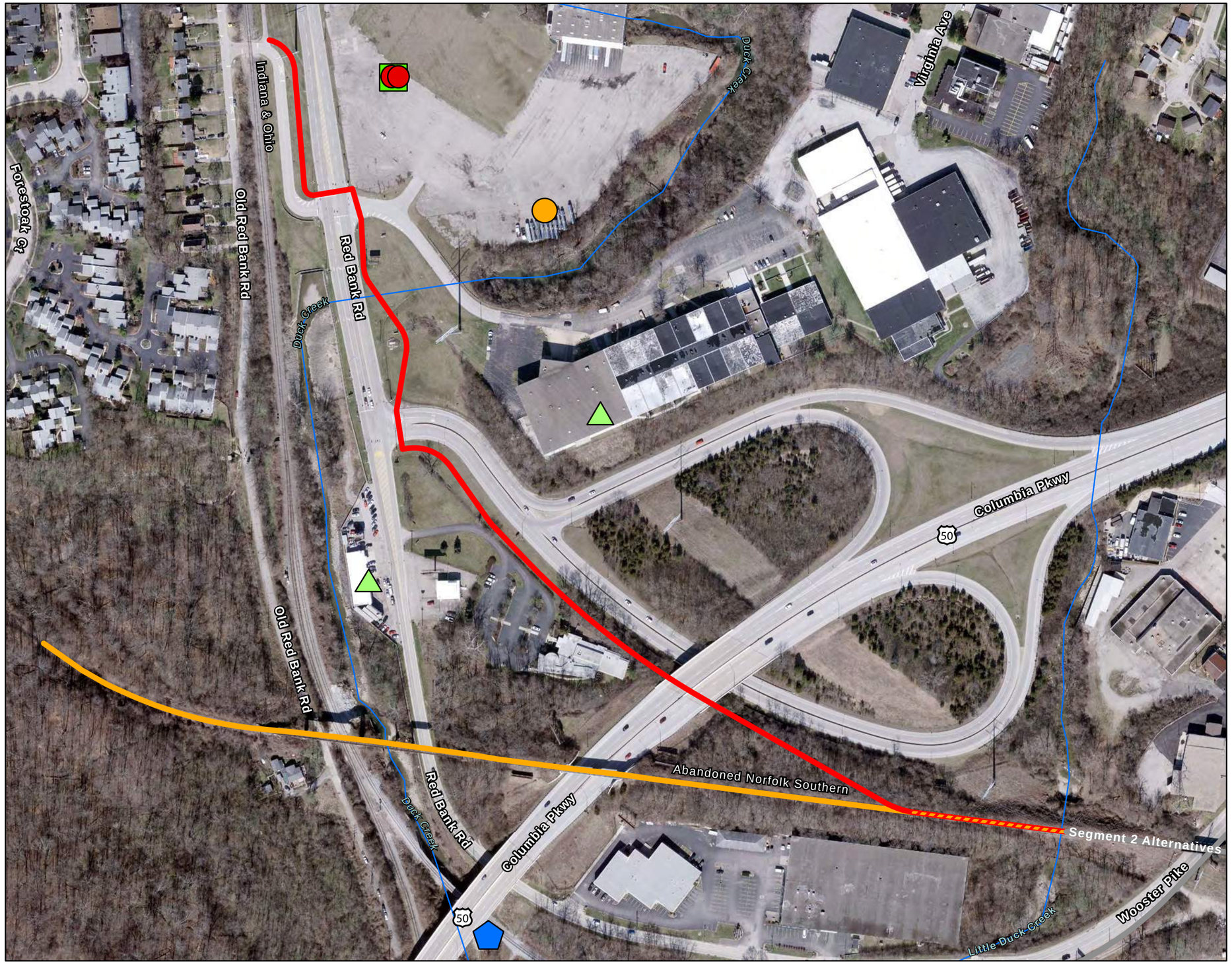


Exhibit No.

5.1

Title

Segment 1- Regulated Materials Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

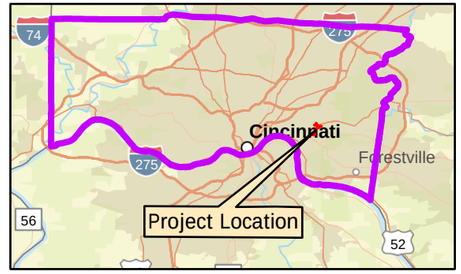
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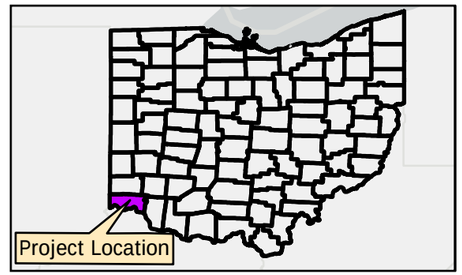
0 200 400 Feet

(At original document size of 11x17)
1:2,700

Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- LUST sites
- UST sites
- Active Solid Waste Site
- Solid Waste Site-1/4 mile buffer
- DERR sites
- RCRA sites
- Spill sites
- Streams*





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
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3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
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World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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Exhibit No.

5.2

Title

Segment 2- Regulated Materials Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

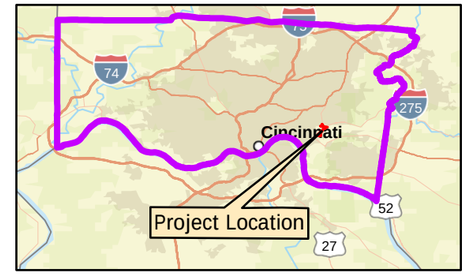
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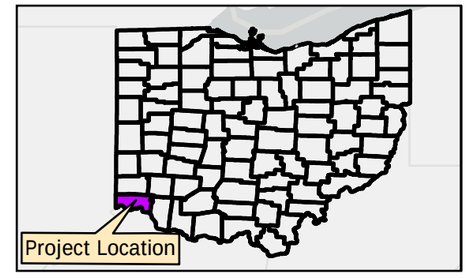
0 200 400 Feet

(At original document size of 11x17)
1:2,700

Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- LUST Sites
- UST Sites
- Active Solid Waste Site
- Solid Waste Site-1/4 mile buffer
- DERR Sites
- RCRA Sites
- Spill Sites
- Streams*





Notes

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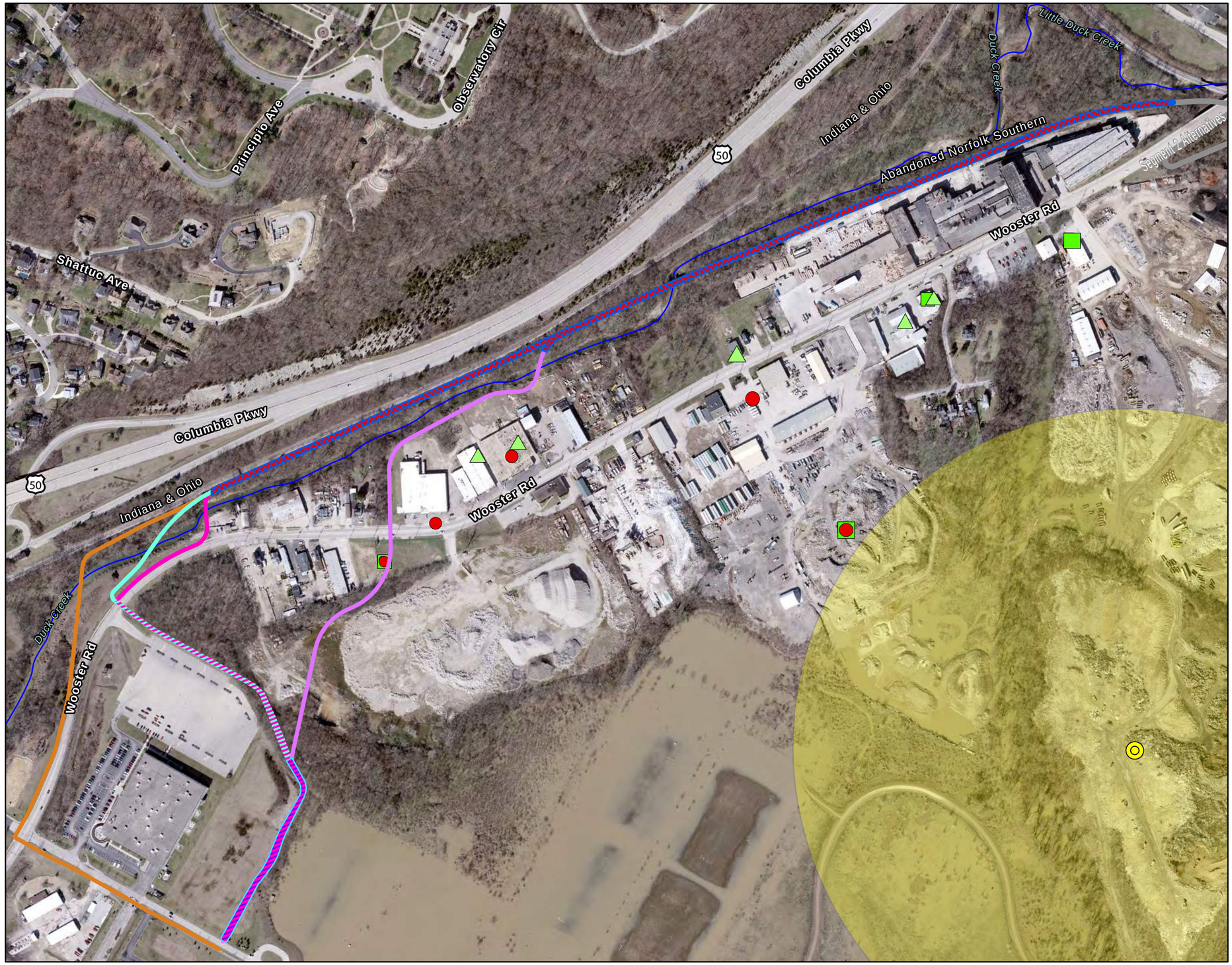


Exhibit No.

5.3

Title

Segment 3- Regulated Materials Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

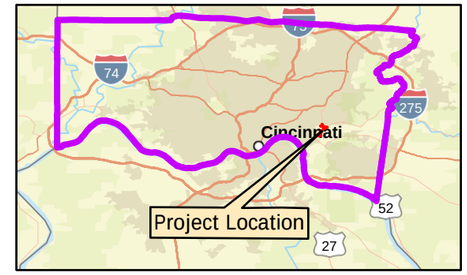
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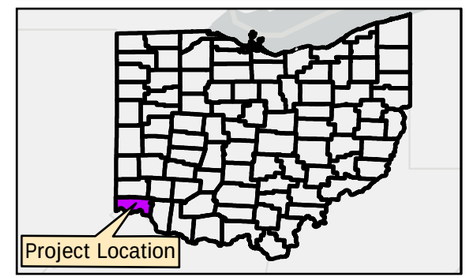
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(At original document size of 11x17)
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Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- LUST sites
- UST sites
- Active Solid Waste Site
- Solid Waste Site-1/4 mile buffer
- DERR sites
- RCRA sites
- Spill sites
- Streams*





Notes

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3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
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*All stream lines drawn in from aerial imagery

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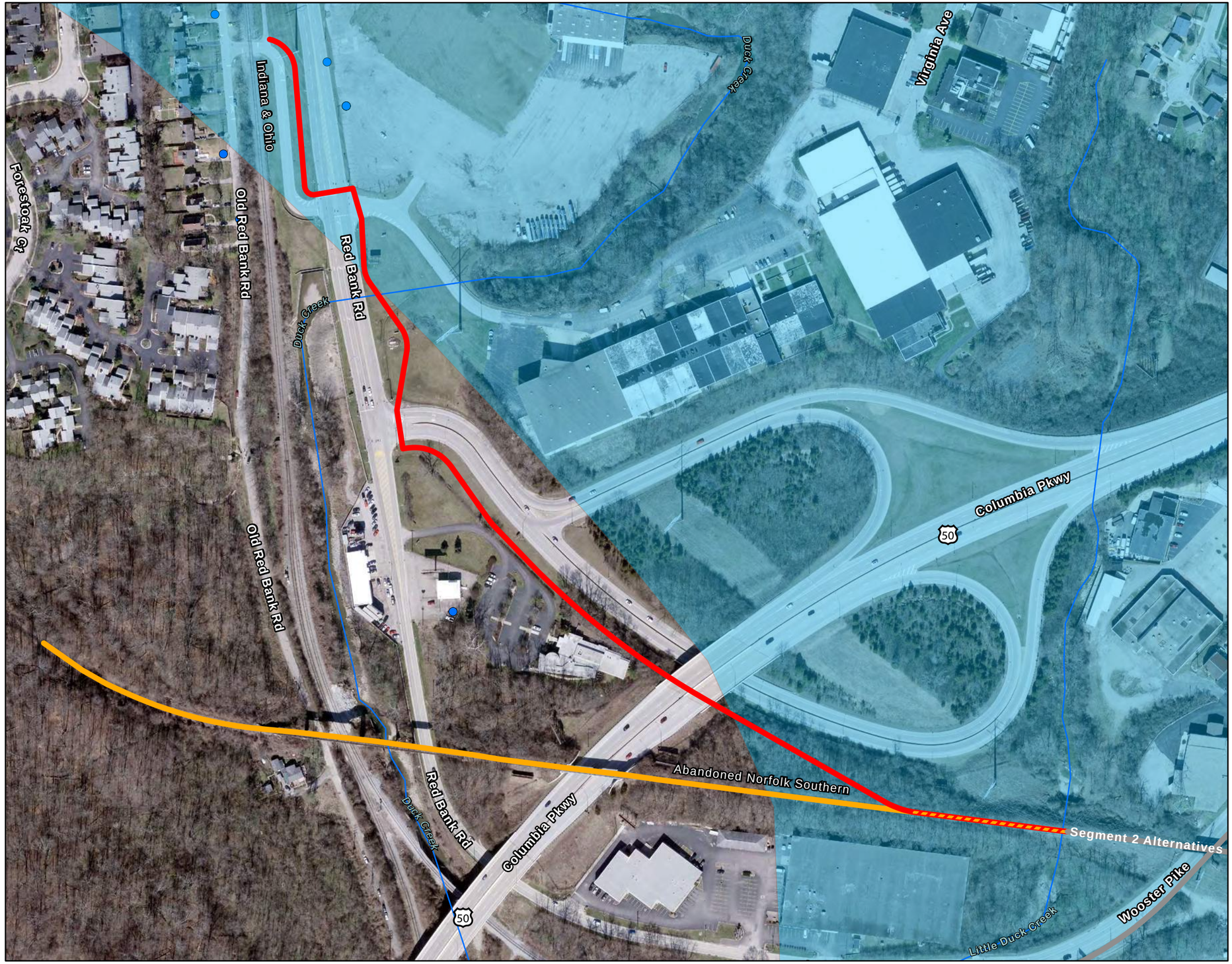


Exhibit No.

6.1

Title

Segment 1- Drinking Water Source Protection Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

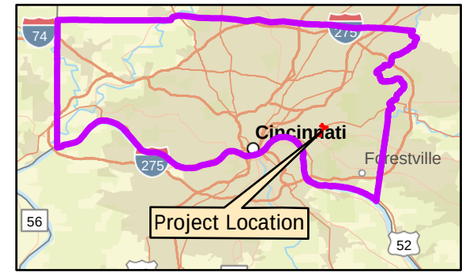
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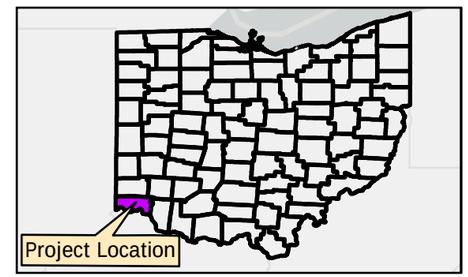
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(At original document size of 11x17)
1:2,700

Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1- Alternatives A & C
- Greater Miami Sole Source Aquifer
- Water Wells
- Streams*





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
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World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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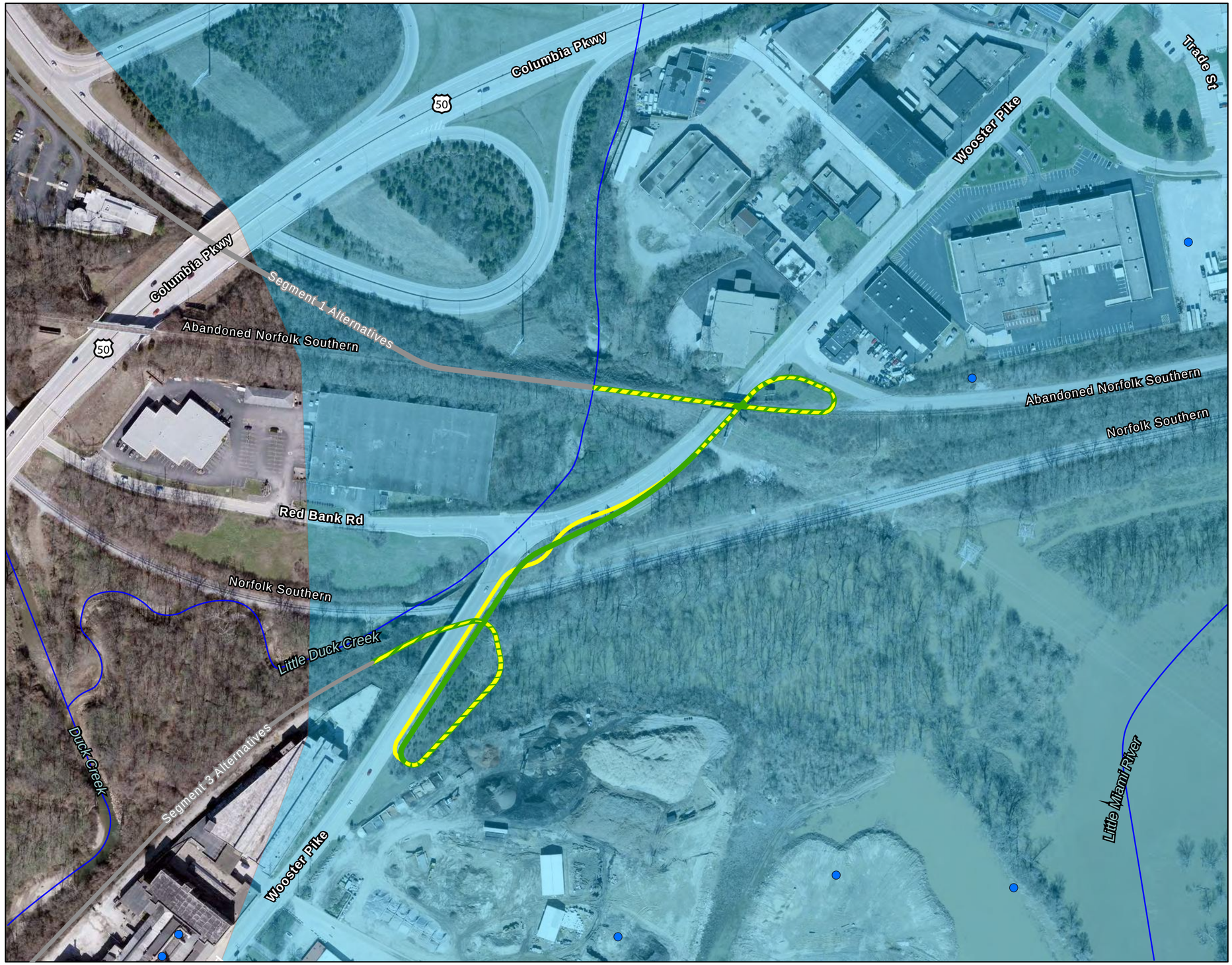


Exhibit No.

6.2

Title

Segment 2- Drinking Water Source Protection Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

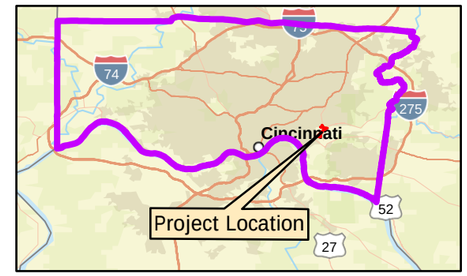
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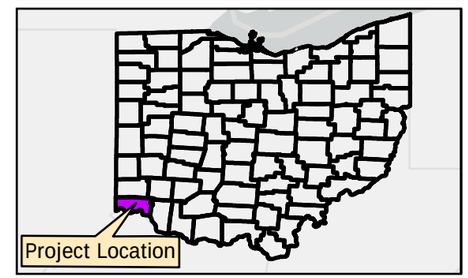
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(At original document size of 11x17)
1:2,700

Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Greater Miami Sole Source Aquifer
- Water Wells
- Streams*





Notes

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Stantec

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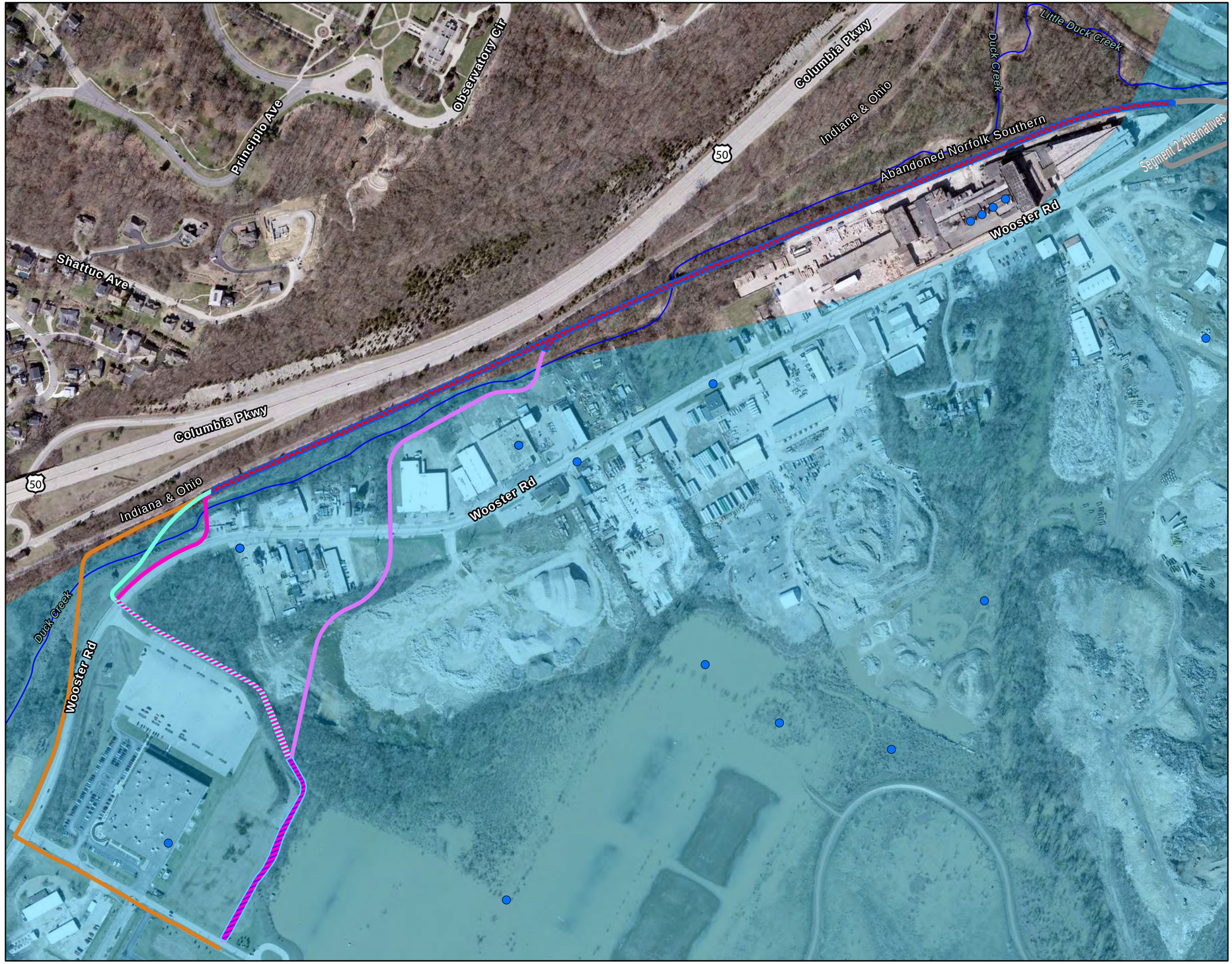


Exhibit No.

6.3

Title

Segment 3- Drinking Water Source Protection Map

Client/Project

173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location

Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

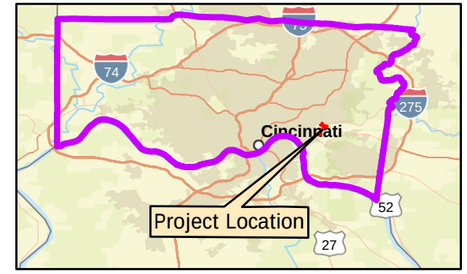
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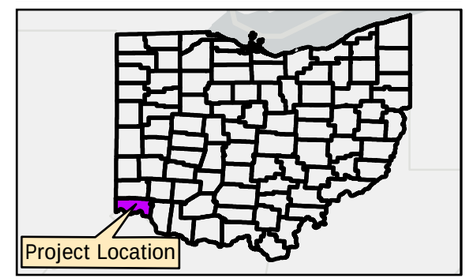
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(At original document size of 11x17)
1:4,700

Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Water Wells
- Greater Miami Sole Source Aquifer
- Streams*





Notes

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Exhibit No.
7.1

Title
Segment 1- EJ Analysis: Minority Populations Map

Client/Project 173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

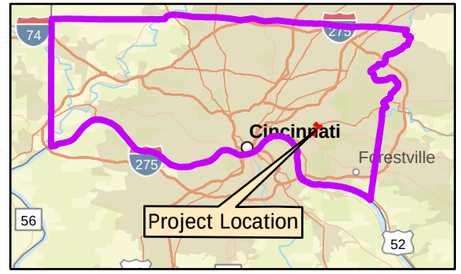
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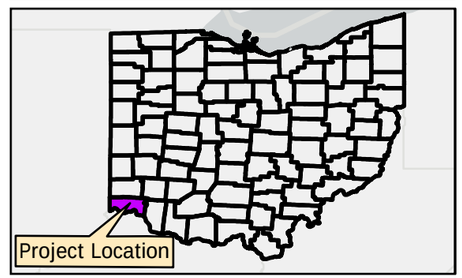
Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1-Alternatives A & C
- Streams*

Minority Population Percentage

0-10%	50-60%
10-20%	60-70%
20-30%	70-80%
30-40%	80-90%
40-50%	90-100%





Notes
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World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

Stantec

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Exhibit No.

7.2

Title

Segment 2- EJ Analysis Minority Populations Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

0 200 400 Feet

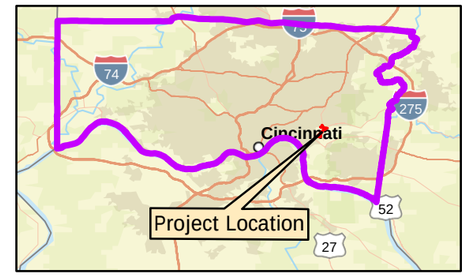
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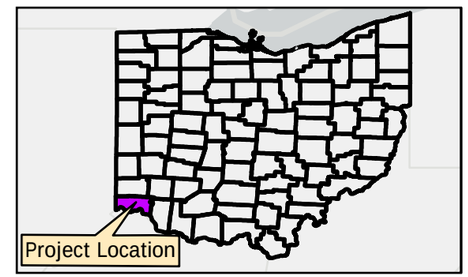
Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Streams*

Minority Population Percentage

0-10%	50-60%
10-20%	60-70%
20-30%	70-80%
30-40%	80-90%
40-50%	90-100%





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
World Street Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

*All stream lines drawn in from aerial imagery

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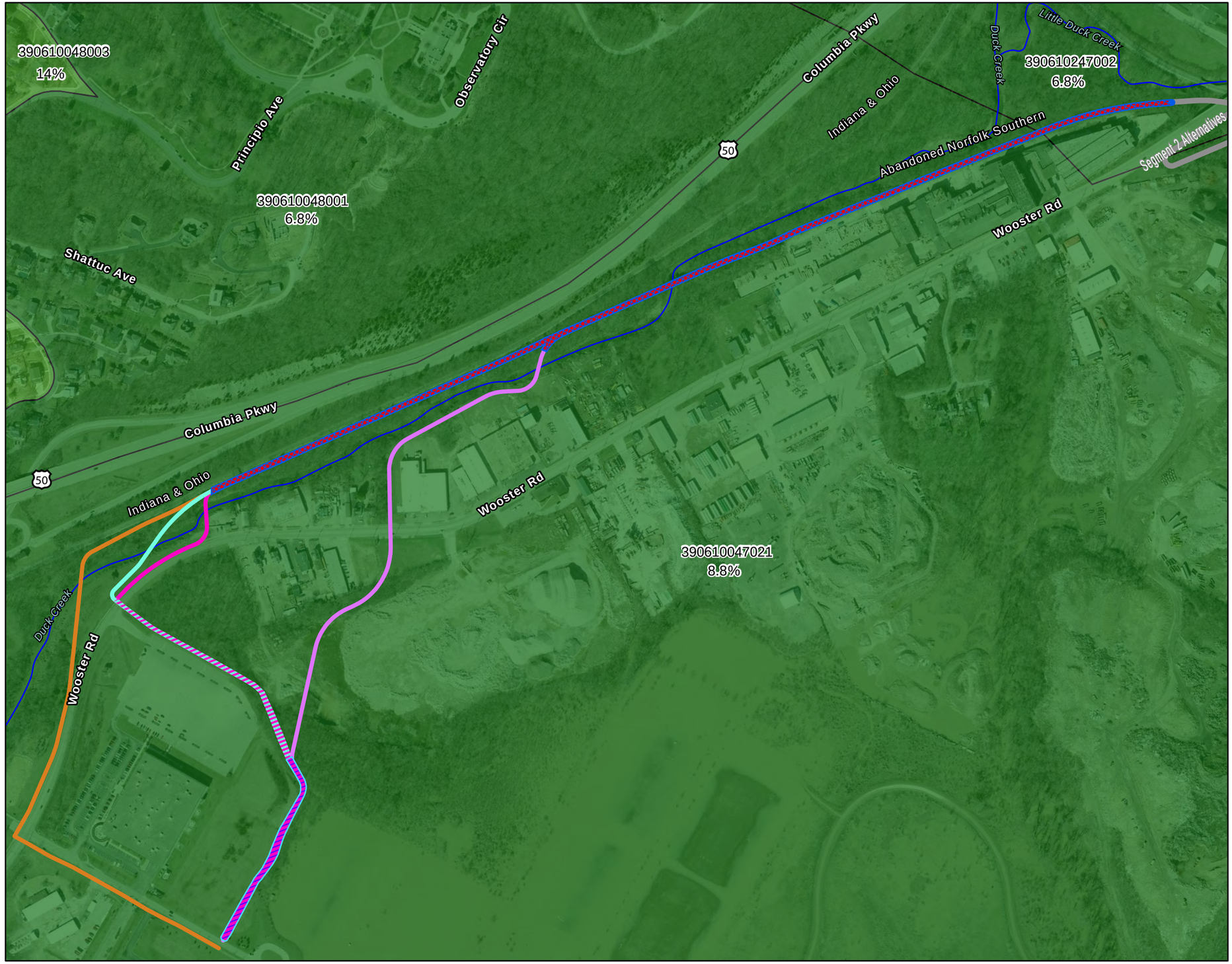


Exhibit No.

7.3

Title

Segment 3- EJ Analysis Minority Populations Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

0 350 700 Feet

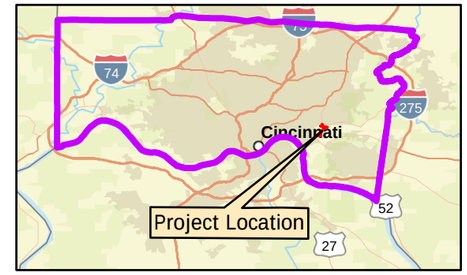
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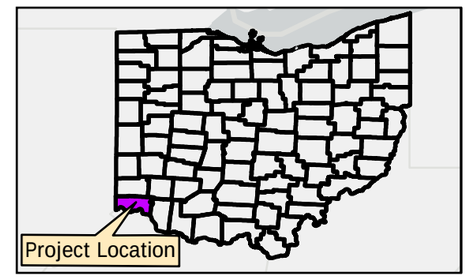
Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Streams*

Minority Population Percentage

0-10%	50-60%
10-20%	60-70%
20-30%	70-80%
30-40%	80-90%
40-50%	90-100%





Notes

1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
World Street Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS
Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

*All stream lines drawn in from aerial imagery

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Exhibit No.
8.1

Title
Segment 1- EJ Analysis: Low-Income Populations Map

Client/Project 173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

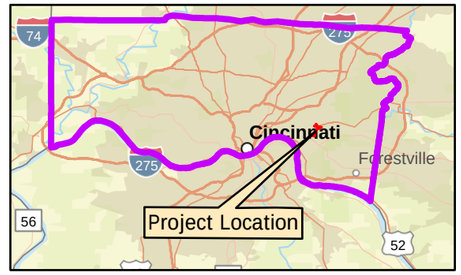
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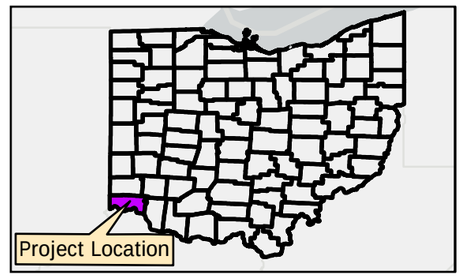
Legend

- Segment 1-Alternative A
- Segment 1-Alternative C
- Segment 1-Alternatives A & C
- Streams*

Low-Income Population Percentage

- 0-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-90%
- 90-100%





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
Hybrid Reference Layer: Esri Community Maps Contributors, City of Cincinnati, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, USFWS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, USFWS

*All stream lines drawn in from aerial imagery

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Exhibit No.
8.2

Title
Segment 2- EJ Analysis Low-Income Populations Map

Client/Project
173620146
HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

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(At original document size of 11x17)
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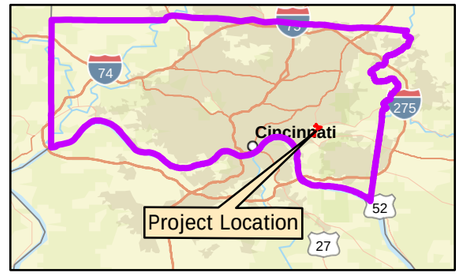


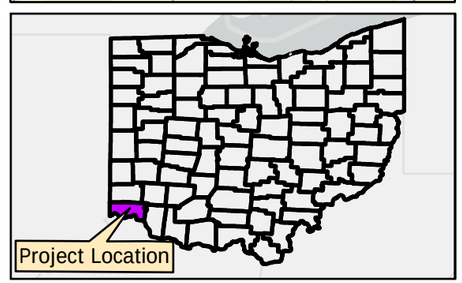
Legend

- Segment 2-Alternative B
- Segment 2-Alternative C
- Segment 2-Alternatives B & C
- Streams*

Low-Income Population Percentage

0-10%	50-60%
10-20%	60-70%
20-30%	70-80%
30-40%	80-90%
40-50%	90-100%





Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base Features Produced from Project Design Elements
3. Background: Light Gray Base: Esri, HERE, Garmin, FAO, NOAA, USGS, EPA
World Street Map: Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

*All stream lines drawn in from aerial imagery

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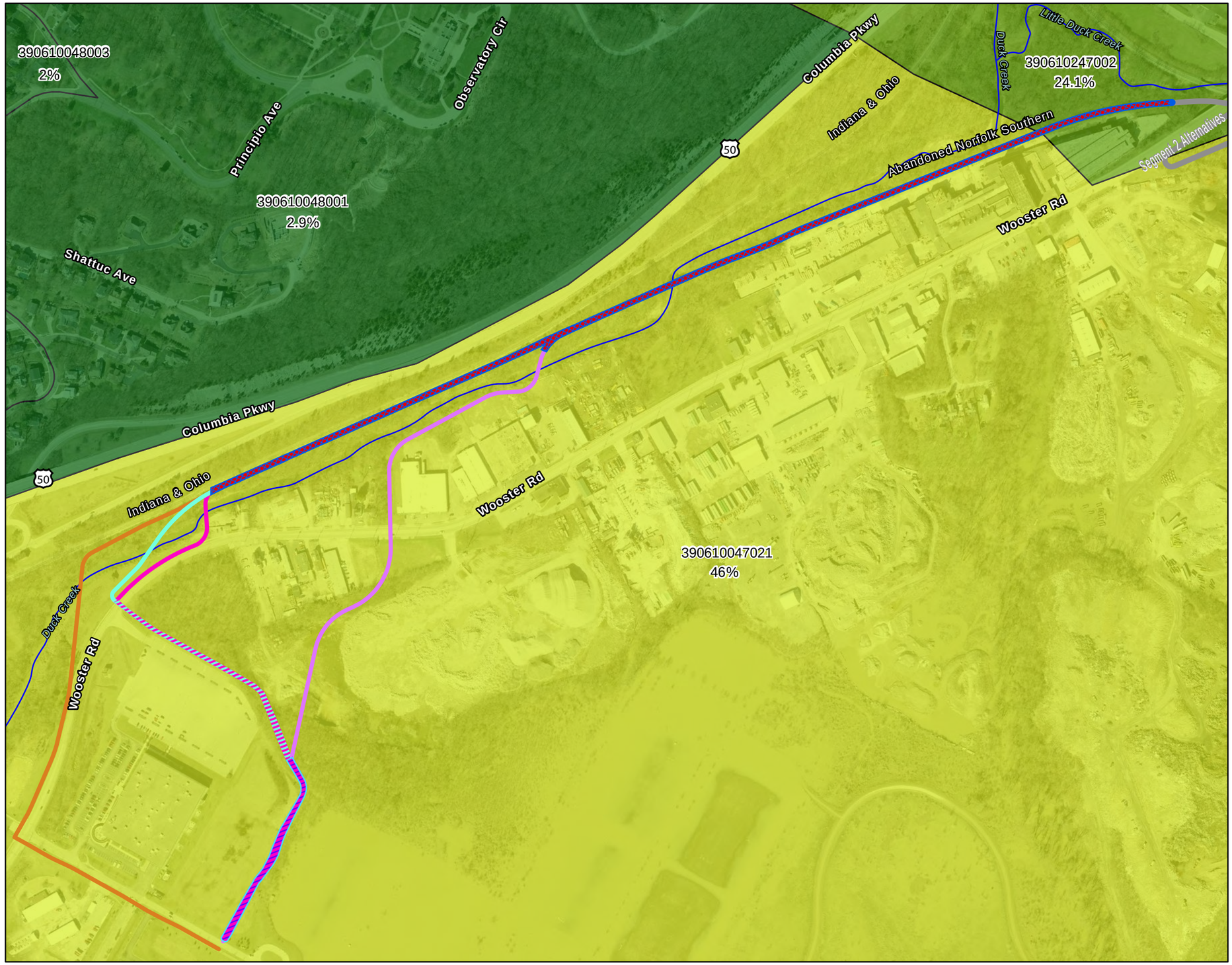


Exhibit No.

8.3

Title

Segment 3- EJ Analysis Low- Income Populations Map

Client/Project 173620146

HAM- Wasson Way to Otto Armleder
PID 113603

Project Location
Columbia Township
Hamilton County, OH

Prepared by RG on 2023-12-11

N

0 350 700 Feet

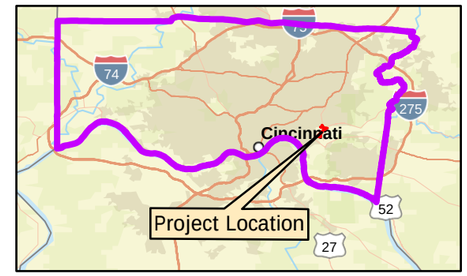
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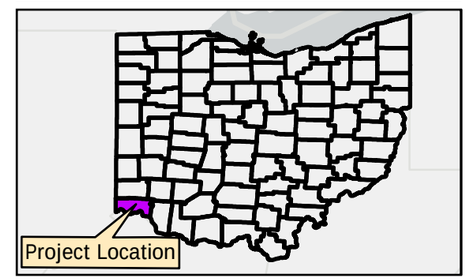
Legend

- Segment 3-Shared Alternatives B-E
- Segment 3-Alternative B
- Segment 3-Alternative C
- Segment 3-Alternative D
- Segment 3-Shared Alternatives B-D
- Segment 3-Shared Alternatives C-D
- Segment 3-Alternative E
- Streams*

Low-Income Population Percentage

- 0-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-90%
- 90-100%





Notes

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*All stream lines drawn in from aerial imagery

Stantec

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Attachment H

Ecological Resources Technical Memorandum

Stantec

Memo

To:	Steve Shadix	From:	Michael de Villiers Cincinnati
Project/File:	173620146	Date:	January 2, 2024

Reference: HAM-Wasson Way to Otto Armleder; PID 113603

Introduction

The proposed trail extension project is in the Village of Fairfax, Columbia Township, Hamilton County, Ohio (See **Figures 1.1** and **1.2**). Great Parks of Hamilton County (Great Parks) and the Village of Fairfax, in cooperation with the Ohio Department of Transportation (ODOT) District 8 are proposing a new shared-use path connection from the end of US 50 at Wasson Way to the entrance to Otto Armleder Park at Wooster Road. This project is divided into three contiguous segments. The eastern section (Segment 1) begins at the existing Wasson Way near US 50 in Ault Park and continues to the intersection of Wooster Road and Red Bank Road. The middle portion of the study area (Segment 2) crosses the existing railroad at the intersection of Wooster Road and Red Bank Road. The southern section (Segment 3) continues from the south side of the existing railroad at the intersection of Wooster Road and Red Bank Road south to Armleder Road near the entrance to Otto Armleder Park. The project is needed to address safety and connectivity for pedestrians and bicyclists between Beechmont Circle and Red Bank Road and between Wasson Way and the Little Miami Scenic Trail at Otto Armleder Memorial Park. The study area is approximately 93.5 acres.

Ecological field surveys for the proposed project were conducted on September 8-9, 2022, and October 16-18, 2023. These surveys included wetland and stream delineations, a freshwater mussel reconnaissance survey, and documentation of vegetative communities within the study area. A total of two (2) streams and four (4) wetlands were found within the study area (See **Figure 2**). Ecological resources found within the study area are described below.

Streams

Two (2) streams were found within the study area including one perennial stream (Duck Creek) and one intermittent stream (Little Duck Creek). Both streams are in an area mapped by the Ohio Environmental Protection Agency (OEPA) as “Eligible” for Nationwide permitting. Table 1 below summarizes streams within the study area:

Table 1. Summary of Streams

Stream ID	Drainage Area (mi^2)	Stream Hydrology Type	Habitat Assessment	OEPA Aquatic Life Use Designation	Length in Study Area (LF)
Duck Creek	14.4	Perennial	QHEI 65.5	Warmwater Habitat	4,884
Little Duck Creek	1.71	Intermittent	QHEI 61.0	Warmwater Habitat	1,410

Reference: HAM-Wasson Way to Otto Armleder; PID 113603

Wetlands

Four (4) wetlands were found within the study area including two palustrine forested wetlands and two palustrine emergent wetlands. Table 2 summarizes wetlands within the study area:

Table 2. Summary of wetlands.

Wetland ID	Hydrologic Connection	ORAM Score (Category)	Wetland Type (Cowardin)	Estimated Total Size (Acre)*	Estimated Size in Study Area (Acre)
Wetland A	Adjacent	50 (Category 2)	Palustrine – Forested	4.97	0.21
Wetland B	Adjacent	29 (Category 1)	Palustrine – Emergent	0.10	0.10
Wetland C	Adjacent	21 (Category 1)	Palustrine – Emergent	0.02	0.02
Wetland D	Adjacent	48.5 (Category 2)	Palustrine – Forested	3.52	0.68

* Total size estimate using aerial imagery

Threatened and Endangered Species

Federally Listed Species

The Ohio Department of Natural Resources, Division of Wildlife (ODNR-DOW) conducted a Natural Heritage Database (NHDB) records check on December 8, 2023. This check found no records of Indiana bat (*Myotis sodalis*), Northern long-eared bat (*Myotis septentrionalis*), or tricolored bat (*Perimyotis subflavus*) captures or hibernacula within a 1-mile radius of the study area. According to a United States Fish and Wildlife Service (USFWS) email information request response on November 1, 2023, the project is not located within a bat buffer. Three potential maternity roost trees were identified within the study area 100 feet past edge of pavement. No portals, openings, cracks, or crevices in rock outcrops that may be an entrance to a cave or mine that would be considered suitable winter hibernacula for Indiana bat or northern long-eared bat were found within the study area. Approximately 32 acres of suitable wooded habitat is found within the study area.

The ODNR-DOW NHDB records check found no records of bald eagle (*Haliaeetus leucocephalus*) nests within a 1-mile radius of the study area and no nests were observed within the study area. Five federally listed mussel species have been found within Hamilton County: fanshell (*Cyprogenia stegaria*), pink mucket pearly mussel (*Lampsilis orbiculata*), rayed bean (*Villosa fabalis*), sheepnose (*Plethobasus cyphyus*), and snuffbox (*Epioblasma triquetra*). A mussel reconnaissance survey conducted on September 8, 2022, in Duck Creek found no live mussels or mussel shells.

State Listed Species

The ODNR-DOW NHDB records check found seven additional records of state-listed species within a 1-mile radius of the study area: state potentially threatened running buffalo clover (*Trifolium stoloniferum*), state endangered loggerhead shrike (*Lanius ludovicianus*), state threatened mountain madtom (*Noturus eleutherus*) and blue sucker (*Cycleptus elongatus*), and state species of concern fawnsfoot mussel (*Truncilla*

donaciformis), black sandshell mussel (*Ligumia recta*), and eastern ringtail dragonfly (*Erpetogomphus designatus*).

Running buffalo clover requires periodic disturbance and a somewhat open habitat to successfully flourish, but it cannot tolerate full-sun, full-shade, or severe disturbance. Historically running buffalo clover was found in rich soils in the ecotone between open forest and prairie. Those areas were probably maintained by the disturbance caused by bison. Today, the species is found in partially shaded woodlots, mowed areas (lawns, parks, cemeteries), and along streams and trails (USFWS, July 2020). The loggerhead shrike is found in semi-open grasslands, shrublands, grazed pastures, and agricultural areas with scrubby vegetation and lookout posts or perches. Their diet includes bugs, small animals, and other small birds, which they store on barbs, thorns, or forks between branches. The mountain madtom is found in the deep, rocky riffles of fast-flowing streams with gravel or cobble substrate and is very sensitive to pollution and siltation. The blue sucker is found in deep, swift, large rivers with cobble substrate and are bottom feeders. The fawnsfoot mussel occurs in both large and medium-sized rivers at normal depths varying from less than three feet up to 15 to 18 feet in big rivers such as the Tennessee. A substrate of either sand or mud is suitable and although it is typically found in moderate current, it can adapt to a lake or embayment environment lacking current. The black sandshell mussel is typically found in medium-sized to large rivers in locations with strong current and substrates of coarse sand and gravel with cobbles in water depths from several inches to six feet or more. It can be found in sand, gravel, or silt. The eastern ringtail dragonfly is found in rivers and streams with gravel bottoms.

Suitable habitat for the running buffalo clover, loggerhead shrike (in semi-open scrub/shrub habitat), fawnsfoot mussel and black sandshell mussel (Duck Creek), and the eastern ringtail dragonfly (Duck Creek) is found within the study area. There is no suitable habitat for the mountain madtom and blue sucker within the study area.

Mussels

A mussel reconnaissance survey was conducted on September 8, 2022, in Duck Creek. Duck Creek is an unlisted stream with a drainage area > 5 mi^2 as indicated by ODNR-DOW's *Ohio Mussel Survey Protocol* (meaning the stream has potential for mussels, but federally listed mussels not expected). No evidence of mussels was observed, including living mussels or dead mussel shells.

Land Cover

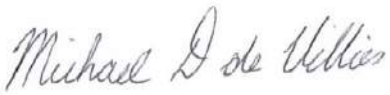
The study area was surveyed for vegetative communities on October 16, 17, and 18, 2023 (See **Figure 2**). Developed High Intensity (DH) and Developed Open Space (DS) vegetative communities account for approximately 27 percent and 17 percent of land cover within the study area, respectively. Approximately 14 percent of the land cover within the study area is Upland Forest (UF), which consists primarily of black locust (*Robinia pseudoacacia*), black cherry (*Prunus serotina*), hackberry (*Celtis occidentalis*), sugar maple (*Acer saccharum*), boxelder (*Acer negundo*), black walnut (*Juglans nigra*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), American elm (*Ulmus americana*), redbud (*Cercis canadensis*), and Amur honeysuckle (*Lonicera maackii*). Approximately 20 percent of the land cover within the study area is Floodplain Forest (FF), which consists primarily of boxelder, silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), and black willow (*Salix nigra*). Approximately 15 percent of the land cover within the study area is Scrub/Shrub (SS), which consists of Amur honeysuckle, eastern red cedar (*Juniperus virginiana*), Callery pear (*Pyrus*

Reference: HAM-Wasson Way to Otto Armleder; PID 113603

calleryana), flowering dogwood (*Cornus florida*), multiflora rose (*Rosa multiflora*), and sandbar willow (*Salix interior*). The remaining 7 percent of land cover within the study area is made up of streams and wetlands, of which approximately 6 percent is Open Water (OW), approximately 0.9 percent is Forested Wetland (FW), and approximately 0.1 percent is Marsh (MA).

Respectfully,

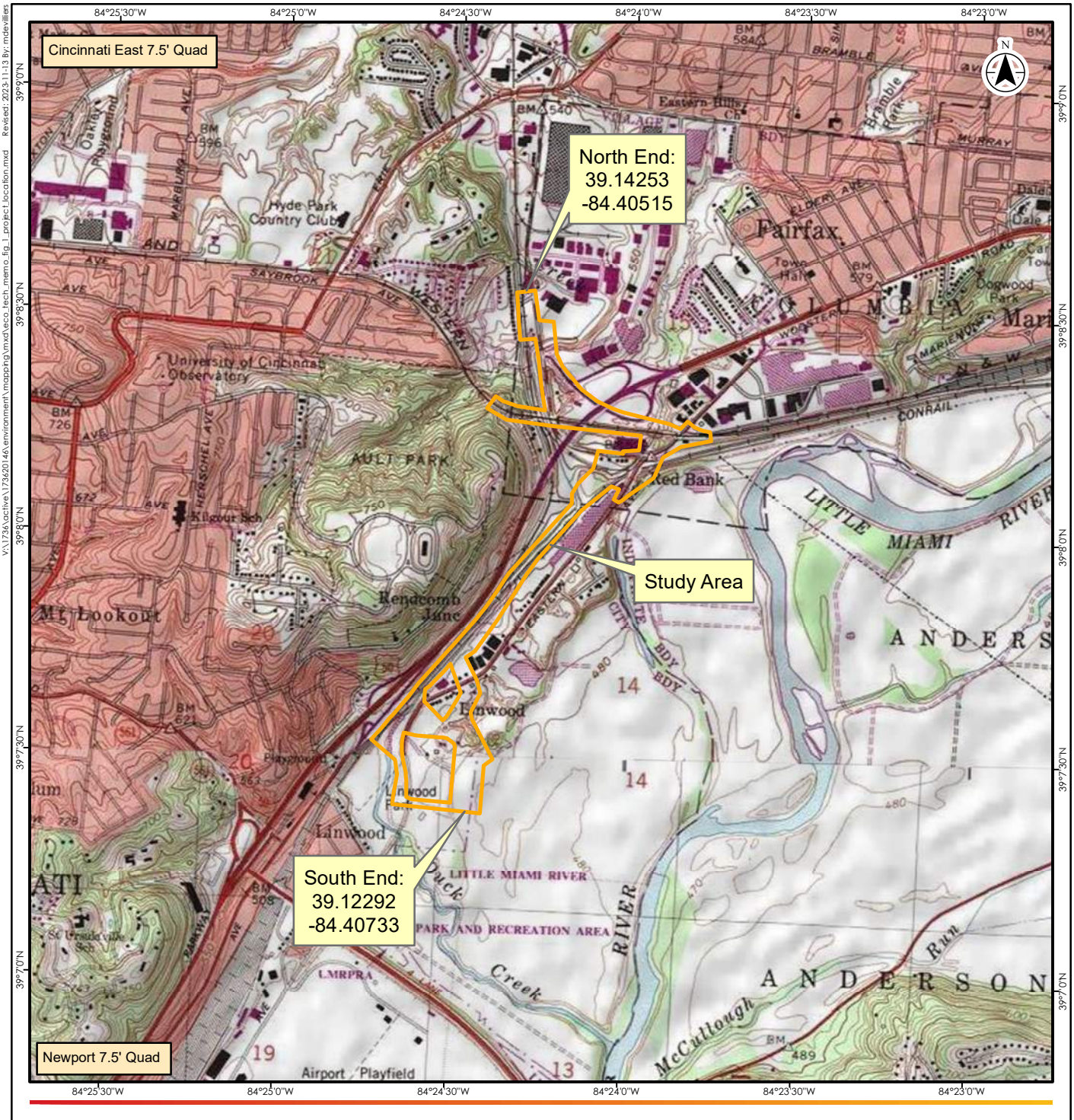
STANTEC CONSULTING SERVICES INC.

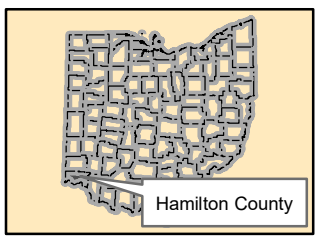


Michael de Villiers
Senior Environmental Specialist
Phone: (513) 619-6463
michael.devilliers@stantec.com

Attachment: Figures 1.1, 1.2, 2; Attachment A Ecological Resources Photolog

Figures







0 1,000 2,000 Feet

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Stantec

Project Location
173620146
Prepared by MDV on 2023-11-13
Columbia Township
Hamilton County, Ohio

Client/Project
Great Parks and Village of Fairfax
HAM-Wasson Way to Otto Armleder; PID 113603
Technical Memorandum

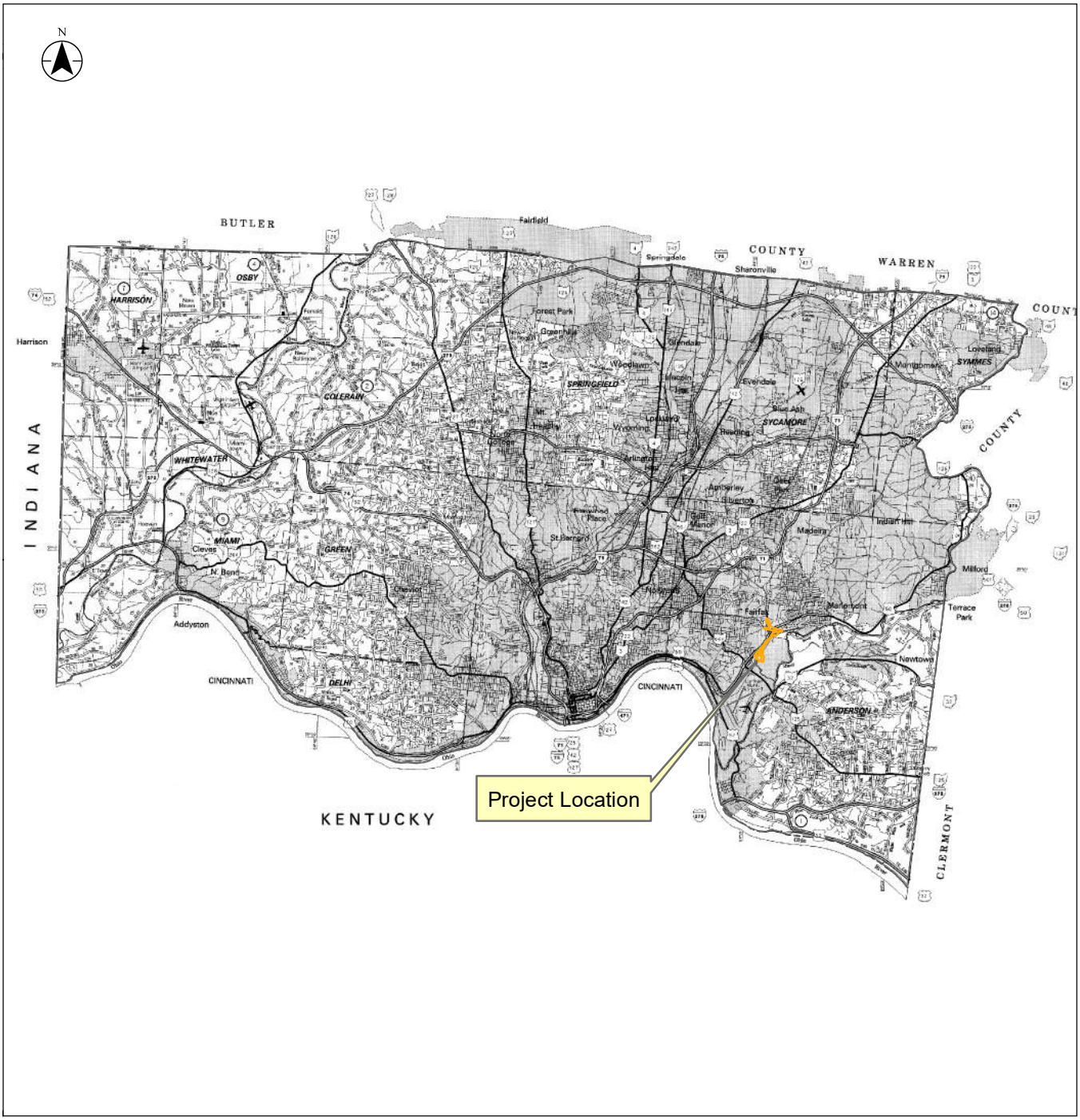
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1.1

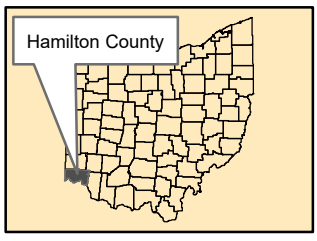
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Notes
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2. Base features produced from project design elements.
3. Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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Stantec

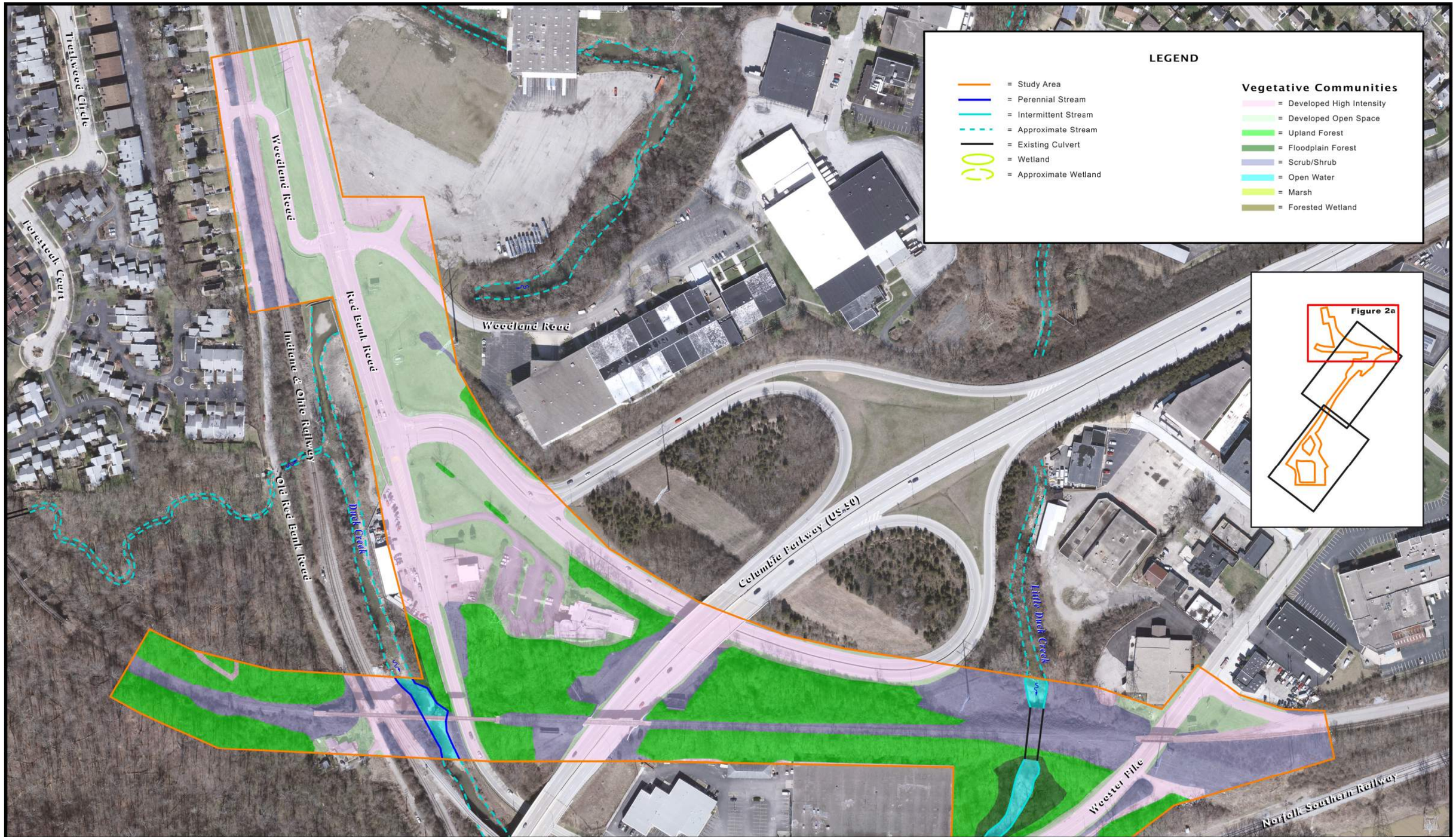
Project Location
173620146
Prepared by MDV on 2023-11-13
Columbia Township,
Hamilton County, Ohio

Client/Project
Great Parks and Village of Fairfax
HAM-Wasson Way to Otto Armleder; PID 113603
Techincal Memorandum

Figure No.
1.2

Title
Project Location Map
County Roadway Map Base

Notes
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
2. Base features produced from project design elements.
3. Service Layer Credits: ODOT Mapping Services (2014)



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December 2023

NORTH

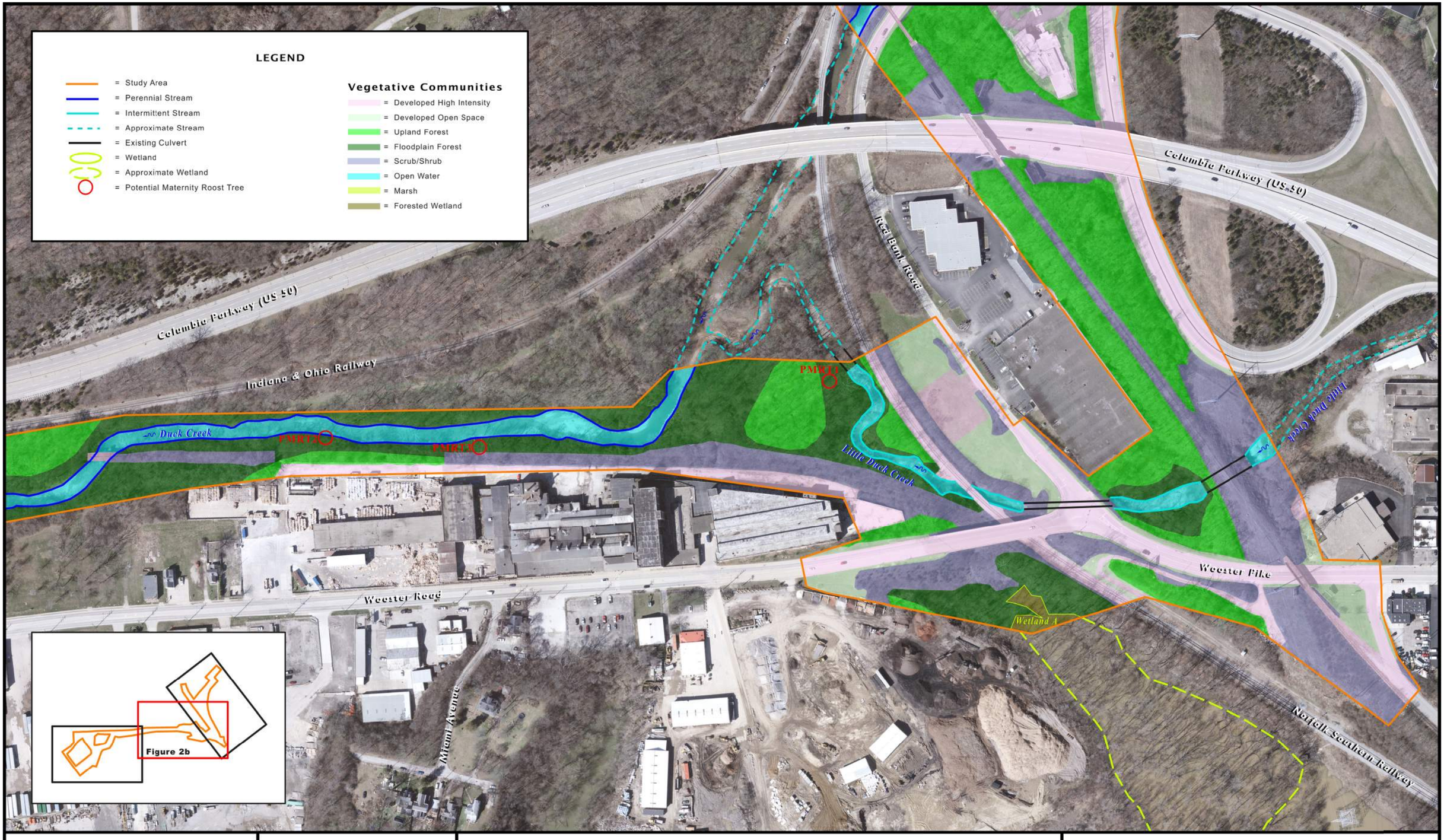
Stantec

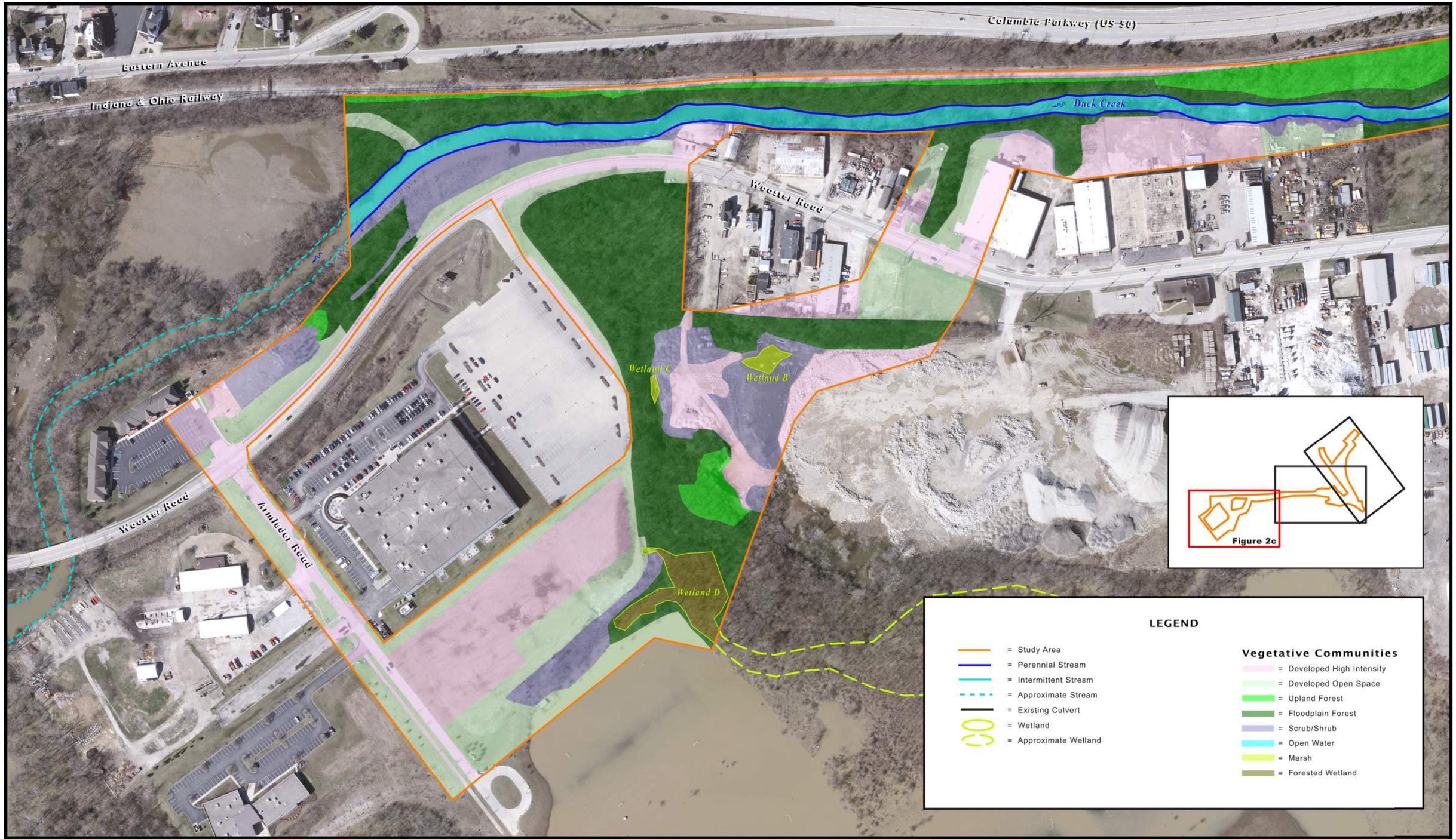
Technical Memorandum

Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603

Figure 2a

Ecological Resources


LEGEND
= Study Area
= Perennial Stream
= Intermittent Stream
= Approximate Stream
= Existing Culvert
= Wetland
= Approximate Wetland
= Potential Maternity Roost Tree
Vegetative Communities
= Developed High Intensity
= Developed Open Space
= Upland Forest
= Floodplain Forest
= Scrub/Shrub
= Open Water
= Marsh
= Forested Wetland
Columbia Parkway (US 50)
Indiana & Ohio Railway
Red Bank Road
Duck Creek
PMRT2
PMRT3
PMRT1
Little Duck Creek
Little Duck Creek
Weester Pike
Weester Road
Wetland A
Miami Avenue
Norfolk Southern Railway
Figure 2b
0 50 100 150 200 FEET
December 2023
NORTH
Stantec
Technical Memorandum
Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603
Figure 2b
Ecological Resources



0 50 100 150 200 FEET

December 2023

NORTH

Stantec

Technical Memorandum

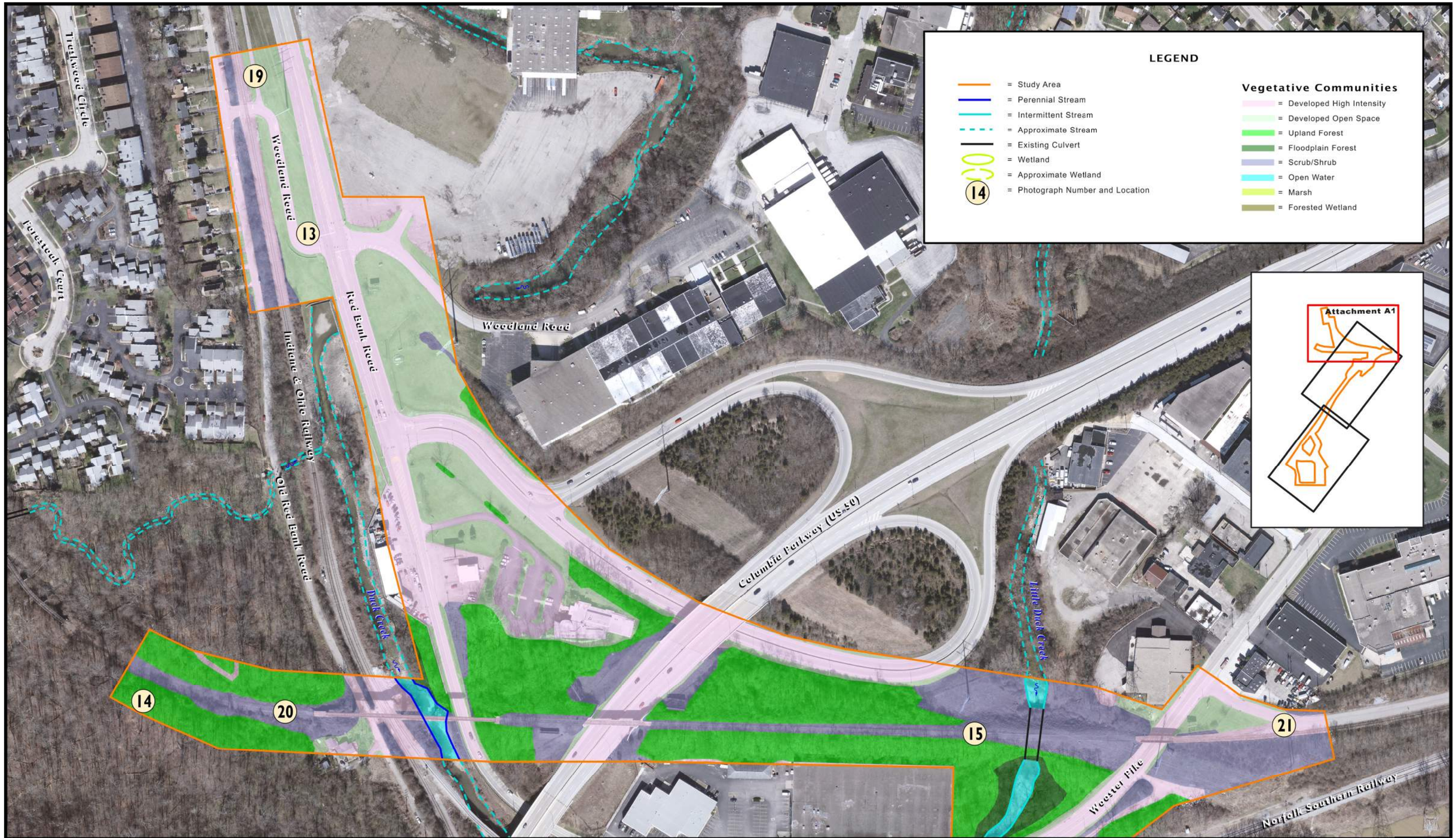
Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603

Figure 2c

Ecological Resources

Attachment A

Photo Log



0 50 100 150 200 FEET

December 2023

NORTH

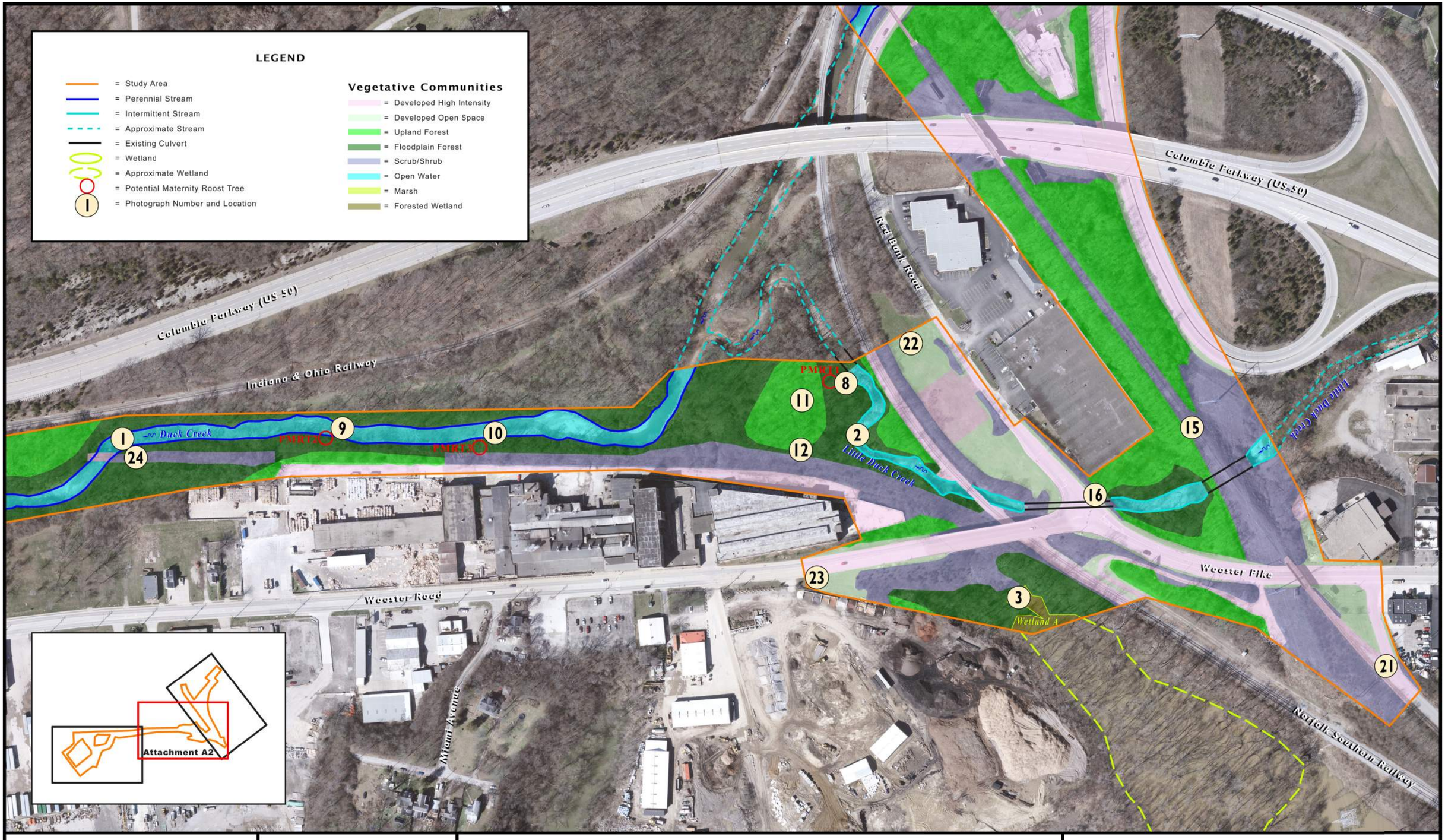
Stantec

Technical Memorandum

Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603

Attachment A1

Photograph Location Map


LEGEND
= Study Area
= Perennial Stream
= Intermittent Stream
= Approximate Stream
= Existing Culvert
= Wetland
= Approximate Wetland
= Potential Maternity Roost Tree
= Photograph Number and Location
Vegetative Communities
= Developed High Intensity
= Developed Open Space
= Upland Forest
= Floodplain Forest
= Scrub/Shrub
= Open Water
= Marsh
= Forested Wetland
Columbia Parkway (US 50)
Indiana & Ohio Railway
Red Bank Road
Duck Creek
Little Duck Creek
Weester Road
Miami Avenue
Weester Pike
Wetland A
Norfolk Southern Railway
PMRT1
PMRT2
PMRT3
Attachment A2
0 50 100 150 200 FEET
December 2023
NORTH
Stantec
Technical Memorandum
Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603
Attachment A2
Photograph Location Map



0 50 100 150 200 FEET

December 2023

NORTH

Stantec

Technical Memorandum

Great Parks and Village of Fairfax, Hamilton County, Ohio
HAM-Wasson Way to Otto Armleder; PID 113603

Attachment A3

Photograph Location Map



Photo Location 1: Duck Creek, perennial, facing upstream, northeast.



Photo Location 1: Duck Creek, perennial, facing downstream, south.



Photo Location 1: Duck Creek, perennial, typical substrates.



Photo Location 2: Little Duck Creek, intermittent, facing upstream, northeast.



Photo Location 2: Little Duck Creek, intermittent, facing downstream, north.



Photo Location 2: Little Duck Creek, intermittent, typical substrates.



Photo Location 3: Wetland A, Sample Point P1, facing east.



Photo Location 4: Wetland B, Sample Point P3, facing east.



Photo Location 5: Wetland C, Sample Point P7, facing south.



Photo Location 6: Wetland D (PFO), Sample Point P9, facing south.



Photo Location 7: Wetland D (PEM), Sample Point P10, facing east.



Photo Location 8: Potential Maternity Roost Tree 1, close-up.



Photo Location 8: Potential Maternity Roost Tree 1, overview, facing southwest.



Photo Location 9: Potential Maternity Roost Tree 2, close-up.



Photo Location 9: Potential Maternity Roost Tree 2, overview, facing south.


Photo Location 10: Potential Maternity Roost Tree 3, close-up.

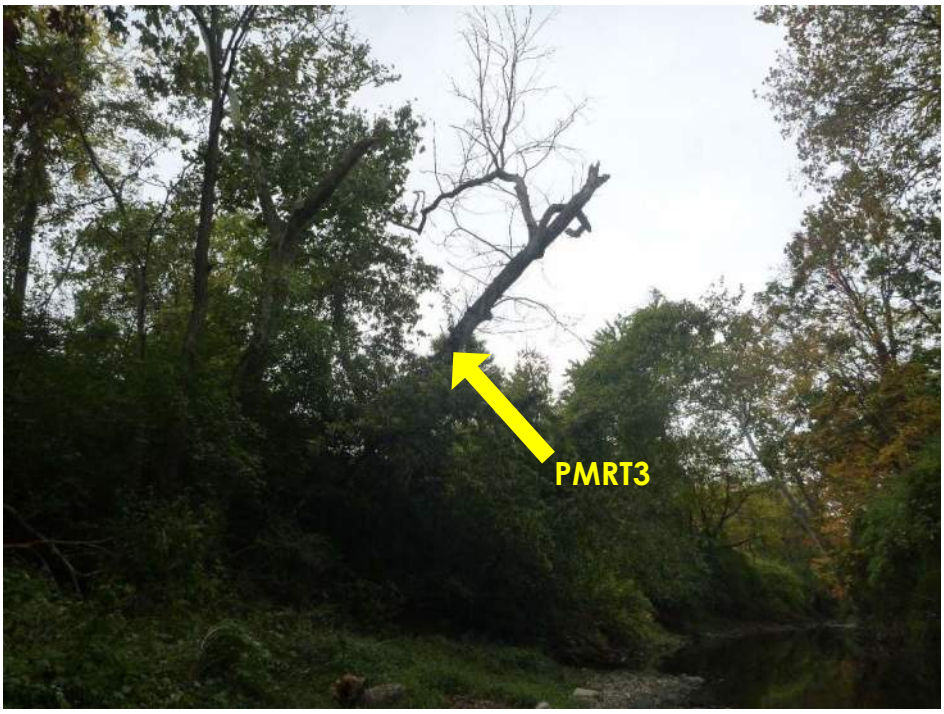


Photo Location 10: Potential Maternity Roost Tree 3, overview, facing south.



Photo Location 11: Abandoned structure foundation, facing southeast.



Photo Location 12: Abandoned well, facing northwest.

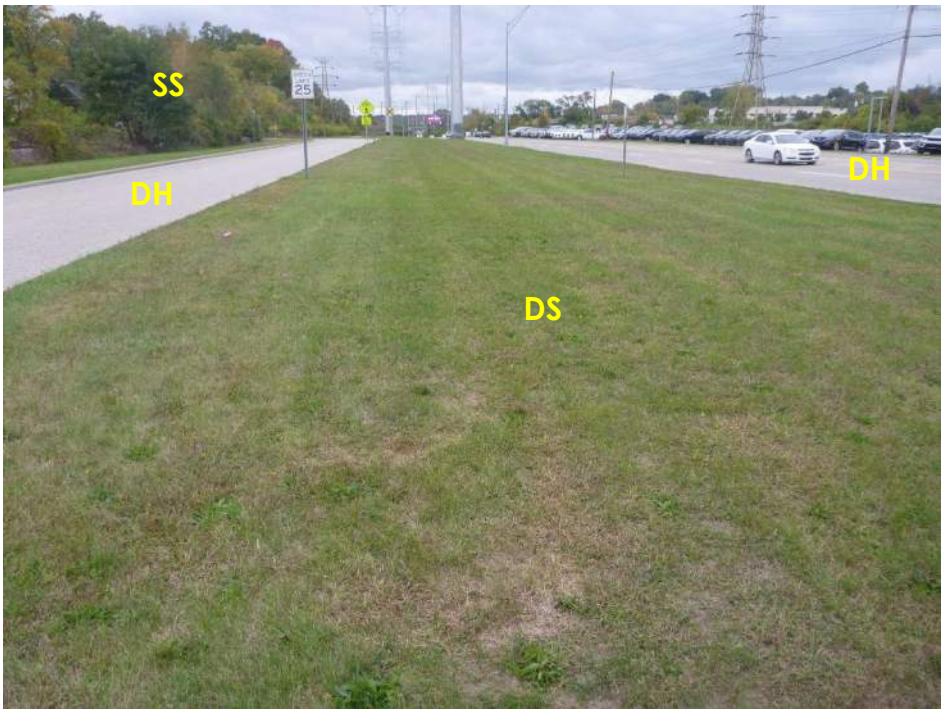


Photo Location 13: Developed High Intensity (DH), Developed Open Space (DS), and Scrub/Shrub (SS) vegetative communities, facing north.

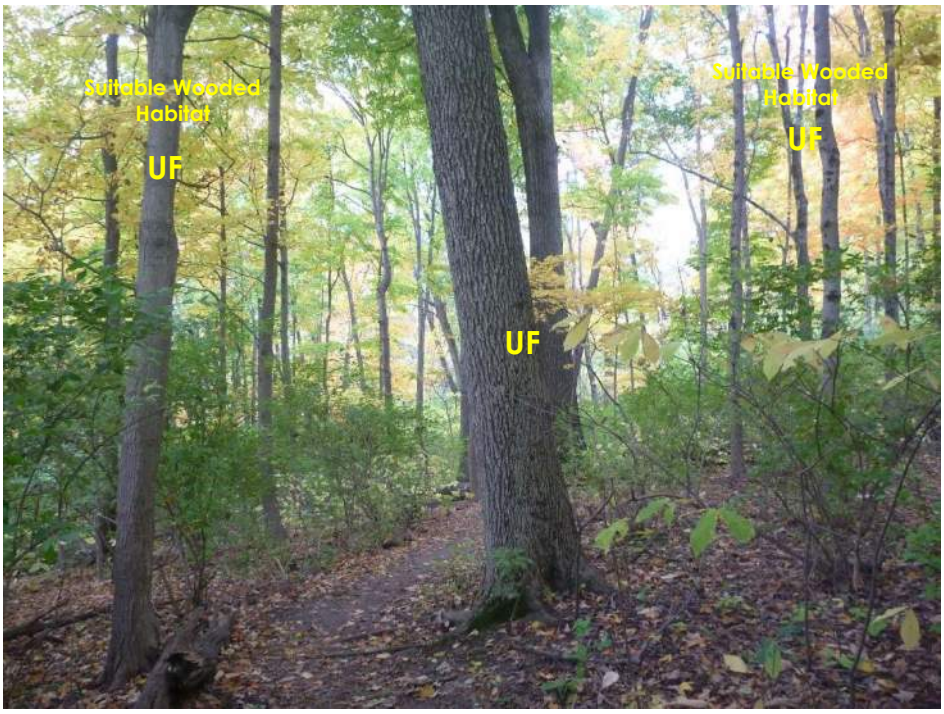


Photo Location 14: Upland Forest (UF) vegetative community, facing east.



Photo Location 15: Upland Forest (UF) and Scrub/Shrub (SS) vegetative communities, facing west.



Photo Location 15: Upland Forest (UF) and Scrub/Shrub (SS) vegetative communities, facing east.

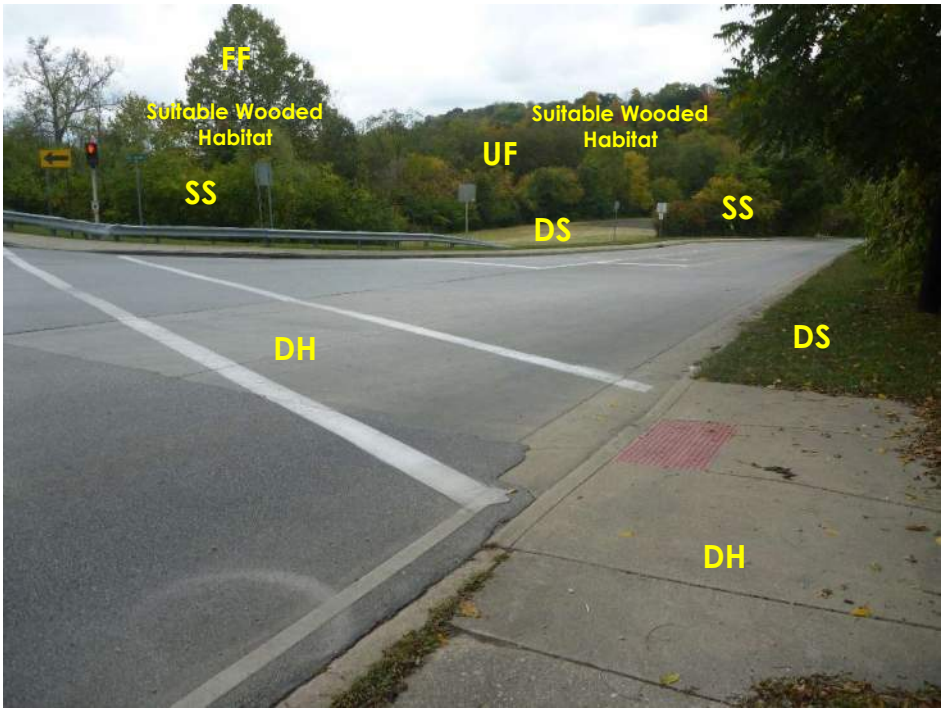


Photo Location 16: Developed High Intensity (DH), Developed Open Space (DS), Upland Forest (UF), Floodplain Forest (FF), and Scrub/Shrub (SS) vegetative communities, facing southwest.

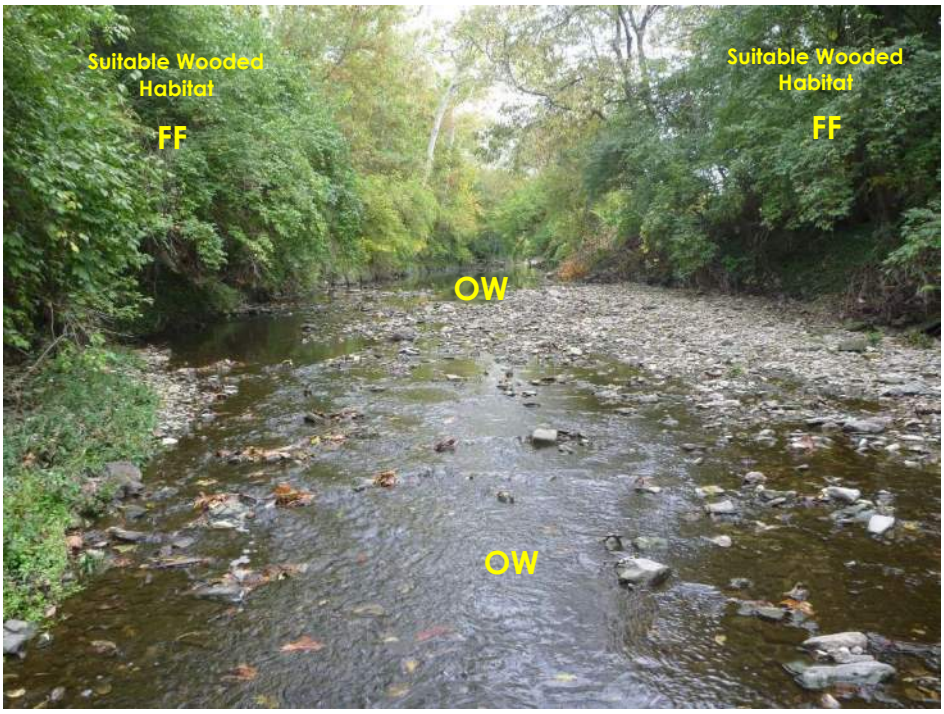


Photo Location 17: Floodplain Forest (FF) and Open Water (OW) vegetative communities, facing northeast.

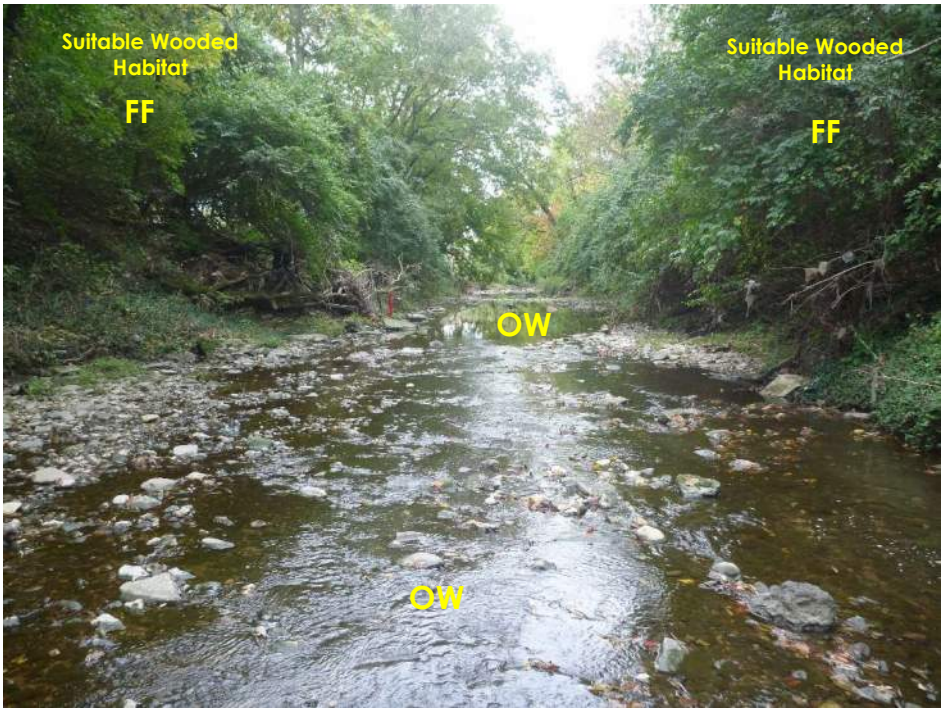


Photo Location 17: Floodplain Forest (FF) and Open Water (OW) vegetative communities, facing southwest.

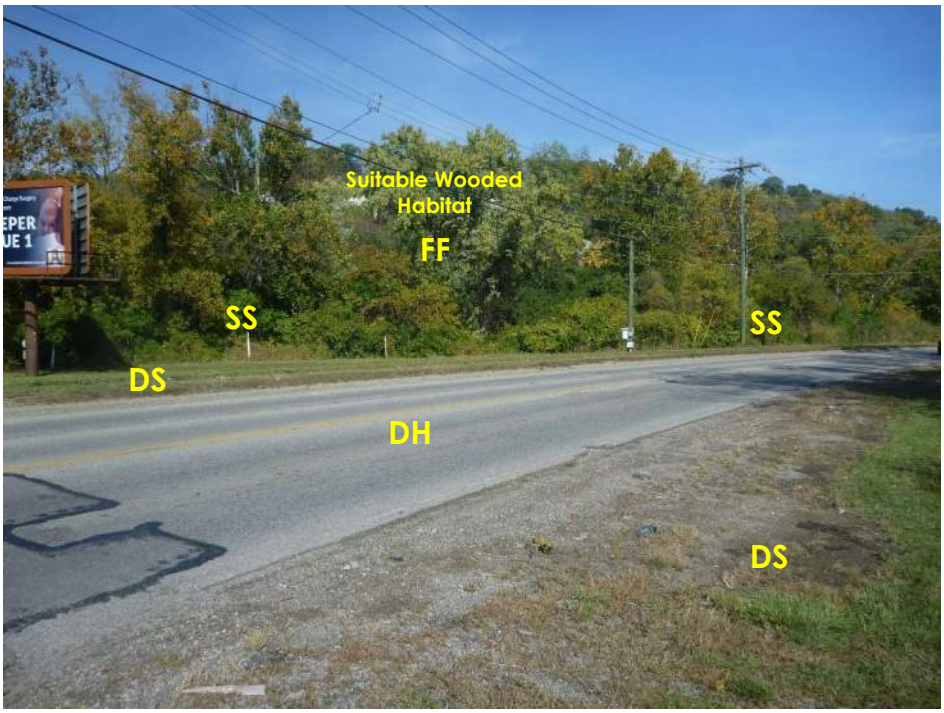


Photo Location 18: Developed High Intensity (DH), Developed Open Space (DS), Upland Forest (UF), and Scrub/Shrub (SS) vegetative communities, facing north.



Photo Location 18: Floodplain Forest (FF)and Developed Open Space (DS) vegetative communities, facing east.



Photo Location 19: View along Woodland Road and Red Bank Road at north end of study area, facing south.



Photo Location 20: View along abandoned rail bridge crossing over Indiana & Ohio Railway, Duck Creek, and Red Bank Road at northwest end of study area, facing east.



Photo Location 21: View of study area adjacent to abandoned rail line at northeast end of study area, facing west.



Photo Location 22: View of study area between Red Bank Road and Norfolk Southern Railway, facing east.



Photo Location 23: View of study area adjacent to Wooster Road, facing northeast.



Photo Location 24: View along abandoned rail line bridge over Duck Creek, facing southwest.



Photo Location 25: View along Indiana & Ohio Railway near the southwest end of the study area, facing northeast.



Photo Location 26: View of intersection of Wooster Road and Armleder Road at south end of study area, facing east.



Photo Location 26: View along Wooster Road at south end of study area, facing north.



Photo Location 27: View of study area on the north side of Armleder Road at south end of study area, facing north.



Photo Location 28: View along Armleder Road at southeast end of study area, facing west.

Attachment I

Preliminary Cost Estimates

Wasson - Armleder Alternate 1-A Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	1.40	$ 28,000.00
Excavation	CY	$ 25.00	2,100	$ 52,490.25
Embankment	CY	$ 25.00	473	$ 11,828.00
Seeding & Mulching	SY	$ 5.00	2,872	$ 14,359.50
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	681	$ 51,092.25
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	3,130	$ 219,126.13
Concrete Barrier, Type D	FT	$ 150.00		
Curb	FT	$ 25.00	-	$ -
Curb Ramp	SF	$ 20.00	-	$ -
4" Concrete Traffic Island	SY	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	-	$ -
Erosion Control	FT	$ 20	2,350	$ 47,000.00
Post Construction Stormwater BMPs	LUMP	3%		$ 128,313.07
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	-	$ -
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	0.50	$ 12,500.00
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	2,141	$ 10,706.19
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	$ -
Cast In Place Concrete Wall	LUMP			
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Rehabilitate Red Bank Road/Duck Creek Bridge	LUMP	$ 3,000,000	1	$ 3,000,000.00
Rehabilitate Columbia Parkway Bridge	LUMP	$ 600,000	1	$ 600,000.00
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 200,000.00	1	$ 200,000.00
Construction Layout & Stakes	LUMP	0.50%	4,405,415	$ 22,027.08
Maintaining Traffic	LUMP	3%	4,405,415	$ 132,162.46
Contingency	LUMP	30%	4,559,605	$ 1,367,881.48
Inflation Factor	LUMP	19%	5,927,486	$ 1,135,113.65
TOTAL			**$**	**7,062,600.05**

Wasson - Armleder Alternate 1-C Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	2.50	$ 50,000.00
Excavation	CY	$ 25.00	5,171	$ 129,266.00
Embankment	CY	$ 25.00	1,939	$ 48,463.50
Seeding & Mulching	SY	$ 5.00	7,805	$ 39,025.55
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	-	$ -
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	3,437	$ 240,611.17
Concrete Barrier, Type D	FT	$ 150.00	-	$ -
Curb Ramp	SF	$ 25.00	1,733	$ 43,337.14
4" Concrete Traffic Island	SY	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	85	$ 8,500.00
Closed Storm System	FT	$ 375	-	$ 30,000.00
Erosion Control	FT	$ 20	2,575	$ 51,500.00
Post Construction Stormwater BMPs	LUMP	3%		$ 49,877.36
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	650	$ 65,000.00
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	0.50	$ 12,500.00
Traffic Signal Modifications for Crosswalk	EA	$ 50,000	2	$ 100,000.00
Pavement Markings	FT	$ 5	2,875	$ 14,375.32
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Soldier Pile & Lagging Wall	LUMP		-	$ -
Segmental Block Wall	LUMP		-	$ -
Sheetpiling Wall	LUMP		-	
Cast In Place Concrete Wall	LUMP		-	
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Drilled Shaft Concrete Wall	LF	$ 2,000.00	350	$ 700,000.00
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	1,712,456	$ 8,562.28
Maintaining Traffic	LUMP	3%	1,712,456	$ 51,373.68
Contingency	LUMP	30%	1,712,456	$ 513,736.81
Inflation Factor (From ODOT Calculator)	LUMP	19%	2,286,129	$ 437,793.67
TOTAL			**$**	**2,723,922.47**

Wasson - Armleder Alternate 2-B Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	2.58	$ 51,622.91
Excavation	CY	$ 25.00	1,485	$ 37,128.00
Embankment	CY	$ 25.00	3,896	$ 97,389.25
Seeding & Mulching	SY	$ 5.00	1,997	$ 9,986.33
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	243	$ 18,225.00
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	3,464	$ 242,506.73
Concrete Barrier, Type D	FT	$ 150.00	-	$ -
Curb	FT	$ 25.00	866	$ 21,640.40
Curb Ramp	SF	$ 20.00	-	$ -
4" Concrete Traffic Island	SF	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	750	$ 281,250.00
Erosion Control	FT	$ 20	2,600	$ 52,000.00
Post Construction Stormwater BMPs	LUMP	3%		$ 113,481.52
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	-	$ -
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	0.50	$ 12,559.14
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	3,000	$ 15,002.45
Lighting	LUMP	$ -	-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	$ -
Cast In Place Concrete Wall	SF	$ 125.00	300	$ 37,500.00
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Drilled Shaft Concrete Wall	LF	$ 2,000.00	382	$ 764,000.00
Railroad Bridge Modifications	LUMP	$ 271,635.00	1	$ 271,635
Wooster Road Bridge Widening	LUMP	$ 1,640,272.00	1	$ 1,640,272
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 200,000.00	1	$ 200,000.00
Construction Layout & Stakes	LUMP	0.50%	3,896,199	$ 19,480.99
Maintaining Traffic	LUMP	3%	3,896,199	$ 116,885.96
Contingency	LUMP	30%	4,032,566	$ 1,209,769.70
Inflation Factor	LUMP	19%	5,242,335	$ 1,003,907.23
TOTAL			**$**	**6,246,242.61**

Wasson - Armleder Alternate 2-C Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	2	$ 43,386.34
Excavation	CY	$ 25.00	768	$ 19,201.11
Embankment	CY	$ 25.00	2,192	$ 54,807.08
Seeding & Mulching	SY	$ 5.00	6,311	$ 31,555.92
Guardrail, Type MGS	FT	$ 35.00	300	$ 10,500.00
Fence, Misc.: Wood	FT	$ 75.00	392	$ 29,376.75
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	3,500	$ 245,000.00
Concrete Barrier, Type D	FT	$ 150.00	490	$ 73,500.00
Curb	FT	$ 25.00	2,550	$ 63,746.00
Curb Ramp	SF	$ 20.00	-	$ -
4" Concrete Traffic Island	SF	$ 120.00	200	$ 24,000.00
Subgrade Stabilization	SY	$ 45.00	3,044	$ 136,985.36
DRAINAGE & EROSION CONTROL				
Underdrains	FT	$ 15.00	2,225	$ 33,372.60
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	1,000	$ 375,000.00
Erosion Control	FT	$ 20	2,625	$ 52,500.00
Post Construction Stormwater BMPs	LUMP	3%		$ 98,713.71
PAVEMENT				
Pavement, Mainline	SY	$ 120	2,844	$ 341,280.00
Pavement, Salvage	SY	$ 60	-	$ -
UTILITIES				
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	450	$ 45,000.00
Water Line Relocation	FT	$ 500	450	$ 225,000.00
Sanitary Sewer Relocation	FT	$ 300	-	$ -
TRAFFIC CONTROL				
Signs, Ground Mounted	MILE	$ 25,000	0.50	$ 12,500.00
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	2,780	$ 13,898.37
Lighting	LUMP	$ 120,000	1	$ 120,000.00
STRUCTURES				
Segmental Block Wall	LUMP		-	$ -
Cast In Place Concrete Wall	LUMP		-	
Drilled Shaft Concrete Wall	LF	$ 2,000.00	121	$ 242,000.00
Precast Box Culvert	EA	$ 250,000	-	$ -
12' X 12' Box Culvert Extension	LF	$ 2,100.00	54	$ 113,400.00
Extended Culvert Headwall	LUMP			$ 60,000.00
Railroad Bridge Modifications	LUMP	$ 271,635.00	1	$ 271,635
Wooster Road Bridge Modification	LUMP	$ 585,400.00	1	$ 585,400
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	3,451,758	$ 17,258.79
Maintaining Traffic	LUMP	3%	3,451,758	$ 103,552.75
Contingency	LUMP	30%	3,572,570	$ 1,071,770.93
Inflation Factor	LUMP	19%	4,644,341	$ 889,391.25
TOTAL			**$**	**5,533,731.95**

Wasson - Armleder Alternate 3-B Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	5.98	$ 119,560.41
Excavation	CY	$ 25.00	10,328	$ 258,210.63
Embankment	CY	$ 25.00	5,499	$ 137,484.82
Seeding & Mulching	SY	$ 5.00	19,735	$ 98,673.67
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	1,407	$ 105,525.00
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	7,364	$ 515,455.40
Concrete Barrier, Type D	FT	$ 150.00	-	
Curb	FT	$ 22.00	-	$ -
Curb Ramp	SF	$ 8.00	316	$ 2,525.50
4" Concrete Traffic Island	SY	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
DRAINAGE & EROSION CONTROL				
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	-	$ -
Erosion Control	FT	$ 20	5,525	$ 110,500.00
Post Construction Stormwater BMPs	LUMP	3%		$ 71,034.22
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	$ -
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	-	$ -
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
			-	
TRAFFIC CONTROL				
Signs, Ground Mounted	MILE	$ 25,000	1	$ 26,425.00
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	5,581	$ 27,904.80
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	$ -
Cast In Place Concrete Wall	SF	$ 350.00	200	$ 70,000.00
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Modify Abandoned RR Bridge over Duck Creek	LUMP	$ 237,363.20	1	$ 237,363.20
Concrete Slab Bridge over Duck Creek	LUMP	$ 528,179	1	$ 528,179.00
				$ -
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	2,438,842	$ 12,194.21
Maintaining Traffic	LUMP	3%	2,438,842	$ 73,165.25
Contingency	LUMP	30%	2,524,201	$ 757,260.33
Inflation Factor	LUMP	19%	3,281,461	$ 628,399.87
TOTAL			**$**	**3,909,861.30**

Wasson - Armleder Alternate 3-C Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	5.86	117,145
Excavation	CY	$ 25.00	4,621	$ 115,536.14
Embankment	CY	$ 25.00	10,013	$ 250,314.62
Seeding & Mulching	SY	$ 5.00	20,623	$ 103,113.68
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	1,230	$ 92,257.50
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	8,556	$ 598,914.40
Concrete Barrier, Type D	FT	$ 150.00	-	$ -
Curb	FT	$ 25.00	-	$ -
Curb Ramp	SF	$ 20.00	184	$ 3,684.22
4" Concrete Traffic Island	SY	$ 120.00	-	-
Subgrade Stabilization	SY	$ 45.00	-	-
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	-
Culvert Type A, <5'	FT	$ 200	-	-
Culvert Type D, 12"	FT	$ 100	-	-
Closed Storm System	FT	$ 375	-	-
Erosion Control	FT	$ 20	6,400	$ 128,000.00
Post Construction Stormwater BMPs	LUMP	3%		$ 73,664.91
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	-
Pavement, Salvage	SY	$ 60	-	-
			-	
UTILITIES			-	-
Electric Transmission Line Relocation	FT	$ 500	-	-
Electric Distribution Line Relocation	FT	$ 100	200	20,000
Water Line Relocation	FT	$ 500	-	-
Sanitary Sewer Relocation	FT	$ 300	-	-
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	1	$ 30,238.97
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	6,386	$ 31,932.35
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	-
Cast In Place Concrete Wall	SF			
Precast Box Culvert	EA	$ 250,000	-	-
Precast Arch Culvert	EA	$ 750,000	-	-
Modify Abandoned RR Bridge over Duck Creek	LUMP	$ 237,363.20	1	$ 237,363.20
Concrete Slab Bridge over Duck Creek	LUMP	$ 596,997	1	$ 596,997.00
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	2,529,162	$ 12,645.81
Maintaining Traffic	LUMP	3%	2,529,162	$ 75,874.86
Contingency	LUMP	30%	2,617,683	$ 785,304.77
Inflation Factor	LUMP	19%	3,402,987	$ 651,672.08
TOTAL			**$**	**4,054,659.41**

Wasson - Armleder Alternate 3-D Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	5.91	$ 118,276.39
Excavation	CY	$ 25.00	5,340	$ 133,507.55
Embankment	CY	$ 25.00	7,272	$ 181,805.78
Seeding & Mulching	SY	$ 5.00	23,729	$ 118,644.26
Guardrail, Type MGS	FT	$ 35.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	1,530	$ 114,750.00
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	8,583	$ 600,814.67
Concrete Barrier, Type D	FT	$ 150.00	-	$ -
Curb	FT	$ 25.00	-	$ -
Curb Ramp	SF	$ 20.00	184	$ 3,684.22
4" Concrete Traffic Island	SY	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	-	$ -
Erosion Control	FT	$ 20	6,400	$ 128,000.00
Post Construction Stormwater BMPs	LUMP	3%		$ 78,812.30
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	$ -
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	-	$ -
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
Gas Line Relocation	FT	$ 300	200	$ 60,000.00
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	1	$ 30,440.44
Traffic Signals	EA	$ 200,000	-	$ -
Pavement Markings	FT	$ 5	6,429	$ 32,145.10
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	$ -
Sheetpiling Wall	LUMP			
Cast In Place Concrete Wall	LUMP	$ 125.00	445	$ 55,625.00
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Modify Abandoned RR Bridge over Duck Creek	LUMP	$ 237,363.20	1	$ 237,363.20
Concrete Slab Bridge over Duck Creek	LUMP	$ 682,020.00	1	$ 682,020.00
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	2,705,889	$ 13,529.44
Maintaining Traffic	LUMP	3%	2,705,889	$ 81,176.67
Contingency	LUMP	30%	2,800,595	$ 840,178.50
Inflation Factor	LUMP	19%	3,640,774	$ 697,208.13
TOTAL			**$**	**4,337,981.63**

Wasson - Armleder Alternate 3-E Cost Estimate

ITEM	UNIT	UNIT PRICE	QTY	COST
ROADWAY				
Clearning & Grubbing	ACRE	$ 20,000	5.78	$ 115,672.24
Excavation	CY	$ 25.00	5,078	$ 126,954.97
Embankment	CY	$ 25.00	9,407	$ 235,169.87
Seeding & Mulching	SY	$ 5.00	19,423	$ 97,115.78
Guardrail, Type MGS	FT	$ 22.00	-	$ -
Fence, Misc.: Wood	FT	$ 75.00	360	$ 27,000.00
5'- 7' Sidewalk	SF	$ 8.00	-	$ -
10' or 12' Shared Use Path	SY	$ 70.00	8,570	$ 599,866.86
Concrete Barrier, Type D	FT	$ 150.00	-	$ -
Curb	FT	$ 22.00	-	$ -
Curb Ramp	SF	$ 8.00	381	$ 3,051.14
4" Concrete Traffic Island	SY	$ 120.00	-	$ -
Subgrade Stabilization	SY	$ 45.00	-	$ -
			-	
DRAINAGE & EROSION CONTROL			-	
Underdrains	FT	$ 15.00	-	$ -
Culvert Type A, <5'	FT	$ 200	-	$ -
Culvert Type D, 12"	FT	$ 100	-	$ -
Closed Storm System	FT	$ 375	-	$ -
Erosion Control	FT	$ 20	6,425	$ 128,500.00
Post Construction Stormwater BMPs	LUMP	3%		$ 102,528.51
			-	
PAVEMENT			-	
Pavement, Mainline	SY	$ 120	-	$ -
Pavement, Salvage	SY	$ 60	-	$ -
			-	
UTILITIES			-	$ -
Electric Transmission Line Relocation	FT	$ 500	-	$ -
Electric Distribution Line Relocation	FT	$ 100	-	$ -
Water Line Relocation	FT	$ 500	-	$ -
Sanitary Sewer Relocation	FT	$ 300	-	$ -
			-	
TRAFFIC CONTROL			-	
Signs, Ground Mounted	MILE	$ 25,000	1	$ 31,683.52
Traffic Signals	EA	$ 50,000	1	$ 50,000.00
Pavement Markings	FT	$ 5	5,594	$ 27,969.05
Lighting	LUMP		-	$ -
			-	
STRUCTURES			-	
Segmental Block Wall	LUMP		-	$ -
Cast In Place Concrete Wall	SF	$ 350.00	2,918	$ 1,021,215.20
Precast Box Culvert	EA	$ 250,000	-	$ -
Precast Arch Culvert	EA	$ 750,000	-	$ -
Modify Abandoned RR Bridge over Duck Creek	LUMP	$ 237,363.20	1	$ 237,363.20
Concrete Slab Bridge over Duck Creek	LUMP	$ 714,555.00	1	$ 714,555.00
INCIDENTALS				
Field Office	MONTH	$ 2,500.00	12	$ 30,000.00
Mobilization	LUMP	$ 100,000.00	1	$ 100,000.00
Construction Layout & Stakes	LUMP	0.50%	3,648,645	$ 18,243.23
Maintaining Traffic	LUMP	3%	3,648,645	$ 109,459.36
Contingency	LUMP	30%	3,776,348	$ 1,132,904.38
Inflation Factor	LUMP	19%	4,909,252	$ 940,121.82
TOTAL			**$**	**5,849,374.12**

FY 2024-2028 Business Plan Inflation Calculator:

Not sure if you have the latest calculator? Click here.

Last Modified: 7/20/2023

Today's Date:
February 28, 2024

Please Enter Values in the Yellow Areas Only:

Estimation Start Date:
Less than or Equal to Today's Date
(mm/dd/yyyy)

2/28/2024
Start Date:

Enter Construction Mid-Point Date:
(cannot exceed 02/28/2049)
(mm/dd/yyyy)

1/1/2028
Construction Mid-Point Date:

Present-Day Estimated Cost:

$3,000,000.00
Estimated Dollar Amount:

Estimate Start Date to Construction Mid-Point Date: **47** **Months**

Inflation - Start to Mid-Point of Construction:

	(compounded growth rate)	**Inflated Dollar Amount:**
Business Plan	**19.2%**	**$3,574,574.05**

Estimator's Name:

County - Route - Section: HAM-Wasson Way to Otto Armleder

PID: 113603

Estimator's Notes: Feasibility Study Estimates